3.0 Affected Environment

This chapter describes the existing environmental resources of the project areas, with emphasis on the conditions in the human and natural environment that may be affected by the project alternatives.

3.1 Physical Setting and Climate

Clearwater National Forest is located on the west side of the Bitterroot Mountains in north central Idaho (Figure 1-1). Forest Headquarters are in Orofino, Idaho. The Forest is divided into four Ranger Districts: North Fork District, with offices in Orofino; Lochsa District with offices in Kooskia; Palouse District, with offices in Potlatch; and Powell District, with an office at Powell Ranger Station 44 miles west of Lolo, Montana. The Lolo Creek study area is within the Lochsa Ranger District, while the Moose Creek study area is within the North Fork District.

The Forest encompasses approximately 1.8 million acres of diverse terrain, landscapes, and vegetation. Nearly a million acres are currently roadless and another quarter million acres are designated wilderness.

Clearwater National Forest is characterized by rugged, mountainous terrain, high mountainous lakes, and streams. The high mountains on the east descend to the Palouse prairie to the west. Elevations range from 1,600 to nearly 9,000 feet. The landscape within the Forest displays a wide variety of landforms including steep canyon breaklands, low relief rolling hills, colluvial midslopes, frost churned uplands, mass wasted areas, and alpine glaciated areas (Wilson, 1983).

Several major tributaries to the Clearwater River flow through the Forest, including the North Fork of the Clearwater, the Lochsa, the Potlatch and the Palouse Rivers. The Clearwater River runs through deep canyons, dramatic "slashes" cut through the mountains.

The area’s climate is dominated by Aleutian Low and Pacific High maritime air masses and prevailing westerly winds. Aleutian Lows that are prevalent in winter bring periods of heavy precipitation as snow and spring rains. Rain on snow events are common, and these can cause flooding. Pacific Highs in summer cause hot, dry weather. Precipitation during summer often occurs as short-term, high intensity thunderstorms. Average annual precipitation in the Lolo Creek watershed is about 40 inches per year with over half the annual precipitation contributing to stream flow. Average annual precipitation in the Moose Creek watershed is approximately 54 inches per year (USFS 1991).

Most precipitation in both watersheds occurs in the fall, winter, and spring. Weather varies with elevation. Summers tend to bring clear days, with occasional afternoon thunderstorms. Daytime highs are normally warm to moderate, with relatively cool to cold nights, depending on elevation. Winter can bring cold temperatures with heavy snows, especially at the high elevations. Sunny days are common between winter storms.

Bedrock within the Forest is predominantly Belt series metasedimentary rocks, Border Zone and Western Idaho Suture Zone metamorphic rocks, Idaho Batholith granitics, and Columbia River

Basalts (Mitchell, 1996). Soils produced from these parent materials vary in thickness and erodibility. Much of the area is capped with volcanic ash produced by the eruption of Mount Mazama (Crater Lake) about 6,700 years ago (Wilson, 1983).

3.2 Lolo Creek

3.2.1 Watershed Description

Lolo Creek is a major tributary to the Clearwater River. The confluence is located near Greer, Idaho (see Figure 1-1 in Chapter 1). The Lolo Creek watershed covers 243 square miles, with 42 square miles above Musselshell Creek (USFS 2003a) and approximately 14.2 square miles within the EIS project area. The watershed ranges in elevation from 1,098 feet at its mouth to 2,775 feet at the U.S. Forest Service Boundary, to 6,051 feet at its headwaters (Clearwater Biostudies, Inc. 1998). Within the study area, the headwaters of tributary Dutchman Creek are at about 4,300 feet, and Lolo Creek descends to about 3,400 feet where it flows out of the study area to the east.

Tributaries within the Lolo Creek project area include Nevada Creek, Mike White Creek, White Creek, Utah Creek, Siberia Creek, and Dutchman Creek. Intermittent streams are rare as most streams are perennial that emerge near ridges. The drainage density within the Lolo Creek watershed is 4.1 miles of stream per square mile (USFS 2002c). The Lolo Creek drainage above Musselshell Creek has had timber harvested on 42 percent of the area since 1954. About 218 miles of roads have been constructed, creating an average density of 5.2 miles of road per square mile (USFS 2002c). Grazing allotments have been managed on approximately 20 percent of the watershed, primarily at the lower elevations, and past wildfires have occurred on 3,800 acres, approximately 47 percent of the watershed.

The State of Idaho has designated the Clearwater River as having several beneficial uses, including domestic water supply, cold-water biota, salmonid spawning, primary contact recreation, and special resource waters (IDEQ 2000). The State has not listed specific beneficial uses for Lolo Creek. The Forest Plan identifies steelhead trout and cutthroat trout as the beneficial uses for the Lolo Creek watershed (USFS 1987).

The Idaho Department of Environmental Quality has determined that many streams across the State do not support their designated beneficial uses due to their inability to meet applicable water quality standards. Lolo Creek has not been identified as having any water quality concerns within the project area. Downstream of the project area, the State has identified Lolo Creek below Eldorado Creek as having water quality concerns from bacteria, dissolved oxygen, flow alteration, habitat alteration, nutrients, oil and grease, sediment, and temperature (IDEQ 1999b).

There are approximately 24.7 miles of perennial streams within the Lolo Creek study area, with Lolo Creek itself running for 11.6 miles through the area. Parts of Lolo Creek were placer mined in the 1970s and early 1980s with heavy equipment. The operation was on the Lolo #5 mining claim and was called the Collette Mine (see Figure 2-3). The mined area has not been reclaimed and this reach of the creek is channelized, with unstable banks.

Clearwater National Forest resource hydrology and fisheries specialists analyzed the Clearwater watershed condition for hydrologic integrity in 1997 (USFS 2003a). Lolo Creek was rated as having a “moderate” condition (USFS 2003d). A “high” condition is defined as a watershed having a robust condition in which no long-term changes occur even with major storm events. These watersheds have stable drainage networks and are in a desired functional condition. A watershed with a “moderate” condition is not meeting the requirements of a watershed in a “high” condition but still maintains a dynamic equilibrium and is functioning within its geomorphic threshold. Moderate watersheds often have higher levels of instream sediment, but the stream network remains stable. Most of the streams in the Lolo Creek drainage were rated moderate because of relatively high levels of cobble embeddedness (i.e. relatively high levels of sediment surrounding stream cobbles).

3.2.2 Geomorphology

The Lolo Creek watershed above Musselshell Creek has moderate topographic relief. Generally, land types are rated moderate to high for sediment delivery efficiency, and many stream channels are moderately to extremely sensitive to changes in flow and sediment (USFS 2003a). Sediment delivery efficiencies in this watershed are relatively high because of a relatively high drainage density, especially in first and second order streams higher in the watershed, and distance to stream channels are relatively short. This means that sediment generated on hillsides and steep slopes does not have long distances to travel before it reaches stream channels.

The Forest Service (2003a) reports that erosion and sedimentation are historical processes that can be considered as “background" effects, and are ongoing whether there are human activities or not. Management actions such as road construction, timber harvest, and fire suppression do not add new processes to the existing natural forces; they may, however, change the frequency and magnitude of the processes.

Lolo Creek has predominantly B3 and C3 channel types as defined by the Rosgen (1994) method (USFS 2002a) --- Table 3-1 describes channel types. In general, Type B channels are dominated by riffles with some reaches containing “rapids” and infrequently spaced scour-pools at bends or areas of constriction. Type C channels have lower gradients and are dominated by riffle/pool systems. The numbers given to the stream types generally describe the material making up the channel substrate, as shown in Table 3-1 (Rosgen 1994).

Table 3-1. Channel Descriptions by Channel Type	
Rosgen Channel Type	*Channel Description*
A2	Entrenched, steep stream with a boulder substrate
A4	Entrenched, steep stream with a gravel substrate
A5	Entrenched, steep stream with a sand substrate
A6	Entrenched, steep stream with a silt/clay substrate
B3	Moderately entrenched stream with a cobble substrate
B4	Moderately entrenched stream with a gravel substrate
B5	Moderately entrenched stream with a sand substrate
G5	Entrenched (Gullied) stream with a sand substrate
G6	Entrenched (Gullied) stream with a silt/clay substrate
Source: USFS (1994)	

Studies conducted by Clearwater National Forest in 1998 showed that Lolo Creek had an average gradient of 2.0 percent (USFS 2002a). These studies rated stream reaches based on a subjective scoring system which rates stream habitat and stream geomorphological condition (USFS 2002a). Results of these studies are provided in Table 3-2. Channel stability was rated "good" on 22 reaches and "fair" on 15 reaches. Mean channel stability for the 37 reaches is 77.1 or "fair." The mean stream bank stability rating was 4.9 in 1993 and 4.7 in 1998. The overall decrease in stable stream banks was attributed to high flows in 1995 and 1996 (USFS 2002a). The survey identified one area (Reach LO-34) where past mining activities at the Collette Mine (see Figure 2-3) caused a substantial decrease in bank stability. In this reach, unstable stream banks have increased from 56 to 418 meters per kilometer. All other reaches are stable. Cobble embeddedness levels (i.e. the amount of sediment surrounding cobbles in the substrate) were 44.7 in 1993 and 44.7 in 1998 (USFS 2002a), both of which exceed the Forest Service's Desired Future Condition of 30 to 35 percent (USFS 1987). In general, the levels of cobble embeddedness in Lolo Creek are associated with natural geomorphic conditions and past management activities (USFS 2002a) such as road construction.

Numerous monitoring studies have been conducted by Clearwater National Forest to evaluate sediment levels and particle size distributions in the substrate of Lolo Creek. Wolman pebble counts (Wolman 1954) were collected in the summer of 1998 in Lolo Creek below Yoosa Creek, above White Creek and below Nevada Creek (USFS 2002a). Wolman pebble count data were collected in three riffles in each reach, representing over 600 individual particle size measurements for each reach. In addition, cores were abstracted from the deeper substrate of the creek and also analyzed for particle sizes. Figure 3-1 depicts combined results from the pebble counts and subsurface cores showing the percent distribution for several particle size classes. Percent distribution is shown by size class and as an accumulated percentage. These data show a normal distribution of particle sizes in the surface substrate for all three reaches. This distribution is typical of channels that are geomorphologically stable with only moderate levels of substrate sediment. An evaluation of Figure 3-1 shows that particle sizes making up less than 2 mm or less are approximately 12 percent of the surface substrate and 13 percent of the

subsurface substrate. The Department of Agriculture defines particle sizes between 2 mm and 0.05 mm as sand and particle sizes between 0.05 mm and 0.002 mm as silt (Brady 1974). These data indicate that a small amount of the substrate material consists of sands, silts, and clays, while a majority of the material is made up of larger gravels, cobbles and rock.

Table 3-2. Comparison of Mainstem Lolo Creek Channel Characteristics in 1993 and 1998

Reach [2]	*Channel Type*	*Channel Stability*[1] *1998*	*Bank Stability 1993*	*Bank Stability 1998*	*Cobble Embeddedness % 1993*	*Cobble Embeddedness % 1998*
LO-13	B3	69	4.9	5.0	47	46
LO-14	B3	66	5.0	5.0	47	41
LO-15	B3	72	5.0	4.8	36	35
LO-16	B3	85	4.8	4.7	50	51
LO-17	B3	86	5.0	4.8	51	48
LO-18	C3	101	4.3	4.9	56	62
LO-19	B2	60	5.0	5.0	27	35
LO-20	C3	96	4.8	4.4	44	46
LO-21	B3c	76	5.0	4.9	51	42
LO-22	B3c	76	5.0	5.0	46	45
LO-23	B3c	83	5.0	5.0	58	52
LO-24	C3	93	4.8	4.8	57	54
LO-25	B3c	58	4.7	4.9	40	37
LO-26	C3	86	5.0	4.5	59	55
LO-27	B3	55	5.0	5.0	42	40
LO-28	C3	88	4.8	4.7	54	50
LO-29	B2c	66	5.0	4.9	52	46
LO-30	B3c	97	5.0	4.5	55	56
LO-31	B2c	74	5.0	5.0	46	45
LO-32	B3c	100	4.9	4.7	49	52
LO-33	B3	55	5.0	5.0	48	45
LO-34	C3	101	4.3	2.9	39	48
LO-35	B1c	62	4.7	4.3	34	36
LO-36	C3	90	5.0	4.0	53	55
LO-37	B3c	78	4.4	4.7	36	41
LO-38	C3	93	4.7	4.2	76	56
LO-39	C3	70	4.8	4.6	26	38
LO-40	C3	81	4.8	4.3	18	43
LO-41	B3c	67	4.9	5.0	28	34
LO-42	B2c	59	5.0	5.0	44	46
LO-43	A2	56	5.0	5.0	7	12
LO-44	B2	56	5.0	5.0	13	25
LO-45	A2	52	5.0	5.0	7	12
LO-46	B3c	61	5.0	5.0	14	24
LO-47	C3	65	5.0	5.0	45	39
LO-48	C3	57	5.0	4.7	35	34
LO-49	C3	68	4.9	4.8	30	28
Mean		77.1 (Fair)	4.9 (Stable)	4.7 (Stable)	44.7% (DFC 30-35%)	42.8% (DFC 30-35%)

Table adapted from USFS 2002a
[1] Scoring: <39 = Excellent; 39-76 = Good; 77-114 = Fair; >114 = Poor.
[2] a map of Lolo Creek reach locations is not available
c channel with a slope that is less than 2%.
DFC = Desired Future Condition

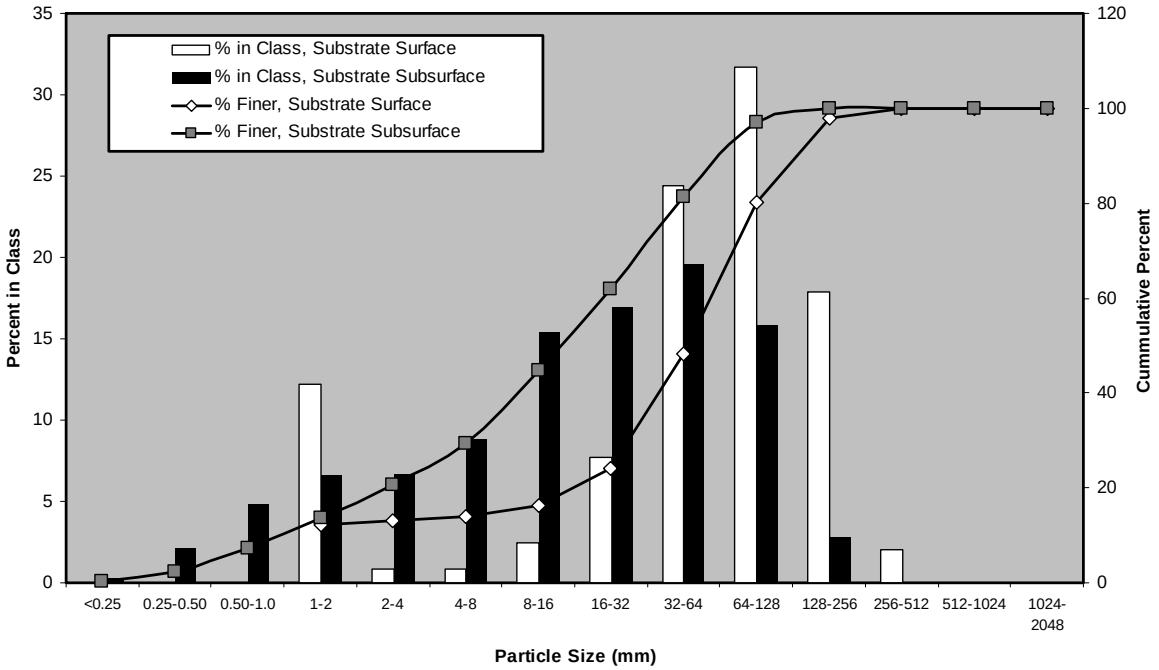


Figure 3-1. Average Particle Size Distribution of Lolo Creek Substrate Materials (USFS 2003e)

3.2.3 Stream and Sediment Discharge

Clearwater National Forest applied a flow-sediment yield model (WATBAL) to evaluate potential effects from the proposed White-White timber sale in upper Lolo Creek above Musselshell Creek in 2002 (USFS 2002c). The WATBAL model was used to predict the relative differences in sediment yields that occur naturally, based on land-types and management activities (USFS 2001e). Based on WATBAL, the Lolo Creek watershed (above Musselshell Creek) has 40 inches of precipitation annually (86,278 acre-feet) and 18 inches of runoff (38,192 acre-feet) (USFS 2002a). The watershed efficiency is 44 percent, which is common for forested montane stream systems. Natural sediment production was estimated at six tons per square mile per year. This would be considered the average rate of erosion and sediment transport through a natural system.

The Forest Plan standard for Lolo Creek is a C channel type (see Table 3-1), steelhead high fishable stream[4] (USFS 1987). The approximate maximum sediment loadings that generally support this criterion are 50 percent over natural. Sediment production should be at or below 35 percent over natural for 20 out of 30 years. Current sediment production in Lolo Creek is 44 percent over natural. Sediment production in Lolo Creek exceeded 35 percent over natural for

[4] "High fishable" is a water quality/fishery objective defined as the maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support an excellent fishery relative to the stream's natural potential, and that will provide the capability for essentially full habitat recovery over time (USFS 1987).

17 out of 30 years (USFS 2002c). Therefore, Lolo Creek does not meet the Forest Plan sediment standard (USFS 2002a.)

In 2002, Equivalent Clearcut Acres amounted to 11.5 percent in the upper Lolo Creek watershed, but Clearwater National Forest indicates that this level is declining (USFS 2002a). WATBAL showed a peak flow increase of five percent over natural for 2002. This is less than the level of 15 to 20 percent that is considered to be potentially detrimental to the stream system (USFS 2001e). WATBAL predicted no accumulated sediment in Lolo Creek from road construction and logging activities. However, sediment does accumulate behind log weirs that have been placed in the creek to improve fishery habitat, but were not designed to pass sediment.

Stream discharge, suspended sediment, turbidity, and bedload have been monitored at the Section 6 Bridge on Lolo Creek since 1986. Turbidity results from an increase of suspended fine sediment that reduces water clarity. Results show low levels of suspended sediment and turbidity with no significant trend over time (Table 3-3). These turbidity data represent nearly 1,000 samples collected since 1986, all of which remain below the State turbidity standard of 50 NTU[5].

Table 3-3. Annual Mean and Maximum Stream Discharge, Suspended Sediment, and Turbidity Measured at the Lolo Creek Section 6 Bridge

Year	*Mean Discharge cfs*	*Maximum Discharge cfs*	*Mean Suspended Sediment mg/l*	*Maximum Suspended Sediment mg/l*	*Mean Turbidity NTU*	*Maximum Turbidity NTU*
1986	95.9	448	10.7	50.7	1.6	5.3
1987	121	1,040	21.7	199	3.5	18.0
1988	57.7	360	5.9	40	2.2	4.5
1989	82.3	570	7.6	48	nm	nm
1990	77.2	332	8.4	95	1.6	9.0
1991	107	446	12.4	66	nm	nm
1992	57.9	262	16.8	145	nm	nm
1993	84.4	409	11.7	72	nm	nm
1994	57.9	343	12.7	59	nm	nm
1995	84.0	387	11.3	64	nm	nm
1996	152	1,209	9.7	60	nm	nm
1997	135	854	13.2	183	nm	nm
1998	46.4	120	17.8	185	3.0	24.8
1999	108	543	9.4	47	3.0	12.1
2000	91.9	409	9.1	95	2.3	11.1
2001	75.3	365	6.1	76	1.9	18.8

Table adapted from USFS 2002a
cfs = cubic feet per second.
mg/l = milligrams per liter
NTU = Nephelometric Turbidity Units
nm = not measured

[5] Nephelometric Turbidity Units are measures that result from a photogrammetric method of measuring light transmission through water. As turbidity increases, more light is scattered by suspended particles in the water and less light is transmitted through the water.

These data show that sediment production in Lolo Creek is meeting State water quality standards and beneficial uses for steelhead trout and cutthroat trout as listed in the Forest Plan for the Lolo Creek watershed (USFS 1987). Bedload is a measurement of sediment and larger size particles that move by jumping/bouncing, rolling, or sliding along the stream bottom. Bedload can be added to the suspended load to determine the total sediment load for a stream. A total of 141 bedload samples were taken at the Lolo Creek Section 6 Bridge monitoring station between 1980 and 2002. Table 3-4 shows average monthly stream discharge, suspended sediment concentration, suspended sediment load, bedload, and total sediment load. These data show the relationship between stream discharge and the total transport of sediment throughout the year. Peak stream discharge occurs in April and May with peak total sediment loads ranging between 11,665 pounds per day (lbs/day) in April and 12,378 lbs/day in May. Total sediment load is reduced approximately 10-fold when stream flows decline later in the water year, to 1,780 lbs/day in July and 957 lbs/day in August. These data further show that a majority of the total sediment load is suspended. The bedload ranges between 5 percent and 48 percent of the total sediment load. Relationships between mean monthly stream discharge and sediment load are depicted in Figure 3-2.

The relationship between stream discharge and sediment transport, as depicted in Figure 3-2, is related to stream velocity. There are several factors, such as channel width, depth, and slope that determine the velocity of a stream at any given flow rate and at any given point. However, the velocity of the water flowing in a stream generally increases with increasing stream flow.

Increasingly higher velocities are required to dislodge, suspend, and transport increasingly larger sizes of sediment material. As flow velocity decreases, sediment particles settle out according to size. Sand and larger fractions drop out to the channel substrate until at lower velocities the stream has only enough energy to keep very fine sediments (i.e. silts and clays) suspended.

A relationship between stream discharge and stream velocity near the Section 6 monitoring station was estimated using channel cross-section information provided by USFS (2003e) and Manning's equation. This relationship is shown in Table 3-5 and Figure 3-3.

Table 3-4. Average Monthly Discharge, Suspended Sediment Load, Bedload, and Total Sediment Load Measured at the Lolo Creek Section 6 Bridge

Month	*Average Stream flow cfs*	*Average Suspended Sediment Conc. mg/L*	*Average Suspended Sediment Load lbs/day*	*Average Bedload lbs/day*	*Total Sediment Load lbs/day*
Oct	32	10	859	nm	–
Nov	49	25	3,317	388	3,704
Dec	49	NA	NA	nm	–
Jan	51	NA	NA	nm	–
Feb	88	15	3,511	nm	–
Mar	140	12	4,399	212	4,611
April	244	14	9,113	2,552	11,665
May	242	15	9,459	2,918	12,378
June	138	15	5,372	1,288	6,660
July	55	10	1,541	239	1,780
Aug	25	7	500	458	957
Sep	21	8	455	721	1,175

Table adapted from USFS 20033
cfs = cubic feet per second.
mg/l = milligrams per liter
lbs/day = pounds per day
NTU = Nephelometric Turbidity Units
nm = not measured

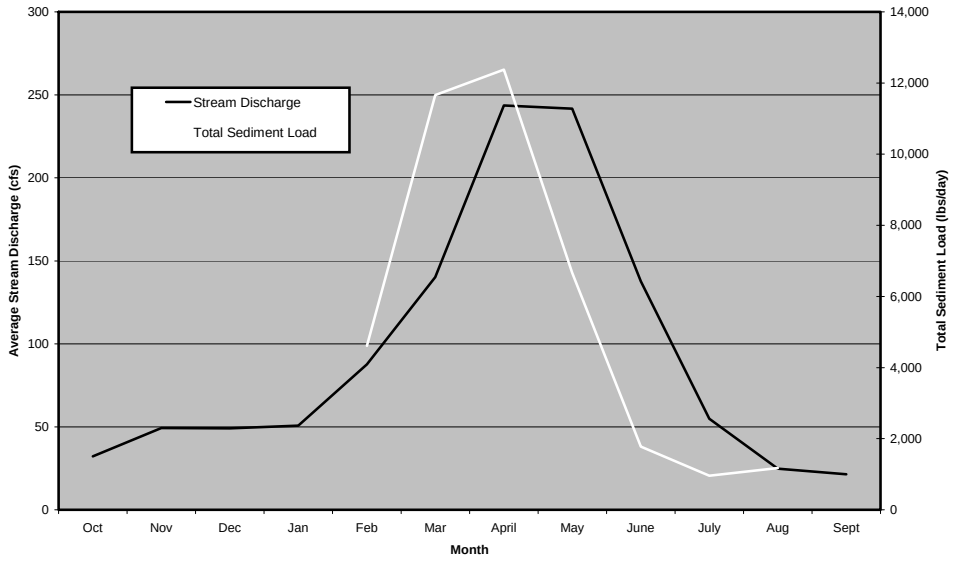


Figure 3-2. Relationship between Stream Discharge and Total Sediment Load at the Lolo Creek Section 6 Bridge (Source USFS 2003e)

Table 3-5. Relationship between Stream Flow and Stream Velocity at the Lolo Creek Section 6 Bridge		
Month	*Average Stream Discharge cfs*	*Average Flow Velocity Flow Velocity Fps*
Oct	17	1.00
Nov	28	1.21
Dec	29	1.23
Jan	29	1.23
Feb	51	1.53
Mar	83	1.83
Apr	143	2.24
May	142	2.24
Jun	79	1.80
Jul	32	1.28
Aug	14	0.93
Sep	12	0.88
Table adapted from USFS 2003e cfs = cubic feet per second fps = feet per second		

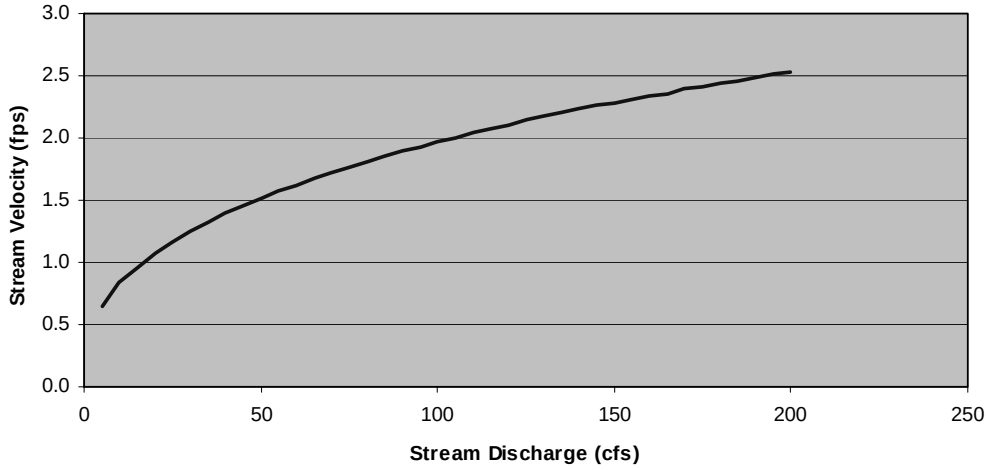


Figure 3-3. Relationship between Stream Flow and Stream Velocity at the Lolo Creek Section 6 Bridge (Source USFS 2003e)

3.2.4 Fisheries and Aquatic Organisms

3.2.4.1 Aquatic Habitat

Aquatic habitat conditions have been degraded in the Lolo Creek drainage by past mining, grazing, road construction, and timber harvest (USFS 1999). Table 3-6 provides a summary of stream channel and aquatic habitat characteristics in the Lolo Creek project area between the confluences of Eldorado Creek and Yoosa Creek. Table 3-7 provides the average percentages of material comprising the substrate in Lolo Creek, also between the confluences of Eldorado Creek and Yoosa Creek (Clearwater BioStudies Inc., 1999a). The data indicate that the substrate is dominated by material larger than cobbles. This substrate provides limited spawning-sized gravels for salmonids. However, it provides excellent fish rearing habitat. Table 3-8 summarizes the average percentages of spawning habitat for various fish within the Lolo Creek project reach, based on a 1998 habitat survey. The data indicate that only a small percentage of the stream habitat area is available for salmonid spawning. Approximately two percent of the stream reach provides good spawning habitat. These data are consistent with the low availability of spawning gravels (Table 3-7).

In 1999, stream temperatures were monitored throughout the summer of 1999 on nine streams (not including mainstem Lolo Creek or lower Eldorado Creek) within the Lolo Creek drainage to evaluate habitat conditions for steelhead trout, spring chinook salmon, westslope cutthroat trout and bull trout. Overall, water temperatures of these streams met the State standards for cold-water biota: water temperatures did not exceed the daily maximum of 22 ºC and the maximum daily average of 19 ºC. Mainstem Lolo Creek and lower Eldorado Creek, however, have shown water temperatures higher than the State standards in past years (USFS 1999).

3.2.4.2 Threatened, Endangered, and Sensitive Species

Chinook Salmon (Oncorhynchus tshawytscha). Spring-run chinook salmon are larger than resident fish, which limits them to mainstem and large spawning streams where gradients are low, and there are large riffles with deep pockets of 3-6” diameter gravel. Concentrated spawning areas include Lolo Creek above Musselshell Creek and in Yoosa Creek. Juvenile rearing occurs in all of the Lolo Creek mainstem, Yoosa Creek below Camp Creek, and the lower reaches of Nevada Creek. Juveniles prefer pool-type habitats for rearing.

State, Federal, and Nez Perce Tribe hatchery supplementation (stocking) of spring/summer chinook adults has occurred in Lolo Creek over the last ten years. This has caused a significant increase in the number of these fish in the drainage. For example, densities of juvenile spring chinook salmon observed over 15 permanent snorkeling stations in Lolo Creek from 1992 to 1996 varied from 0.2 to 38.5. From 1997 to 2002, juvenile densities observed from the same stations have varied from 35.7 to 78.7 (USFS 2003a).

No historical records or current documentation of fall-run chinook salmon spawning or rearing within the Lolo Creek watershed are available (USFS 2002a). There is no designated critical habitat for fall chinook in the study area; the closest critical habitat is downstream, on the mainstem of the Clearwater River at the mouth of Lolo Creek.

Table 3-6. Summary of Lolo Creek Aquatic Habitat Characteristics [a]	
Rosgen Classification (see Table 3-1)	2% A, 46% B, 52% C
Average Gradient	1.1 %
Stream Width	11.0 m
Stream Depth	0.253 m
Thalweg Depth	0.497 m
Bank Stability	4.6 (Stable)
Cobble Embeddedness [b]	45 %
Pool:Riffle Ratio [c]	61 : 39
Acting Debris / Potential Debris [d]	4 / 13
Pool Quality	2.6 (Good)
Instream Cover	2.3 (Moderate)
Bank Cover	1.1 (Sparse)
a = averages derived from 1998 summer stream survey data between Eldorado Creek and Yoosa Creek (Clearwater BioStudies Inc., 1999a). b = The target cobble embeddedness rate for the Forest Plan should be less than 35 %. c = The target pool:riffle ratio is 40:60 for Rosgen B channels and 50:50 for C channels. d = Acting debris = Pieces of in-channel wood per 100m. Potential debris = riparian conifers available for recruitment into the channel per 100 m. (Forest Plan recommends 40 pieces Acting and 80 pieces potential per 100 meters of stream)	

Table 3-7. Average Substrate Composition in Lolo Creek (percent)	
Bedrock	3.1
Boulders (>30.5 cm)	19.9
Large rubble (15.2 – 30.5 cm)	29.5
Small rubble (cobbles, 7.6 – 15.2 cm)	29.7
Coarse gravel (2.5 – 7.6 cm)	11.1
Small gravel (0.6 – 2.5 cm)	1.2
Sand (<0.6 cm)	4.6
Silt	0.8
Organic debris	0.1
Source: Clearwater BioStudies, Inc., 1999a	

Table 3-8. Percent of Lolo Creek Stream Area Available for Spawning				
Fish	*Percent*			
	Good	*Fair*	*Poor*	*Total*
Resident salmonid (spring)	0.2	0.4	0.5	1.1
Resident salmonid (fall)	< 0.1	0.2	0.6	0.8
Steelhead trout	1.6	6.1	4.2	11.9
Chinook salmon	0.3	2.9	6.1	9.3
Source: Clearwater BioStudies, Inc. 1999a				

Steelhead Trout (*Oncorhynchus mykiss*). Snake River Basin steelhead trout are summer steelhead trout, which leave the ocean and enter fresh water from late August to October, then spawn during the following spring from March to May. Steelhead that reach the Clearwater are thought to be age 2 ocean fish. Although steelhead trout are capable of spawning more than once before they die, most steelhead trout in the Clearwater Basin survive to spawn only once (USFS 1999).

Spawning and initial rearing of juvenile steelhead trout generally take place in moderate gradient (generally 3-5%) streams. Females dig redds and deposit 1,500 to 6,000 eggs in pea- to baseball-sized gravel. The eggs hatch in about 35-50 days, and alevins remain in the gravel 2 to 3 weeks before they emerge as fry in late spring and begin to actively feed. Snake River Basin steelhead trout usually smolt as 2- or 3-year olds and migrate to the ocean (USFS 1999).

Productive steelhead trout habitat is characterized by complexity, primarily in the form of large and small wood and/or boulders and rock. Juveniles may move around in a basin to take advantage of favorable habitat. Fry prefer protected and complex edge habitat with low velocity (<0.3 ft/s), and are seldom observed in water over 15 inches deep. Summer rearing takes place primarily in the faster parts of small and deep scour pools with some form of surface cover and wood or medium to large substrate (cobble or boulders). Other important habitat components for juveniles are pools with “bubble curtains” undercut/scoured areas, and pocket water in deep riffles and rapids. Winter rearing occurs more uniformly at lower densities across a wide range of fast and slow habitat types. Small tributaries and lakes are probably important winter habitat (USFS 1999).

The Lolo Creek drainage produces very few steelhead trout due to overall low adult escapement, spawning, migration, and habitat conditions. Adult and juvenile plantings have occurred over the past 20 years, and steelhead production that does occur is most likely a combination of wild/natural and hatchery production. Steelhead trout mostly spawn in the mainstem of Lolo Creek (from Musselshell Creek to Yoosa Creek), accessible tributaries in upper Lolo Creek drainage, and in the Yoosa Creek drainage.

Juvenile steelhead rearing has been documented in the mainstem of Lolo Creek. Fish population surveys over the past 15 years have found juvenile steelhead trout at most sampling sites throughout the mainstem Lolo Creek (Table 3-9). Fish population surveys in 1996, 1998, and 1999 showed very low average densities in the mainstem Lolo Creek: 0.51, 0.33, and 0.95 fish per 100 square meters, respectively (USFS 2002a). Thus, the likelihood of wild steelhead adults migrating and spawning in Lolo Creek is considered very low in any given year, probably under 100 spawning pairs (USFS 2002a).

Table 3-9. Summary of Steelhead Trout Populations Within the Lolo Creek Drainage [a]

Stream/Reach	*Number of Fish Population Stations*	*Number of Stations with Steelhead Trout*
Lolo mainstem [b]	214	207
11 Lolo tributaries [c]	18	2
Yoosa Creek [c]	39	30
Lolo mainstem [d]	15	15
Lolo mainstem [e]	47	46
Lolo mainstem [f]	68	58
Yoosa Creek [f]	27	24
Lolo Creek (downstream USFS lands) [g]	3	3

a = Does not include pre-1992 data from IDFG and pre-1988 USFS data.
b = Snorkeling data collected between 1988 and 1999 and 2001 by USFS personnel or Clearwater BioStudies, Inc.
c = Snorkeling and/or electrofishing data collected between 1991 and 1997 by USFS personnel, Clearwater BioStudies, Inc., or Isabella Wildlife Works.
d = U.S. Fish and Wildlife Service – Idaho Fishery Unit: Snorkeling data from 1987-1988, and 1990-1991. Two bull trout were observed during the 1987 survey on mainstem Lolo Creek (between White Creek and Yoosa Creek).
e = Idaho Department of Fish and Game: Snorkeling data from 1985 (Petrosky and Holubetz 1986), and 1994 (Hall-Griswold et al. 1995).
f = Nez Perce Tribe snorkeling data from 1993 (USFS 2002a as cited from Hesse and Arnsberg 1994, 1995).
g = U.S. Department of the Interior, Bureau of Land Management (BLM 2000) snorkeling data from three sites in Lolo Creek downstream of USFS lands (stream miles: 0.9, 6.7 and 22.0).

Bull Trout (Salvelinus confluentus) are found in cold-water streams, rivers, and lakes, and they can be resident or migratory. Migratory adults can exceed 600 millimeters length, while residents are much smaller, from 150 to 300 millimeters. Bull trout spawning occurs in clear, headwater streams with a gravel or rubble bottom, and spawning may take place each year or in alternate years. In the spring, migratory adults return to spawning streams from downstream rivers or lakes in the spring. Spawning by resident and migratory bull trout begins when stream temperatures fall to between five and nine degrees Celsius, which would normally be from mid-August to November. Eggs hatch in January and the fry remain within the gravel until early spring. Some juveniles (which are designated as migratory adfluvial) migrate to downstream lakes and larger rivers by mid-summer. Other juveniles (designated as fluvial) may rear in tributary streams for three to four years before recruiting to larger streams and rivers (USFS 1999).

Although the Lolo Creek drainage was probably within the historical range of bull trout, populations have since been largely extirpated. Fish population data do not show any bull trout spawning and early rearing in the Lolo Creek drainage over the past several years (USFS 1999).

Between 1974 and 2000, very few bull trout were observed through fish population monitoring via snorkeling and electrofishing surveys in the Lolo Creek drainage. The Clearwater Basin Bull Trout Technical Advisory Team (CBBTAT 1998) reported that several bull trout were observed in the mainstem of Lolo Creek between 1987 and 1994. USFWS, IDFG, and Nez Perce Tribe monitoring efforts also observed individual bull trout during snorkeling surveys in the mainstem Lolo Creek during this period. However, bull trout were not observed by these agencies or by

the Forest Service during monitoring activities in 1996-1999 and 2001. Fish population surveys conducted by the BLM documented one juvenile bull trout downstream of USFS lands in 2000 (Table 3-10). Bull trout were not observed by the Forest Service in 2002. In addition, bull trout have not been observed in the Eldorado Creek, Musselshell Creek, or Yoosa Creek drainages.

The extent of bull trout spawning and production is considered very low (Table 3-9). Habitat conditions and warmer temperature regimes appear to limit bull trout production in the Lolo Creek drainage. The 1999 survey of nine streams in the watershed found that temperatures in each of these streams exceeded the desired bull trout rearing temperature of 10 ºC or below. Other than temperature, other habitat conditions in upper Lolo Creek would not preclude bull trout spawning, and the Lolo Creek drainage has been designated an adjunct watershed for future bull trout recovery efforts (USFS 1999).

Westslope Cutthroat (Oncorhynchus clarki lewisi) generally have a wide distribution and can be found in streams with channels as narrow as 18 inches. The highest densities are found in the small tributary streams, and in the mid and upper reaches of the larger streams where competition with other trout or salmon species is limited (USFS, 1999). Cutthroat spawning occurs in pool tailouts and in runs in pockets of gravel with 0.5- to 2-inch diameter. Gravel pockets can be relatively shallow and still be adequate for egg incubation, which is why this species does so well in small or headwater streams. Rearing occurs in pools, along stream margins, and in pocket water habitats.

Lolo Creek supports populations of westslope cutthroat trout. This species is designated by the Forest Service as sensitive. The cutthroat population for the upper Lolo Creek watershed is considered strong, with densities averaging 2.3 (age 2+) fish/100 square meters (Clearwater BioStudies Inc., 1999a). Designated critical reaches for cutthroat occur primarily in low gradient areas of tributaries and in Lolo Creek above Dutchman Creek.

Pacific lamprey (*Lampetra tridentata*) is a Federal species of concern (USFS 2003d) and is listed by the Idaho Department of Fish and Game as a State endangered species. Pacific lamprey have an anadromous life history where young adults migrate to the ocean, remain there for up to four years, then return to streams to spawn (April to July), after which time they die. Upon hatching, juvenile lamprey (amocetes) typically embed themselves in sand-dominated, low-gradient channels where they filter-feed and grow. They typically rear in these areas for up to seven years before migrating to the ocean to become parasitic on various ocean fish (Moser and Close 2003). Some sandy habitat appropriate for lamprey spawning occurs within the mainstem of Lolo Creek, and data from the Nez Perce Tribe indicates that both juvenile and young adult lampreys do occur in Lolo Creek (USDOE, 1997).

3.2.4.3 Other Aquatic Organisms

Mountain whitefish (*Prosopium williamsoni*) prefer cold (8-10 ^{o}C) mountain streams with large riffles or pools averaging 3-4 feet in depth (Lusch, 1985). They are primarily bottom feeders with a preference for insects, snails, amphipods and crawfish. They have also been known to eat salmonid fry and eggs of its own kind. Whitefish are broadcast spawners and require a gravel bottom surface on which the eggs will attach themselves. Whitefish occur in Lolo Creek in very

low numbers; although the creek provides spawning opportunities, summer water temperatures may limit juvenile survival (USFS 2000).

Table 3-10. Summary of Bull Trout Populations Within the Lolo Creek Drainage [a]

Stream/Reach	*Number of Fish Population Stations*	*Number of Stations with Bull Trout*	*Bull Trout Age Classes and Densities*
Lolo mainstem [b]	214	0	
11 Lolo tributaries [c]	18	0	
Yoosa Creek [c]	39	0	
Lolo mainstem [d]	15	2	Two juvenile bull trout; 1-4" and 1-5" in 1987.
Lolo mainstem [e]	47	0	
Lolo mainstem [f]	68	3	One juvenile bull trout 1993 and two juvenile bull trout 1994.
Yoosa Creek [f]	27	0	
Lolo Creek (downstream USFS lands) [g]	3	1	One 6-9" bull trout sighted at station #2

a = Does not include pre-1992 data from IDFG and pre-1988 USFS data.
b = Snorkeling data collected between 1988 and 1999 and 2001 by USFS personnel or Clearwater BioStudies, Inc.
c = Snorkeling and/or electrofishing data collected between 1991 and 1997 by USFS personnel, Clearwater BioStudies, Inc., or Isabella Wildlife Works.
d = U.S. Fish and Wildlife Service – Idaho Fishery Unit: Snorkeling data from 1987-1988, and 1990-1991. Two bull trout were observed during the 1987 survey on mainstem Lolo Creek (between White Creek and Yoosa Creek).
e = Idaho Department of Fish and Game: Snorkeling data from 1985 (Petrosky and Holubetz 1986), and 1994 (Hall-Griswold et al. 1995).
f = Nez Perce Tribe snorkeling data from 1993 (USFS 2002a as cited from Hesse and Arnsberg 1994, 1995).
g = (BLM 2000) snorkeling data from three sites in Lolo Creek downstream of USFS lands (stream miles: 0.9, 6.7 and 22.0).

<u>*Sculpins*</u> (*Cottus spp.*) occur in Lolo Creek but their populations and condition is largely unknown. Sculpins generally prefer small cobble-sized substrate for breeding and non-embedded substrate in run/pool type habitats for cover. They are an important food source for other aquatic and terrestrial animals (USFS 2000).

<u>*Aquatic Invertebrates.*</u> Aquatic insects are a primary food source of juvenile salmon and trout, and are a large part of the diet of resident adult trout and other coldwater fish. The presence, distribution, and abundance of aquatic invertebrates are dependent upon basic habitat conditions such as water temperature, water quality and chemistry, substrate, and flow. In general, the four most important aquatic insect groups or "orders" that comprise the diet of salmonids and many other fish include true flies (order *Diptera*), mayflies (*Ephemeroptera*), caddisflies (*Tricoptera*), and stoneflies (*Plecoptera*).

Limited aquatic invertebrate data exist for Lolo Creek. At one station located just upstream of the confluence with Musselshell Creek from a survey conducted by IDEQ in July 1995, a Macroinvertebrate Biotic Integrity (MBI) score of 3.94 was calculated (IDEQ 1996). A score greater than 3.5 indicates that the macroinvertebrate community is not impaired and therefore similar to background reference conditions within the ecoregion.

3.2.5 Wildlife

Table 3-11 identifies the Forest Service's designated management indicator and sensitive wildlife and avian species that may occur in the Lolo Creek project area.

3.2.5.1 Forest Service Management Indicator and Sensitive Wildlife

Birds. Pileated woodpeckers (*Dryocopus pileatus*) and belted kingfishers (*Ceryle alycon*) are recognized Forest management indicator or sensitive bird species (Table 3-11). Though pileated woodpeckers may be observed in riparian areas, they reside in mature forest habitats that would not be disturbed by suction dredging. Belted kingfishers are relatively common and generally inhabit riparian areas; they feed on fish. It is likely they nest in streambanks or possibly in nearby vegetation in the Lolo Creek study area.

Mammals. Big game management indicator species that may occur in the study area include white-tailed deer, elk, and moose. In addition, American martens (management indicator) and fishers (sensitive) may be present.

Amphibians. Suitable habitat exists in the study area for the western (boreal) toad and the Coeur d'Alene salamander, so these species may be present.

3.2.5.2 Threatened and Endangered Wildlife

Four wildlife species in the Clearwater National Forest have been listed by the U.S. Fish and Wildlife Service under the Endangered Species Act as being endangered or threatened: gray wolf (listed as endangered), bald eagle (threatened), grizzly bear (threatened), and lynx (threatened). Grizzly bears do not occur in the Lolo Creek project area. The potential occurrence of the remaining three species within the study area is as follows:

- *Bald Eagle* (*Haliaeetus leucocephalus*). No use by bald eagles has been documented on National Forest land within the Lolo Creek drainage (USFS, 2002a).

- *Gray Wolf* (*Canis lupus*). The upper Lolo Creek watershed is within the boundary of the Central Idaho nonessential population area for the gray wolf. There are numerous, and increasing, wolf sightings (animals and tracks) in Lolo, Musselshell and Eldorado Creek watersheds. It is likely that denning is or soon will be occurring in or near the Lolo Creek watershed, but it is unlikely that denning will occur in the study area.

- *Lynx* (*Lynx canadensis*). Nine lynx sightings were recorded in Clearwater County between 1942 and 1995 (USFS 2001d). The Lolo Creek study area does not contain suitable lynx habitat (USFS 1999).

Table 3-11. Sensitive Wildlife and Management Indicator Species

Species	*Habitat Description*	*Likelihood of Occurrence* [a]
Management Indicator Species		
Elk *Cervus elaphus*	Grasses, forbs and some dryland shrubs provide nutritious forage for elk throughout the summer and into the fall. These areas (often most evident on major ridges and within upland basins) typically support high to moderate habitat use. A large percentage of the pregnant cows calve on broad gentle ridges where seclusion from human disturbance is important.	Elk are widespread in both project areas. The lower and western portions of the Lolo Creek drainage are used by elk during mild winters (USFS 2003b). The lower portions of Moose Creek provide winters habitat.
Moose *Alces alces*	Moose are wide-ranging, preferring shrubby, mixed coniferous forests with nearby lakes and marshes, and streams. They generally require water bodies for foraging. They browse on new growth of trees and shrubs (e.g., willow, aspen and fir) and on vegetation associated with water. Moose breed in September to late October, and calves are born late May-early June.	Moose are relatively common in the project areas where riparian areas provide both browse forage and dense hiding cover.
White-tailed deer *Odocoileus virginianus*	These deer typically use mixed deciduous/conifer forests near water for dense cover and forage food. They breed in the fall and fawns are born in spring.	Year-round deer habitat is considered moderate to heavy in both project areas.
American marten *Martes Americana*	Martens prefer dense, high-elevation grand fir, subalpine forests. They also utilize high elevation riparian areas. Moist habitats of mature lodgepole pine and dense cedar/grand fir forests are utilized at lower elevations. Down logs and snags provide refuge and den sites. The size of a marten's home range is 0.8 to 15.7 km^2 (Ruggiero et al., 1994).	Suitable marten habitat is present in upper Lolo creek (USFS 2003b), and the Moose Creek drainage.
Pileated woodpecker *Dryocopus pileatus*	Pileated woodpeckers primarily utilize 20 inch or greater diameter-breast-height snags for nesting; however, they are known to forage on large snags and down dead wood, feeding principally on carpenter ants. Pileated woodpeckers tend to avoid open areas for foraging, preferring forests with significant old-growth component and high basal area (USFS 2003b).	Pileated woodpeckers are not likely to utilize the riparian areas for nesting, but may occasionally use the vicinity for foraging.
Belted kingfisher *Megaceryle alcyon*	Kingfishers (a neotropical species) are predators of small fish where they hunt by perching over or along the stream. Therefore, fairly wide-open stream courses without significant ermergent vegetation and clear water are preferred.	This species is common along Lolo Creek and its major tributaries. It is also expected along Moose Creek.
Sensitive Species		
Fisher *Martes pennanti*	Fishers tend to select moist habitats, characterized by dense canopy cover, in mature or late mature stands of lodgepole pine, spruce, subalpine fir grand fir or cedar. Fisher habitat use is typically within 400 m from perennial streams with forested riparian areas, often in proximity to alder glades and small meadows. The primary prey of fishers is small mammals (such as squirrels and snowshoe hare), while carrion is also utilized. The average home range for fishers range from 15 km^2 for females to 40 km^2 for males (Ruggiero, et al., 1994). Most studies suggest that fishers are tolerant of moderate human activities.	Due to the prevalence of fisher habitat in the Lolo Creek and Moose Creek drainages, fishers are expected to be relatively common.

Table 3-11. Sensitive Wildlife and Management Indicator Species (Cont.)

Species	*Habitat Description*	*Likelihood of Occurrence* [a]
Sensitive Wildlife Species		
Wolverine *Gulo gulo*	Wolverines typically inhabit large areas of medium-aged forests or scattered mature forest areas around slides, cliffs, swamps and meadows. Habitat types used by wolverines include sub-alpine fir, lodgepole pine, western larch, Douglas fir and mixed conifers. They typically inhabit remote mountainous areas where human disturbance is unlikely. Home ranges for females in Idaho range between 16-516 km^2 (Ruggiero et al. 1994).	The riparian areas along the project creeks provide poor habitat and the level of human activity would preclude wolverine use in the affected area.
Townsend's big-eared bat *Plecotus townsendii*	Western big-eared bats are more commonly found in southern Idaho and at much lower elevations than those of the project areas. They are communal and utilize natural caves or old underground mines and, occasionally, old buildings.	There are no caves, buildings, mines, or bridges that appear to meet the criteria for suitable habitat in the project areas.
Northern goshawk *Accipter gentillis*	The Northern goshawk is a forest-adapted raptor that prefers mature coniferous stands with dense canopy cover and mature forest edge. They typically nest in stands of mature or late mature forest that are larger than 25 acres and have relatively dense crown closure. Northern goshawks typically feed on a variety of forest dwelling mammals and birds ranging in size from snowshoe hares to chipmunks.	Riparian zones along the project areas are not suitable for nesting. However, this species has been sighted in the Lolo Creek watershed and is also expected to be present in the Moose Creek drainage.
Flammulated owl *Otus flammeolus*	Flammulated owls are typically associated with large ponderosa pine and Douglas fir trees on south and western slopes. Suitable habitat varies from open, large ponderosa pine (with little under-story) to multi-layered and closed-canopies. This owl preys only on insects and typically forages in the edge habitats between forest and grassland, as well as in forests of low or moderate density. Breeding territories are typically located near open areas, including old burns, grassy hillsides, natural clearings and some logged areas. They often nest in cavities previously constructed by flickers or pileated woodpeckers.	The project areas do not contain suitable habitat for the flammulated owl.
Black-backed woodpecker P*icoides arcticus*	Large burned forests during early postfire years are potentially important source habitats and believed critical for supporting black-backed woodpecker populations. Burned conifer forests and other insect infested forests provide key conditions necessary for both nesting and foraging.	There are no documented sightings and suitable habitat is very limited in the Lolo Creek and Moose Creek project areas.
Harlequin duck *Histrionicus histrionicus*	Harlequin ducks are diving ducks that winter along the Pacific coast and then migrate inland to nest along forested, mountain streams. Harlequin ducks prefer streams in canyons, or meandering and braided streams. They prefer dense riparian vegetation for cover and undisturbed, pristine areas are considered prime habitat for Harlequin duck nesting and brood-rearing activities.	Breeding has not been documented in the Clearwater National Forest, but a few sightings have been reported in the upper Lochsa River area and near the mouth of Papoose Creek (USDE 1997 from USDA 1995). There is a very low probability of occurrence in the project areas.

Table 3-11. Sensitive Wildlife and Management Indicator Species (Cont.)

Species	*Habitat Description*	*Likelihood of Occurrence* [a]
Sensitive Wildlife Species		
Western (Boreal) toad *Bufo boreas boreas*	This species utilizes spring pools and slow-moving portions of streams. They generally breed in early July, depending on runoff water during May and June. Tadpole larvae are usually restricted over muddy bottoms where they feed on detritus or filtering suspended plant material. They metamorphose into adults during summer and early fall (Nussbaum et al. 1983).	The boreal toad is likely to be present in the project areas since suitable habitat exists.
Coeur d'Alene salamander *Plethodon vandykei idahoensis*	This salamander is usually found in moist, forested areas at moderate elevations below 5,000 feet. They occur in wet, humid and cool microhabitats. Typical habitat features are fractured bedrock or gravel, often under a dense tree canopy, near cascading water. Coeur d'Alene salamanders feed primarily on aquatic and semi-aquatic insects.	Local populations appear to represent the most southern distribution of Coeur d'Alene salamanders. Although there are no reported sightings, some suitable habitat does exist in both project areas.
Northern leopard frog *Rana pipiens*	The northern leopard frog is found in marshes and wet meadows from low valleys to mountain ridges. It is also found in areas virtually devoid of fish, preferring cattail or sedge marshes and weedy ponds for breeding.	There are no known or suspected occurrences of these frogs in the Clearwater National Forest.

a = Likelihood of occurrence for Lolo Creek project area as described in USFS (2003b)

3.2.6 Vegetation and Wetlands

3.2.6.1 Riparian Vegetation

The riparian area along Lolo Creek is predominantly forested wetlands with a dominant community type of western red cedar/ladyfern. Associated species include grand fir, Engelmann spruce, Douglas fir, mountain ash, willow, common snowberry, dogwood, Sitka alder, devil's club, western thimbleberry, queencup, beadlily, arrowleaf, groundsel, starflowered Solomon's seal, plume grass, and pine grass. Areas within 300 feet of Lolo Creek are designated as being within the Riparian Habitat Conservation Area. These areas receive primary emphasis and management activities subject to specific standards and guidelines consistent with PACFISH[6] objectives.

The riparian wetland areas are generally associated with a high water table near the stream and soils that are often saturated allowing wetland plants such as ladyfern, sedges, devil's club, and willows to grow.

The site of the former Collette Mine on the Lolo #5 mining claim is dominated by wetlands or areas that historically would have been classified as wetlands but were drastically disturbed by mining. In some areas, emergent wetlands have formed in parts of the old channel where it was dredged. However, the majority of the area is dominated by abandoned tailings piles. Although some willow and other obligate wetland species can be observed in the area, these piles have generally restricted the reestablishment of a functional vegetation community in many parts of the floodplain. Likewise, the stream banks of Lolo Creek in this area are unstable and lack the appropriate riparian vegetation and root mass to provide shading and armoring of banks. A wetland deliniation has not been conducted to determine wetland area and describe potential wetland types, functions and values.

3.2.6.2 Forest Service Sensitive Plant Species

Table 3-12 identifies Forest Service Northern Region Idaho sensitive plant likely to occupy riparian areas typified by areas along Lolo Creek.

3.2.7 Recreation

Clearwater National Forest contains thirty-seven developed campgrounds, timber harvest area, roads, gravel pits, recreation facilities, utility corridors and mining claims. It is estimated that 915,921 people visit the Clearwater National Forest annually. Recreational opportunities within the forest are numerous in many areas, including Lolo Creek. Recreational activities in the Forest include hunting and fishing; camping and hiking; boating and rafting; mushrooming and berry-picking; cross-country skiing and snowmobiling; gold panning and rock collecting; bird watching; photography; and sightseeing. These types of activities depend on area access and a well-developed transportation network (USDOE, 1997).

[6] PACFISH: Forest Service and Bureau of Land Management interim strategies for managing anadromous fish-producing watersheds in Oregon, Washington, Idaho, and Northern California.

Table 3-12. Sensitive Plant Species Commonly Associated with Riparian Habitats

Species	*Habitat Description*	*Likelihood of Occurrence* [a]
Deer fern *Blechnum spicant*	Found at mid-elevations in moist, mineral soils of shaded mature western red cedar and wester hemlock habitat types. Rarely occurs in wet areas of other habitat types. It has a strong affinity for draws and riparian areas. Habitat may be related to duration and depth of snowpack.	Known populations are within riparian habitat conservation areas in Lolo Creek watershed. Not known to be present in Moose Creek area but could occur.
Mingan moonwart *Botrychium minganense*	A small fern-like plant, with spores on a separate branch, that occurs widely in North America. It grows in a wide variety of habitats, including meadows, prairies, riverbanks and moist forests. Most Idaho occurrences have been found at mid-elevations on northern mountains on the Panhandle NF; CNF populations are from old cedar forests, on all aspects, and between 3,400 and 4,500 feet elevation.	Locations include upper North Fork Clearwater, East Fork Moose Creek, and Lolo Creek. Two populations have been noted in the Lolo Creek watershed, both occur on major ridges. Though no reports of occurrence in Moose Creek, it is probable the species could occur there.
Green bug-on-a-stick *Buxbaumia viridis*	A moss that lives in soil, humus or very rotten logs in shady, moist forests. Elevations range from low to subalpine where the climate is generally misty.	Is known to occur in Lolo Creek and near Forest Service lands in the Lolo Creek drainage. Though no reports of occurrence in Moose Creek, it is probable the species could occur there.
Henderson's sedge *Carex hendersonii*	A large sedge of the Pacific Coast, with disjunct populations in Idaho's Lochsa, Selway, and Clearwater River drainages. Idaho populations occur on low elevation river terraces in shady cedar forests with maidenhair fern, on flat to slightly sloped moist ground. Populations usually occur in near-climax forests of river and stream bottoms, and less well-developed populations and scattered individuals occur upslope in drier cedar habitat types.	ICDC records indicate a population in a Cedar Creek tributary near Lolo Creek. Though no reports of occurrence in Moose Creek, it is probable the species could occur there.
Bristle-stalked Sedge *Carex leptalea*	An inconspicuous boreal sedge associated with cool wet meadows, spahgnum bogs, fens, swamps, and lake shores.	On the Clearwater Forest it has been found at Musselshell Meadows near Lolo Creek. It is not known or suspected to be in the Moose Creek project area.
Cup lichen *Cladonia andereggii*	Very little is known about this rare fruticose lichen, its habitat requirements, or the substrate on which it grows. There are only two occurrences worldwide, both from a moist cedar/hemlock forest along a tributary of the upper Palouse River. These were found in 1989. The area was surveyed recently but the species was not found.	Not known or suspected to occur in Lolo or Moose Creek project areas. It is not listed by ICDC in Clearwater or Idaho counties.
Clustered Lady's Slipper *Cypripedium fasciculatum*	This rare orchid is represented by small populations in eight western states. In Idaho it is associated with low elevation river canyons (1,500-4,200 feet elevation) and cedar habitats, and occasionally in drier grand fir and Douglas fir habitats. It prefers patchy, filtered light, a thick duff layer, and moderate to low understory cover.	Two populations are known to exist near the Lolo Creek watershed and it is probable this species occurs within Lolo Creek as well. It is not known or suspected to be in the Moose Creek drainage.

Table 3-12. Sensitive Plant Species Commonly Associated with Riparian Habitats

Species	*Habitat Description*	*Likelihood of Occurrence* [a]
Light moss *Hookeria lucens*	Habitat is moist or wet shaded areas, on rock, soil, humus, bark, conifer needles on the forest floor, and decaying wood. Predominantly in wet sites, especially in humid coniferous forest, occasionally submerged in pools in depressions, on damp soil or rotten wood, and sometimes along watercourses.	Two populations have been recorded in Eldorado. Though it has not been reported in Lolo Creek, it is probable the species occurs there. It is probable the species occurs in Moose Creek as well.
Licorice fern *Polypodium glycyrrhiza*	This fern mainly occurs along the west slopes of the Cascade/Coast Ranges. Only two inland locations are known-both on the Clearwater National Forest. One on Isabella Creek near its confluence with the North Fork Clearwater River. The other along Elk Creek, (a tributary of the North Fork). They occur at low elevations (1,800 ft) in moss-covered rock crevices along streams, within moist western redcedar forest. Sites are shaded, and wet year-round from seepage.	Not known or suspected to occur in Lolo or Moose Creek project areas. ICDC has not reported this species in Idaho county.
Naked mnium *Rhizomnium nudum*	A dark green leafy moss of boreal and temperate forests on soil, humus, or rotten logs, often along streams or in damp depressions, and within conifer forests, from near sea level to subalpine zones. Most populations on the Clearwater National Forest are riparian, but it occasionally is found on moist slopes well above the streams.	Records indicate a presence along Lolo Creek. This species has not been reported in Clearwater county, and is not expected to occur in the Moose Creek drainage.
Short-styled triantha *Triantha occidentalis brevistyla*	A plant of northern, boreal wetlands and river banks. It is rare in Idaho where it has been found on rock bars along large streams and in wetlands or bogs. These plants grow in rock and cobble below the seasonal high-water line.	On the Clearwater Forest three populations are documented from low elevations on the North and Middle Fork Clearwater River. There is suspected habitat for this species to occur in both project areas, although no populations have been reported.
Idaho strawberry *Waldsteinia idahoensis*	Habitat consists of open sites in montane forests, in western redcedar, grand fir, and subalpine fir habitat types. It grows along streams, extending onto toe-slopes and even up to mid-slope positions. Cool, moist microsites are most favorable for its development. On the Clearwater National Forest, a typical site is in a bottom with western redcedar mixed with cool species such as subalpine fir and spruce. Plants are most abundant in openings or along roadsides within this habitat.	Though no records indicate presence, it is possible this species may occur in both the Lolo Creek and Moose Creek drainages.

A = Likelihood of occurrence for Lolo Creek project area as described in USFS (2003b) and from Idaho Conservation Data Center (IDEC 2003).

3.2.7.1 Forest Service Management of Recreation

The Forest Service manages recreation by guidelines set forth in the Recreation Opportunity Spectrum (ROS). The ROS provides a framework by which outdoor recreation environments, activities, and experience opportunities can be organized and defined. Underlying the ROS is the basic assumption that quality outdoor recreation is best satisfied through a diverse set of opportunities.

The ROS framework is arranged along a continuum from primitive to urban, as shown in the sidebar. Opportunities for experiences along the continuum represent a range from a very high probability of solitude, self-reliance, challenge and risk to a very social experience where self-reliance, challenge, and risk are relatively unimportant.

> The ***Recreational Opportunity Spectrum*** is based on the premise that people expect and seek variety in forest settings. The Spectrum establishes six classes that reflect the range of possible settings:
> - Primitive
> - Semi-primitive Non-motorized
> - Semi-primitive Motorized
> - Roaded Natural
> - Rural
> - Urban
>
> An area's class is determined by a combination of factors:
> - Remoteness
> - Naturalness (level of human modification)
> - Social setting (number of encounters with people)
> - Degree of visitor controls
>
> Source: USFS 1994b

3.2.7.2 Recreation in Lolo Creek

The Forest Service manages the Lolo Creek area as "Roaded Natural" (USFS 1987). The Roaded Natural class is characterized by mostly natural-appearing landscapes as viewed from sensitive roads and trails. Interaction with other users in developed campsites are common, but with some chance for privacy. Access and travel are available to conventional motorized vehicles including sedan, trailers, recreational vehicles, and some motor homes. Vegetative alterations are done to the landscape to maintain desired visual and recreational characteristics.

Recreation opportunities in the Lolo Creek area include fishing, hunting, camping, and hiking, as well as suction dredge mining.

Two prominent trails are located in or near the project area, the Lewis and Clark National Historic Trail and the Nez Perce (Nee-Me-Poo) National Historic Trail. The Lewis and Clark trail, located near the southern boundary of the project area, traces the path taken by these explorers in 1805-06. It is anticipated that use of this trail will increase in the next year to celebrate Lewis and Clark's bicentennial crossing (personal communication, Bretz 2003). The Nez Perce Trail, crossing the northern portion of the study area, was a hunting route used by Native Americans.

Access to Lolo Creek is by FS Roads 100 and 500. The Kamiah-Pierce Road 100 is an arterial route that extends from U.S. Highway 12 at Kamiah to Road 250 near Pierce (2001 Clearwater National Forest Map, 1:26720). Road 100 is the main access road to the Clearwater and Lolo Creek drainage, and it runs parallel to Lolo Creek in the lower portion of the study area. It is also designated as Forest Highway 55. Road 100 provides access to the western portal of the historic Lolo Motorway. Lolo Trail Road 500 is a main road that extends from Road 100 east to

U.S. Highway 12. Beyond Canyon Junction, Road 500 becomes a primitive native surfaced road known as the Lolo Motorway within the Lolo Trail National Historic Landmark. The road parallels the route of the Lewis and Clark expedition and is not suited for passenger car use. It is anticipated that it will be the primary road used by forest visitors celebrating the bicentennial of the Lewis and Clark expedition, and the Forest Service may implement a permit system to control access. Forest Road 103, which parallels Lolo Creek in the upper portion of the study area, is also considered a high use recreation road to access the area. This road can also access the Lewis and Clark National Historic Trail and the Nez Perce National Historic Trail.

Only one developed campsite is located in the vicinity of the study area. The Lolo Creek Campground is a non-fee campground with seven units. It has a vault toilet and fire rings. The campground is on a double terrace, with the creek on the lowest third terrace. Other small dispersed camping sites are located throughout the project area, including on mining claims. These areas are primitive (i.e., no amenities) and are generally used by hunters and miners in the area. The Lolo Creek area is also popular for day users to pick berries, look for firewood and general picnicking. Peak use is during the summer months, with the hunting season extending from late August to early November.

3.2.8 Visual Resources

Visual resources are the natural (landforms, water bodies, vegetation) and anthropogenic (buildings, fences, signs) features that give a particular environment its aesthetic qualities. Attributes used to describe the visual resource value of an area include the number of visitors or viewers of an area or feature; the landscape character; the perceived aesthetic value or quality of the area or feature; and the uniqueness of the area or feature for particular visual qualities.

3.2.8.1 Forest Service Management of Visual Resources

The Forest Service assigns Visual Quality Objectives (VQOs) to manage scenic resources in the Clearwater National Forest. VQOs are the desired levels or degrees of acceptable alteration of the characteristic landscape, and range from the least evidence of development to very evident. VQOs include (USFS 1987):

- Retention: in general, human activities are not evident to the casual visitor.
- Partial Retention: human activities may be evident but must remain subordinate to the characteristic landscape.
- Modification: human activity may dominate the characteristic landscape but must, at the same time, utilize naturally established form, line, color, and texture. The activity should appear as a natural occurrence when viewed in foreground (0 to 0.25 miles from the viewer) and middleground (0.25 to 3-5 miles).

The Forest will be updating the Clearwater National Forest Plan in the next few years, and as part of that process will revise the VQOs into Scenic Integrity Objectives.

3.2.8.2 Lolo Creek Visual Resources

Lolo Creek sits in a river canyon and ridge system surrounded by forests. Views in the foreground of Lolo Creek consists of water forms, rock forms, very large boulders, deep pools, and gravel bars. Vegetation includes conifers, hardwoods, and shrubs; continuous vegetation is composed mostly of coniferous species interspersed with deciduous vegetation. Lolo Creek itself provides the only distinctive attraction. Other areas are scenic but common and do not provide a unique attraction to the area. The Lolo Creek area has not had a specific VQO assigned to it. Adjacent areas are managed for *Retention* in the foreground, *Partial Retention* in the middleground and *Modification* in the background (personal communication, Jones 2003).

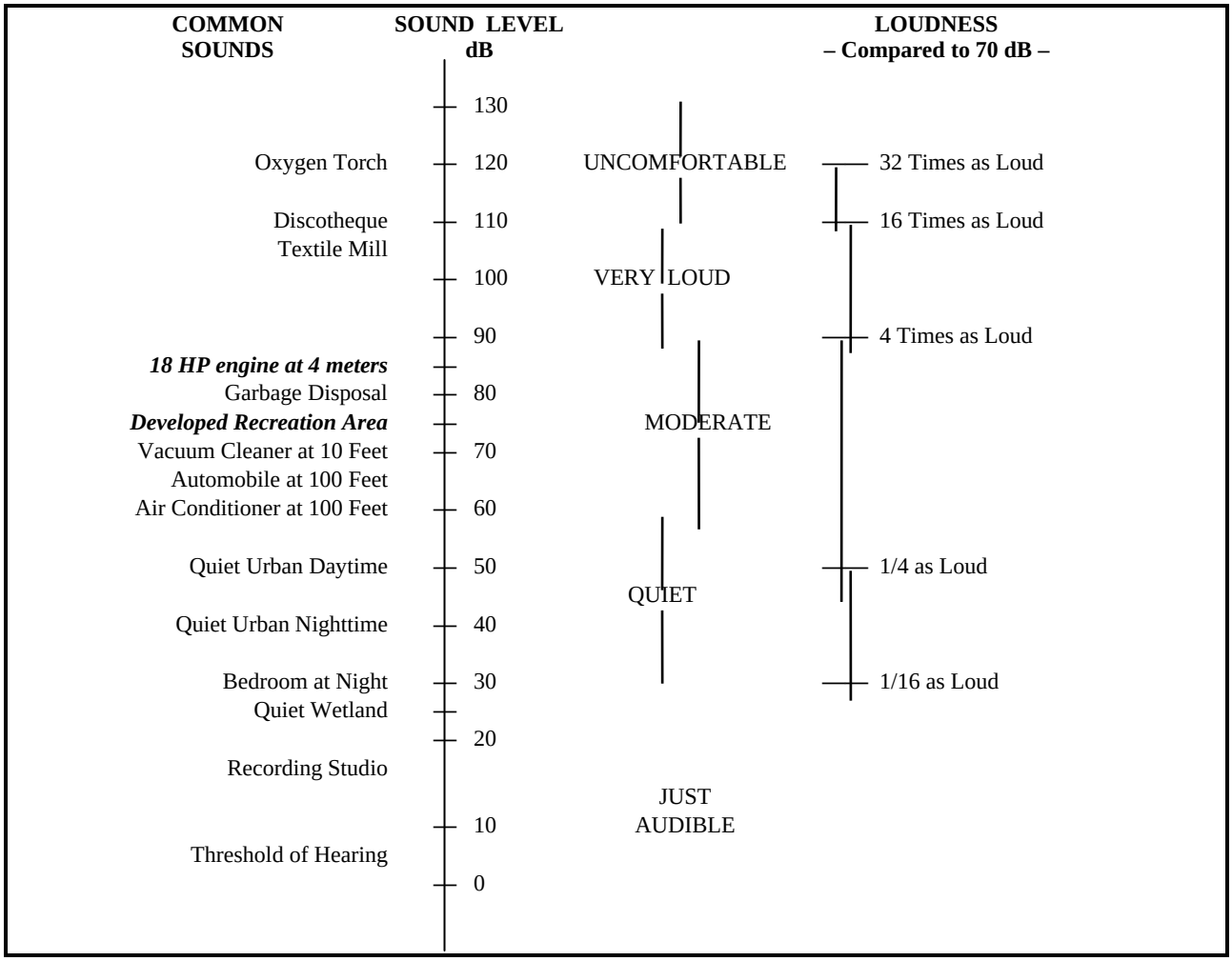
The VQO for the Lewis and Clark National Historic Trail is *Partial Retention* Class B (A - Distinctive, B- Common, and C- Indistinctive). Management activities for this VQO should remain visually subordinate to the surrounding landscape. The landform, vegetation patterns, and water characteristics provide ordinary or common scenic quality. The VQO for the Lolo Creek Campground is also *Partial Retention*. The Nez Perce National Historic Trail has a VQO of *Retention* (USFS 1987); management activities focus on keeping the natural-appearing landscape with little or no development (personal communication, Jones 2003). Due to their proximity to historic trails, Forest roads 100 and 103 in the Lolo Creek drainage are managed in a similar fashion as other sensitive visual travel corridors: they are managed to have high visual sensitivity.

3.2.9 Noise

Noise is generally considered to be “unwanted” sound that interferes with normal activities or otherwise diminishes the quality of the environment. It may be intermittent or continuous, steady or impulsive. It may be stationary (such as a generator) or transient (aircraft overflight or passing vehicles). There is wide diversity in responses to noise; responses vary not only according to the type of noise and the characteristics of the source, but also according to the sensitivity and expectations of the receptor, time of day, weather, and distance between the noise source (e.g., a generator) and the receptor (e.g., a person or animal).

Sound-measuring instruments record instantaneous sound levels in decibels (dB). With these measurements, sound levels for individual noise events and average sound levels, in decibels, over extended periods of hours, days, months, or years can be calculated. When measuring community response to noise, it is common to adjust the frequency content of the measured sound to correspond to the frequency sensitivity of the human ear. This adjustment is called A-weighting (ANSI 1988). Figure 3-4 shows A-weighted sound levels (in dB) from several typical sources (dB).

Natural noises would include flowing water, insects, birds, and other animals. There would also be noises from human activities, such as vehicles on the roads, recreational vehicle engines and power generators on the Lolo Creek Campground and/or on dispersed campsites, and aircraft. Background noise levels have not been measured in the Lolo Creek area. However, average noise levels could be expected to vary from 25 to 75 db (Figure 3-4).



Source: *Adapted from* (Harris 1979).

Figure 3-4. Typical A-Weighted Sound Levels of Common Sounds

3.2.10 Socioeconomics

Clearwater National Forest is influenced by conditions occurring at national and regional levels. However, the local area would most affect activities in the Forest, and be most affected by activities in the Forest. Visitors to the Forest come from across the country, but a large majority reside in the Pacific Northwest. Most visitors reside in north and north-central Idaho and northeast Montana, with fewer visitors from increasing distances.

The nearest sizable city to Lolo Creek is Orofino, Idaho, the county seat of Clearwater County. This would be the economic area most affected by activities in Lolo Creek. In 2000, the total population of Clearwater County was 8,930, and residents had a per capita of income of $15,463 (U.S. Department of Commerce, 2001).

The amount of gold recovered is estimated annually in the *Clearwater National Forest Monitoring and Evaluation Report*. However, the actual amount of gold recovered by small-scale suction dredging in Lolo Creek is not known; thus, it is not known what contribution suction dredging may make to individual or county income or to the local or regional economies. Several of the dredge operators state that the gold recovered supplements their income. Only one of the prospective operators is known to rely on suction dredging as their sole source of income, or even as a major source of income.

3.2.11 Heritage Resources

Heritage resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious or other purposes. They include archaeological resources, historic architectural resources, and traditional resources. Archaeological resources are areas where prehistoric or historic activity measurably altered the earth or where deposits of physical remains (e.g., projectile points, pottery, etc.) have been discovered. Architectural resources include standing buildings, districts, bridges, dams, and other structures of historic or aesthetic significance. Traditional resources can include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture. Significant heritage resources can be eligible for, or listed in, the National Register of Historic Places (NRHP), or may be identified by Native American groups as important in maintaining their cultures, i.e., Traditional Cultural Properties. Native American treaty rights and traditional uses are described in more detail in section 3.4.

3.2.11.1 Historical Setting

Aboriginal land use of the project region probably dates to at least 10,000 years ago, although this early period is not completely understood for the Clearwater Region (USFS 2002e). Inhabitants are likely to have lived in small groups, using a diversity of canyon and upland floral and faunal resources (including large game animals) as encountered. Tools included short-bladed projectile points, knives, and scraping tools. As the climate gradually warmed, the population increased, and shifts in subsistence practices are represented by small campsites along the rivers and streams of the region. Game such as deer, elk, rabbits, birds, and fish were taken locally, and plant use increased. Tool types increased in variety and included dart points and food processing tools such as ground cobbles and pestles. After about 3,500 years ago, pithouse villages became more common. Bow and arrow technology was introduced approximately 1200 years ago. Deer, elk, and bison, among other large game, were hunted as locally available. Semi-permanent villages were established in the Clearwater River region. The larger dart points of earlier periods were replaced with small arrow points, and major root processing is represented by large mortars and digging sticks. After the introduction of the horse to many (though not all) Plateau groups between 300 and 400 years ago, mobility increased and dwellings shifted to more portable structures (USFS 2003f).

At the time of the arrival of Euroamericans in the region in 1805, the Nez Perce people occupied villages in the Clearwater River region, among other areas (USFS 2002e). Traditional Nez Perce territory in the Clearwater, Snake, and Salmon River basins provided game animals, plants and

fish resources. Estimates suggest that the majority of Nez Perce resource use focused on the acquisition of fish, including chinook, coho, chum, steelhead, sockeye salmon, and lamprey. Non-anadromous fish included dolly varden, lake and cutthroat trout, squawfish, suckers and sturgeon. Plant resources included camas and couse, among many others. Section 3.4 provides a more detailed description of Nez Perce use of plant and animal resources.

Lewis and Clark's Corps of Discovery expedition entered the region along the Lolo Trail in 1805. Between 70 and 130 Nez Perce villages are estimated to have been located in the river basins of central Idaho when Lewis and Clark came through (USFS 2002e). The trail, known as *Khoo-say-na-is-kit* by the Nez Perce, was used by Native Americans to travel to and from buffalo country. In the 1830s, the trail was used by fur traders, and in the 1850s was investigated by John Mullan for its potential as a military trail. Today, the Lolo Trail and the Lewis and Clark National Historic Trail are part of the Lolo Trail National Historic Landmark.

As Euroamerican settlers moved into the region following initial exploration, settlers and miners began to encroach on the Nez Perce homeland. In 1855, Isaac Stevens, the governor of the newly formed Washington Territory, called the Nez Perce leaders to a council at Walla Walla to create a reservation. An agreement was reached that reserved most of the traditional Nez Perce homeland (7.7 million acres) as their exclusive domain.

In 1860, gold was discovered on the Nez Perce Reservation at a location which would become known as Orofino Creek (Hoggatt 1997). The discovery of gold created a rush to the Nez Perce Reservation. By 1863, the U.S. government was unable to control Euroamerican incursions into Nez Perce lands and negotiated a second treaty, dramatically reducing the size of the reservation that had been established in 1855 (Hoggatt 1997).

Eventually the U.S. government directed all non-treaty Nez Perce to move onto the reservation. On the way to the reservation, young warriors (independent of the Nez Perce leadership) sought out specific settlers to avenge the deaths of certain Nez Perce people (Hoggatt 1997). The outbreak of violence ignited the Nez Perce War of 1877. The route of the non-treaty Nez Perce as they fled U.S. military forces across the Northwest was memorialized as the Nez Perce (or Nee-Me-Poo) National Historic Trail in 1986 (USFS 2003f) and is part of the Lolo Trail National Historic Landmark. The Nez Perce trail began in Oregon and led eastward over the Lolo Trail and into Montana (USFS 2003f). Musselshell Meadows, just west of the Lolo Creek study area, was the location of a Nez Perce camp along the trail.

Initial mineral explorations in the region did not locate gold in the North Fork Clearwater River drainage. However, after 1860, when gold was found on Orofino Creek and the Lolo Trail was improved as a route into the region, the search for gold intensified. Mining north of the town of Pierce also extended into some North Fork streams, although those placers did not compare with Orofino Creek (ISHS 1981). Lolo Creek and its tributaries became hosts to mining beginning in the late 19th century and continuing through the 20th century.

In the early 1900s, large-scale commercial logging began to gain importance in the Clearwater region (ISHS 1981). New towns such as Headquarters and Elk River grew up in association with logging (CHM 2003). Logging continued throughout the 20th century. USFS operations became

prominent in the region after 1906. The Bitterroot Forest Reserve in Idaho and Montana was established in 1897, and in 1907 part of the Bitterroot Forest that included the Lolo Trail became the Clearwater and Lolo National Forests (USFS 2002e). The Clearwater National Forest continues to manage the project region today.

3.2.11.2 Identified Heritage Resources

Heritage resource inventories in the Lolo Creek study area began in the 1970s and continue into the present, although the immediate project area has not been surveyed completely. There has been no recent survey or heritage inventory on the north or west banks of Lolo Creek, or on the east bank of the creek between Nevada Creek and the Lewis and Clark National Historic Trail to the south.

Records of the Idaho State Historic Preservation Office (SHPO) identify 14 previously recorded resources in the Lolo Creek study area, including the Pioneer Quartz Mine and mining road; Nez Perce camp locations; the location of the NRHP-eligible Pioneer Quartz Mine (10CW191) on Dutchman Creek, initially used from 1897 through 1903; USFS lookouts (Austin Ridge and Lolo Forks); and historic cabins and mining features. Until a formal determination of National Register eligibility is made, all recorded and unrecorded heritage resource sites are treated as eligible for nomination to the NRHP.

Portions of the Lolo Trail National Historic Landmark also lie within the project area. This nationally designated historic landmark contains portions of the route used by the Lewis and Clark expedition as they crossed the Rocky Mountains in 1805 and 1806; segments of the trail used by the Nez Perce and U.S. Army during the war of 1877; and a route used by Native Americans to travel to the plains of Montana for buffalo hunting. The Nez Perce (Nee-Me-Poo) National Historic Trail passes through the Lolo Creek study area in the vicinity of Siberia and Dutchman Creeks. The Lewis and Clark National Historic Trail crosses the southern tip of the study area in the vicinity of Lolo Campground. Both of these trails are part of the Lolo Trail National Historic Landmark. Many other heritage resources are recorded immediately west of the study area in the Musselshell Creek vicinity where there are Native American camps, trails, homesteads, a sawmill, and an historic USFS work center.

Traditional Native American resource locations occur in the vicinity of the Lolo Creek study area. The camas collection areas associated with Musselshell Meadows lie to the west, and just outside, the study area. Within the study area are the Nez Perce (Nee-Me-Poo) National Historic Trail, and streams and tributaries connected to salmon production. The Nez Perce Tribe has identified salmon as an integral part of tribal religion, culture, and physical sustenance, and has indicated that the annual return of the salmon allows the transfer of traditional values from generation to generation (Columbia River Inter-Tribal Fish Commission (CRITFC) 2002). The Nez Perce Tribe has indicated that Lolo Creek is an important stream in their restoration efforts for chinook salmon in the Clearwater River Subbasin (Mancuso 1996). The Yoosa Creek tributary of upper Lolo Creek, which is just outside the study area, is the location of a satellite facility site for the Nez Perce tribal hatchery program (see Figure 1-1). The USFS has initiated contact with the Nez Perce Tribe to identify potential traditional resource concerns in the Lolo Creek study area.

In November of 2001, the Nez Perce Tribal Ethnographer, Josiah Pinkham, identified six traditional gathering areas in the Lolo Creek area, one of which is on the bank of Lolo Creek. Additional areas, yet to be identified, could also lie within the Lolo Creek study area. The exact location of traditional areas is considered confidential and is generally not publicized; for that reason, they are not identified here.

3.3 Moose Creek

3.3.1 Watershed Description

Moose Creek is a major tributary of lower Kelly Creek, which is itself a major tributary of the upper North Fork Clearwater River (see Figure 1-1 in Chapter 1). Independence Creek and Deadwood Creek are two major tributaries of Moose Creek within the EIS study area. There are approximately 34.3 miles of perennial streams within the project area; Moose Creek runs for 10.2 miles through the study area (including 0.6 miles through private land), Independence Creek for 5.1 miles (1.3 miles through private land), and Deadwood Creek for 3.8 miles (all on National Forest System lands). (See Figure 2-1).

The entire Moose Creek watershed covers 66 square miles (USFS 1994a), of which 19.3 square miles are within the study area. Of the 19.3 square miles, the Independence Creek and Deadwood Creek watersheds are 5.4 and 3.4 square miles, respectively.

Over half (about 61 percent) of the Moose Creek watershed is considered undeveloped, but other parts of the drainage, including the study area for this EIS, have undergone extensive mining, road construction, and timber harvest on USFS and private lands. Both Deadwood Creek and Independence Creek were heavily placer mined beginning in the 1860s and continuing to the 1950s. Both dragline dredging and hydraulic mining were employed. Moose Creek was dredge mined in the 1930s, 1940s, and 1950s. Dredging took place on Moose Creek above Independence Creek for approximately three miles from the mouth to approximately two miles above the Deadwood Creek confluence. Figure 3-5 shows a dragline in operation along Moose Creek in the 1950s. Some areas of the Moose Creek watershed were privately owned until 1996, when most private lands, with the exception of four patented mining claims parcels, were transferred to the USFS. Two of the patented claims are in the study area, including 98 acres along 1.3 miles of Independence Creek and 36 acres along a 0.6 mile segment of Moose Creek.

Idaho DEQ has listed several beneficial uses for the North Fork Clearwater River, including domestic water supply, agricultural water supply, cold-water biota, salmonid spawning, primary contact recreation, secondary contact recreation, and special resource waters (IDEQ 2000). The Forest Plan for the Moose Creek and Deadwood Creek watersheds identifies cutthroat trout as an indicator species (USFS 1987), and cutthroat are also known to occur in Independence Creek. No stream segments within the Moose Creek study area have been identified by Idaho DEQ as having water quality concerns.

Figure 3-5. Dragline and Washer Operation on Moose Creek
(Source: Manchester and Sievers, 1957)

3.3.1.1 Deadwood Creek

Past activities in the Deadwood Creek watershed include mining, road building, and timber harvest. Mining was primarily in the floodplain, and activities such as dredging and the use of flash dams for hydraulic mining altered channel characteristics, channel stability and substrate composition. Clearwater National Forest 1993 data and 2003 GIS acreage show that the Deadwood Creek watershed had a road density of 2.3 miles per square mile (USFS 2003c). Many of the roads were built using inslope construction, which impacted the natural drainage and sediment delivery of the watershed. Intermittent timber harvesting conducted from 1968 through 1977 and timber regeneration cut acres total 600 acres, which amounts to 29 percent of the watershed (USFS 1994a).

3.3.1.2 Independence Creek

Past activities in the Independence Creek watershed were the same as in Deadwood Creek: mining, road building, and timber harvest. Mining was primarily in the creek itself and the floodplain adjacent to the creek and its tributaries. Activities such as dredging and the construction of stream diversions altered channel characteristics and channel stability (USFS 1994a). Clearwater National Forest 1993 data and 2003 GIS acreage show that Independence Creek watershed has a road density of 5.9 miles per square mile (USFS 2003c). Many of the roads were constructed using inslope construction, which impacted the natural drainage and sediment delivery of the watershed. Forest Service road 5440 crosses Independence Creek at an unimproved ford just above the confluence with Moose Creek (see Figure 2-3).

Sediment is delivered to first and second order streams from eroding cutslopes, ditches, and from road surfaces. A diversion that was built to divert water from the East to the West Fork of Independence Creek causes significant erosion from the hillslopes that were cut during construction. Tree harvesting within riparian areas reduced potential large woody debris, decreasing the creek's ability to store and trap sediment. Timber harvesting and broadcast

burning began in 1959 and continued until 1982 (USFS 1994). There were intermittent timber harvests and timber regeneration cuts on 2,370 acres, which amounts to 68% of the watershed.

3.3.1.3 Moose Creek

Most past activities in the Moose Creek watershed were in the Deadwood, Independence, and Osier Creek watersheds; the first two are described above and the last is not in the study area. Along Moose Creek itself, dredge mining occurred from the mouth of Moose Creek to approximately two miles above the Deadwood Creek confluence. The dredge mining greatly impacted the channel, which continues to show the effects. Streambanks remain unstable and a majority of the original channel substrate has been sorted and moved by the dredge activities. Clearwater National Forest (USFS 1994a) reported that the one major road adjacent to Moose Creek has not disrupted the natural drainage of the watershed. There are 158 miles of road at a density of 2.2 miles per square mile in the watershed. Timber harvesting and broadcast burning were also conducted in the Moose Creek watershed between 1959 and 1982. A total of 4853 acres were harvested, which amounts to 10.4 percent of the watershed (USFS 2003c).

3.3.2 Geomorphology

3.3.2.1 Deadwood Creek

The Deadwood Creek watershed is primarily made up of the following land types, each of which is described below: glaciated lands, colluvial and frost churned uplands, and fluvial lands (USFS 1994a).

Glaciated lands are characterized by steep, high elevation, rocky peaks and ridges that were shaped by glaciation. Slopes are frequently above 60 percent. Cirque basins are common above 5,500 feet. Streams range from being weakly entrenched in bedrock with moderately steep gradients to gentle, weakly entrenched low gradient streams in valley floors.

Many streams originate in colluvial and frost churned uplands and are located on debris above bedrock with moderately steep gradients. This land group sustains stream flow from ground water throughout the year. Water yields average 60 to 85 percent of precipitation at higher elevations and 40 to 75 percent at lower elevations.

Geomorphologically, fluvial lands represent a progression from the higher relief landforms with generally seep gradient streams to lower relief, rolling hill-type topography. Streams in this land type have low gradients and meandering channels are common.

Deadwood Creek has predominantly B3 and B4a channel types as defined by the Rosgen (1994) method (USFS 1994a). Table 3-1 above characterized the various channel types. In general, Type B channels are dominated by riffles with some reaches containing “rapids” and infrequently spaced scour-pools at bends or areas of constriction. The letter “a” denotes a creek with a gradient of 10% and above. Studies conducted on two reaches within the stream rated Deadwood Creek as having “fair” stability (USFS 1994a) and low levels of cobble embeddedness (USFS 1995).

Data are not available describing the particle size distribution of the substrate within Deadwood Creek. However, past activities would suggest that a relatively higher proportion of the substrate could be fine sediments (those by definition that are less than 4 mm in size) as compared to an undisturbed watershed with similar geology. USFS (1994a) indicates that Deadwood Creek is an energy limited system, suggesting that sediments produced in the watershed would have a tendency to fall out and collect in the bottom of the channel until high flow events occur. However, the low levels of noted embeddedness may suggest that fine sediments have been transported out of the stream from large flow events.

3.3.2.2 Independence Creek

The Independence Creek watershed is dominated by colluvial and frost churned uplands, and fluvial lands (USFS 1994a). The general geomorphologies of these land-types were described for Deadwood Creek above.

Independence Creek has stream reaches with a broad range of types as defined by the Rosgen (1994a) system (USFS 2002a). Stream reaches have been surveyed to have the following range of types: A2, A4, A5, A6, B3, B4, B5, G5 and G6. These stream types are characterized in Table 3-1 above. Studies conducted on twenty reaches within the stream rated Independence Creek as having “fair” to “poor” stability (USFS 1994a) and moderately high levels of cobble embeddedness (USFS 1995).

Data are available from one cross-section describing the particle size distribution of the substrate within Independence Creek (USFS 2003e). Figure 3-6 depicts results from pebble counts showing the percent distribution for several particle size classes. Percent distribution is shown by size class and as an accumulated percentage. These data show a moderately high proportion of the substrate consists of fine sediments in the 0-2 mm size class. These data confirm probable impacts from past activities, such as mining and timber harvests. USFS (1994a) further indicates that Independence Creek is an energy-limited system, which suggests that fine sediments produced in the watershed would have a tendency to fall out and collect in the bottom of the channel until high flow events occur. Studies conducted on two reaches within the stream rated Independence Creek as having “fair” stability (USFS 1994a) and low levels of cobble embeddedness (USFS 1995).

3.3.2.3 Moose Creek

The Moose Creek watershed is dominated by glaciated lands, colluvial and frost churned uplands, and fluvial lands (USFS 1994a). The general geomorphologies of these land-types were described for Deadwood Creek above.

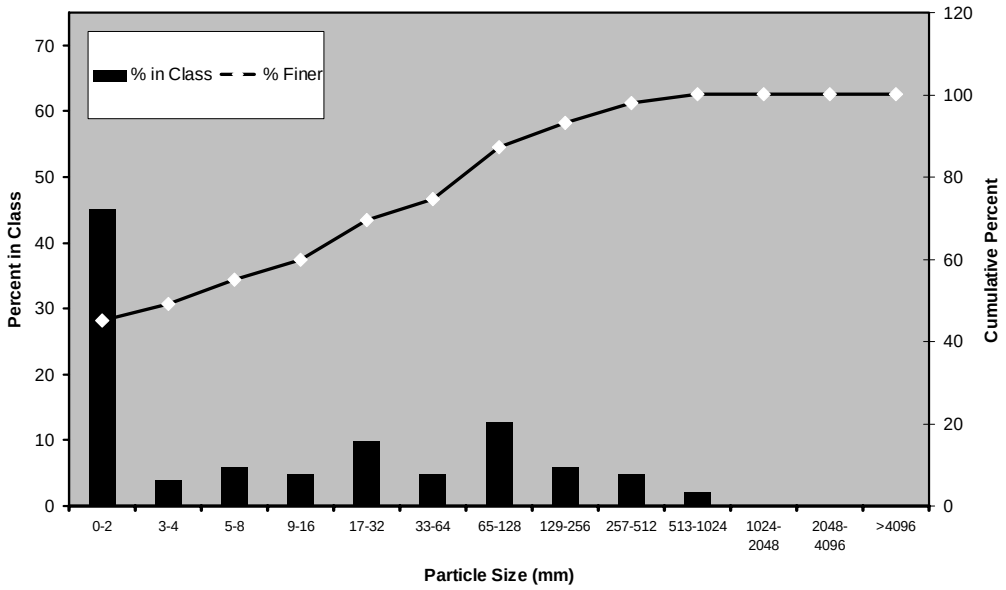


Figure 3-6. Particle Size Distribution of Independence Creek Substrate Materials
(Source USFS 2003e)

Two stream reaches surveyed by Clearwater National Forest both show Moose Creek with a B3 channel type as defined by the Rosgen (1994) system (USFS 1994a) (Table 3-1). Type B channels are dominated by riffles with some reaches containing "rapids" and infrequently spaced scour-pools at bends or areas of constriction. The number 3 denotes a substrate that is predominately composed of cobbles. Studies conducted on these two reaches within the stream rated Moose Creek as having "fair" stability (USFS 1994a) and low levels of cobble embeddedness (USFS 1995).

Data are available from two reaches describing the particle size distribution of the substrate in Moose Creek (USFS 2003e). These reaches were surveyed using the Wolman pebble count method (Wolman, 1954). One surveyed reach was on Moose Creek near the mouth and one reach was surveyed above the Independence Creek confluence. Figure 3-7 depicts results from pebble counts showing the percent distribution for several particle size classes. Percent distribution is shown by size class and as an accumulated percentage. These data show a moderately high proportion of the substrate consists of fine sediments in the 0-2 mm size class. These data confirm probable impacts from past activities, such as mining and timber harvests. However, USFS (1994a) indicates that Moose Creek is an energy-surplus system. This suggests that fine sediments produced in the watershed would have a tendency to be transported out of the watershed. An energy-surplus stream also has the potential to impact channel morphology through scouring of the bed and erosion of the banks during very high flows.

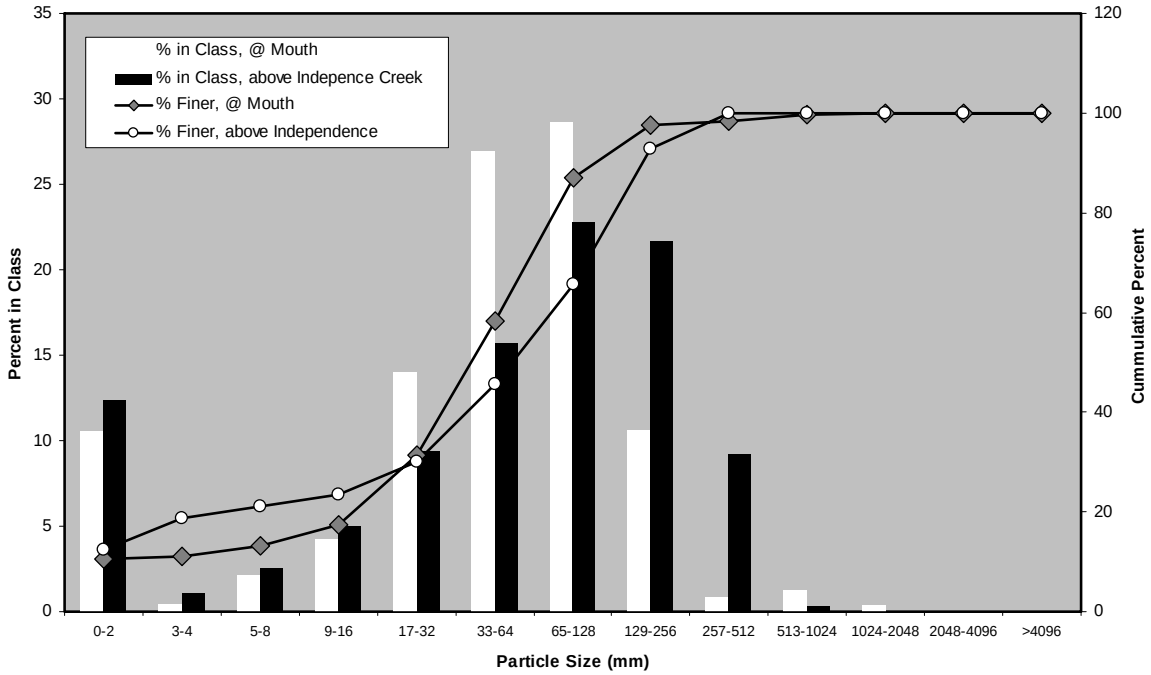


Figure 3-7. Particle Size Distribution of Moose Creek Substrate Materials
(Source USFS 2003e)

3.3.3 Stream and Sediment Discharge

Clearwater National Forest applied a flow-sediment yield model (WATBAL) to evaluate sediment yields and hydrologic response of the Moose Creek watershed including the Deadwood Creek and Independence Creek tributaries (USFS 1994a). The WATBAL model is designed to simulate the potential and most likely effects of forest management practices, such as timber harvest, road construction, or fire on watershed hydrology and sediment yield.

3.3.3.1 Deadwood Creek

Sediments produced in the Deadwood Creek watershed from logging and road construction tend to deposit in the channel. Natural sediment production was estimated at 18 tons per square mile per year (USFS 1994a). This would be considered the average rate of erosion and sediment transport through an undisturbed natural system. The sediment yield from the watershed was 9 percent over "natural" in 1994 and 5 percent over "natural" projected for 2003 (USFS 1993a).

The Forest Plan standard for Deadwood Creek is a B channel type (see Table 3-1), cutthroat high fishable[7] stream (USFS 1987). The approximate maximum sediment loadings that generally support this criterion are 55 percent over "natural." Sediment production should be at or below

[7] "High fishable" is a water quality/fishery objective defined as the maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support an excellent fishery relative to the stream's natural potential, and that will provide the capability for essentially full habitat recovery over time (USFS 1987).

45 percent over natural for 20 out of 30 years. Based on this analysis, Deadwood Creek is currently meeting standards established by the Forest Plan.

In 2003, Equivalent Clearcut Acres amounted to 5.3 percent in the Deadwood Creek watershed. WATBAL showed a peak flow increase of 3 percent over natural for 2003. This is less than the level of 15 to 20 percent that is considered to be potentially detrimental to the stream system (USFS 2001e).

Stream discharge, suspended sediment, turbidity, and bedload were studied on Deadwood Creek in 1981 (USFS 1993b). Table 3-13 provides average monthly data. Bedload is a measurement of sediment and larger size particles that move by jumping/bouncing, rolling, or sliding along the stream bottom. Bedload can be added to the suspended load to determine the total sediment load for a stream. These limited data show a relatively high level of total sediment load in June (1,031 lbs/day) and July (1,045 lbs/day) compared to much lower levels in August (9.6 lbs/day). Turbidity levels ranged between 0.7 and 1.9 NTU which is well under the State turbidity standard of 50 NTU. Turbidity data show that sediment production in Deadwood Creek is meeting State water quality standards. These 1981 data represent a worse-case scenario for Deadwood Creek because stream discharge was at its highest above "natural" according to the WATBAL model (USFS 1994a). Relationships between mean monthly stream discharge and sediment load are depicted in Figure 3-8.

3.3.3.2 Independence Creek

Sediments produced in the Independence Creek watershed from logging and road construction tend to deposit in the channel, and surveys conducted noted high amounts of fine sediments in the channel (USFS 1994a). Natural sediment production was estimated at 17 tons per square mile per year (USFS 1994a). This would be considered the average rate of erosion and sediment transport through an undisturbed "natural" system. The sediment yield from the watershed was projected 33 percent over "natural" for 2003. USFS (1993b) reports that the 33 percent value was a large reduction in the amount of sediment yields that WATBAL estimated for the 1960s and 1970s, thus concluding that impacts associated with road construction and timber harvesting had mostly subsided.

The Forest Plan standard for Independence Creek is a B channel type (see Table 3-1), cutthroat moderate fishable[8] stream (USFS 1987). The approximate maximum sediment loadings that generally support this criterion are 150 percent over natural. The 33 percent level for 2003 is well below the Forest Plan standard that must be met for sediment production 10 out of 30 years. Based on this analysis, Independence Creek is currently meeting standards established by the Forest Plan.

[8] "Moderate fishable" is a water quality/fishery objective defined as the maximum short-term reduction of water quality that is still likely to maintain a fish habitat potential that can support at least a moderate harvestable surplus relative to the stream's natural potential, and that will provide the capability for significant habitat recovery over time (USFS 1987).

Table 3-13. Mean Stream Discharge, Suspended Sediment, Bedload, and Turbidity Measured on Deadwood Creek in 1981

Month	*Mean Discharge (cfs)*	*Mean Suspended Sediment Conc. mg/l*	*Mean Suspended Sediment Load lbs/day*	*Mean Bedload lbs/day*	*Total Sediment Load lbs/day*	*Turbidity NTU*
Oct	2.2	0.3	3	12	15	1.9
Nov	nm	nm	nm	nm	nm	nm
Dec	nm	nm	nm	nm	nm	nm
Jan	nm	nm	nm	nm	nm	nm
Feb	nm	nm	nm	nm	nm	nm
Mar	nm	nm	nm	nm	nm	nm
Apr	nm	nm	nm	nm	nm	nm
May	13.5	4.0	289	195	484	0.7
Jun	19.2	4.8	466	565	1,031	1.2
Jul	6.9	5.2	153	892	1,045	1.2
Aug	2.3	1.8	22	0	22	0.7
Sep	nm	nm	nm	nm	nm	nm

Table adapted from USFS (2003e)
cfs = cubic feet per second.
mg/l = milligrams per liter
lbs/day = pounds per day
NTU = Nephelometric Turbidity Units
nm = not measured

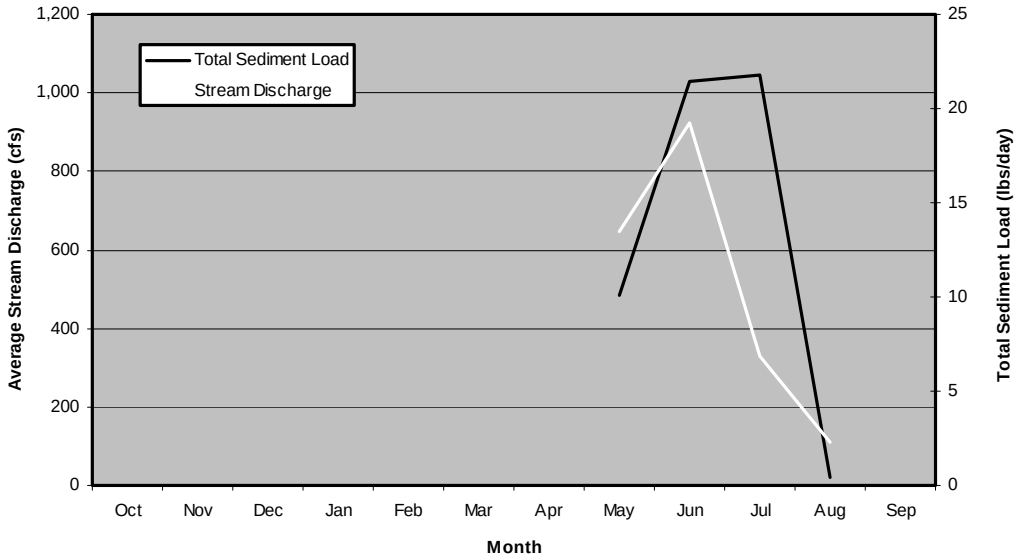


Figure 3-8. Relationship between Stream Discharge and Total Sediment Load for Deadwood Creek (Source USFS 2003e)

In 2003, Equivalent Clearcut Acres amounted to 14 percent in the Independence Creek watershed (USFS 2003b). WATBAL showed a peak flow increase of 8 percent over natural for 2003. This is less than the level of 15 to 20 percent that is considered to be potentially detrimental to the stream system (USFS 2001).

Stream discharge, suspended sediment, turbidity, and bedload were studied on Independence Creek in 1981. Average monthly data are provided in Table 3-14. These limited data show relatively high levels of total sediment load in June (1,441 lbs/day) and July (667 lbs/day) and low levels in August (27 lbs/day). Turbidity levels range between 1.1 and 5.2 NTU and are well under the State turbidity standard of 50 NTU above background (IDEQ 2000). Turbidity data show that sediment production in Independence Creek is meeting State water quality standards. These 1981 data represent a worse-case scenario for Independence Creek as stream discharge was at its highest above "natural" according to the WATBAL model (USFS 1994a). Relationships between mean monthly stream discharge and sediment load are depicted in Figure 3-9.

Table 3-14. Mean Stream Discharge, Suspended Sediment, Bedload, and Turbidity Measured on Independence Creek in 1981

Month	*Mean Discharge (cfs)*	*Mean Suspended Sediment Conc. mg/l*	*Mean Suspended Sediment Load lbs/day*	*Mean Bedload lbs/day*	*Total Sediment Load lbs/day*	*Turbidity NTU*
Oct	2.9	2.5	39	nm	39	5.2
Nov	nm	nm	nm	nm	nm	nm
Dec	nm	nm	nm	nm	nm	nm
Jan	nm	nm	nm	nm	nm	nm
Feb	nm	nm	nm	nm	nm	nm
Mar	nm	nm	nm	nm	nm	nm
Apr	nm	nm	nm	nm	nm	nm
May	nm	nm	nm	nm	nm	nm
Jun	11.0	16.6	712	729	1,441	4.0
Jul	7.5	3.3	133	545	677	1.1
Aug	2.3	2.2	27	nm	27	1.2
Sep	3.1	nm	nm	nm	nm	nm

Table adapted from USFS (2003e)
cfs = cubic feet per second.
mg/l = milligrams per liter
lbs/day = pounds per day
NTU = Nephelometric Turbidity Units
nm – not measured

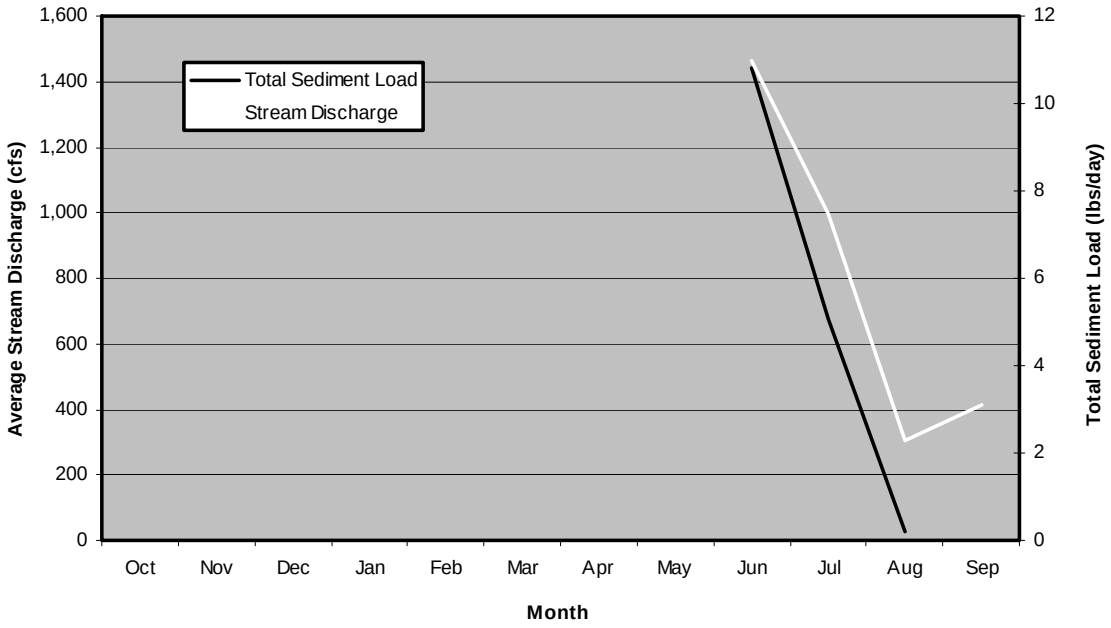


Figure 3-9. Relationship between Stream Discharge and Total Sediment Load for Independence Creek (Source USFS 2003e)

3.3.3.3 Moose Creek

Based on WATBAL, sediments produced in the Moose Creek watershed from logging and road construction tend to be transported out of the watershed because of a relatively high energy system (USFS 1994a). Natural sediment production was estimated at 12 tons per square mile per year (USFS 1991). This would be considered the average rate of erosion and sediment transport through an undisturbed "natural" system. The sediment yield from the watershed was projected to be 0 percent over "natural" in 2003. USFS (1994a) reports that this is a large reduction in the amount of sediment yields that WATBAL estimated for the 1960s.

The Forest Plan standard for Moose Creek above the Independence Creek confluence is a B channel type, cutthroat high fishable stream (USFS 1987). The approximate maximum sediment loadings that generally support this criterion are 55 percent over "natural". The 2003 level of 0 percent is well below the Forest Plan standard that must be met for sediment production 10 out of 30 years.

In 2003, Equivalent Clearcut Acres (ECA) amounted to 4.8 percent in the Moose Creek watershed. WATBAL showed a peak flow increase of 3 percent over natural for 2003. This is less than the level of 15 to 20 percent that is considered to be potentially detrimental to the stream system (USFS 1991).

Stream discharge, suspended sediment, turbidity, and bedload were monitored on Moose Creek between 1979 and 1981. Average monthly values are presented in Table 3-15. These data show relatively low levels of suspended and total sediment load for most months. Turbidity levels range between 0.7 and 4.3 NTU and are well under the State turbidity standard of 50 NTU above

background. Turbidity data show that sediment production in Moose Creek is meeting State water quality standards. Relationships between mean monthly stream discharge and sediment load are depicted in Figure 3-10.

The relationship between stream discharge and sediment transport, depicted in Figure 3-9, is related to stream velocity. There are several factors, such as channel width, depth and slope that determine the velocity of a stream at any given flow rate and at any given point. However, the velocity of the water flowing in a stream generally increases with increasing stream flow.

Table 3-15. Mean Stream Discharge, Suspended Sediment, Bedload, and Turbidity Measured on Moose Creek in 1980-1981

Month	Mean Discharge (cfs)	Mean Suspended Sediment Conc. mg/l	Mean Suspended Sediment Load lbs/day	Mean Bedload lbs/day	Total Sediment Load lbs/day	Turbidity NTU
Oct	37	3	401	0	401	1.2
Nov	71	1.8	690	nm	690	4.3
Dec	nm	nm	nm	nm	nm	nm
Jan	nm	nm	nm	nm	nm	nm
Feb	nm	nm	nm	nm	nm	nm
Mar	nm	nm	nm	nm	nm	nm
Apr	539	9	25103	488	25591	2.3
May	420	5	11189	488	11677	1.1
Jun	352	4	7148	376	7523	1.4
Jul	163	7	5619	254	5872	1.8
Aug	66	2	767	nm	767	0.7
Sep	48	1	325	nm	325	1.6

Table adapted from USFS 2003e
cfs = cubic feet per second.
mg/l = milligrams per liter
lbs/day = pounds per day
nm = not measured

Increasingly higher velocities are required to dislodge, suspend, and transport increasingly larger sizes of sediment material. As flow velocity decreases, sediment particles settle out according to size. Sand and larger fractions drop out to the channel substrate until at lower velocities the stream has only enough energy to keep very fine sediments (i.e. silts and clays) suspended.

A relationship between stream discharge and stream velocity for a reach near the mouth of Moose Creek was estimated using cross-section survey data provided by USFS (2003e) and Manning's equation. This relationship is shown in Table 3-16 and Figure 3-11.

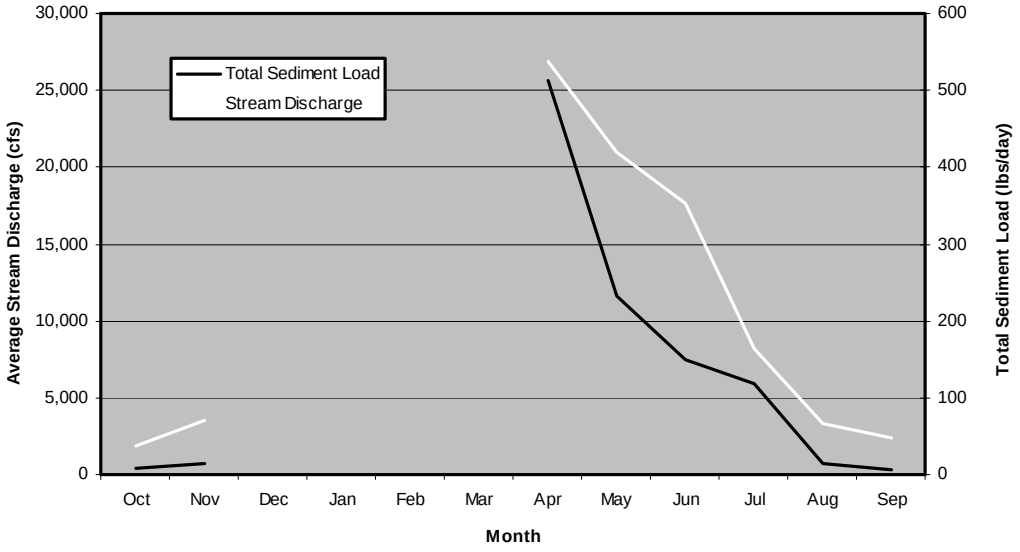


Figure 3-10. Relationship between Stream Discharge and Total Sediment Load for Moose Creek at Mouth (Source USFS 2003e)

3.3.4 Fisheries and Aquatic Organisms

3.3.4.1 Aquatic Habitat

Table 3-17 provides a summary of aquatic habitat characteristics in the Moose Creek, Independence Creek and Deadwood Creek project area. Habitat conditions vary along Moose Creek. Upstream of the Deadwood Creek confluence there are steep to very steep gradients and excellent fish habitat. Between the mouths of Deadwood Creek and Independence Creek, the gradient is moderately steep with habitat affected by past placer mining. Between the mouths of Independence Creek and Osier Creek, the gradient is moderately-steep to steep that repeatedly changes character in response to channel confinement. Downstream of Osier Creek, the size and sinuosity of Moose Creek increases in response to tributary inflows, reduced channel confinement, and a decline in stream gradient.

Independence Creek is a moderately steep stream dominated by large substrate material. In-stream cover is sparse and bank cover is moderate. Deadwood Creek is a steep stream with sparse in-stream and bank cover conditions. Deadwood Creek has the greatest amount of woody debris among the three streams.

Table 3-16. Relationship between Stream Flow and Stream Velocity at the Mouth of Moose Creek

Month	*Average Stream Discharge cfs*	*Average Flow Velocity Flow Velocity Fps*
Oct	72	1.3
Nov	93	1.4
Dec	107	1.5
Jan	92	1.4
Feb	110	1.5
Mar	123	1.6
Apr	362	2.4
May	726	3.0
Jun	513	2.7
Jul	147	1.7
Aug	64	1.2
Sep	55	1.2

Table adapted from USFS (2003e)
cfs = cubic feet per second
fps = feet per second

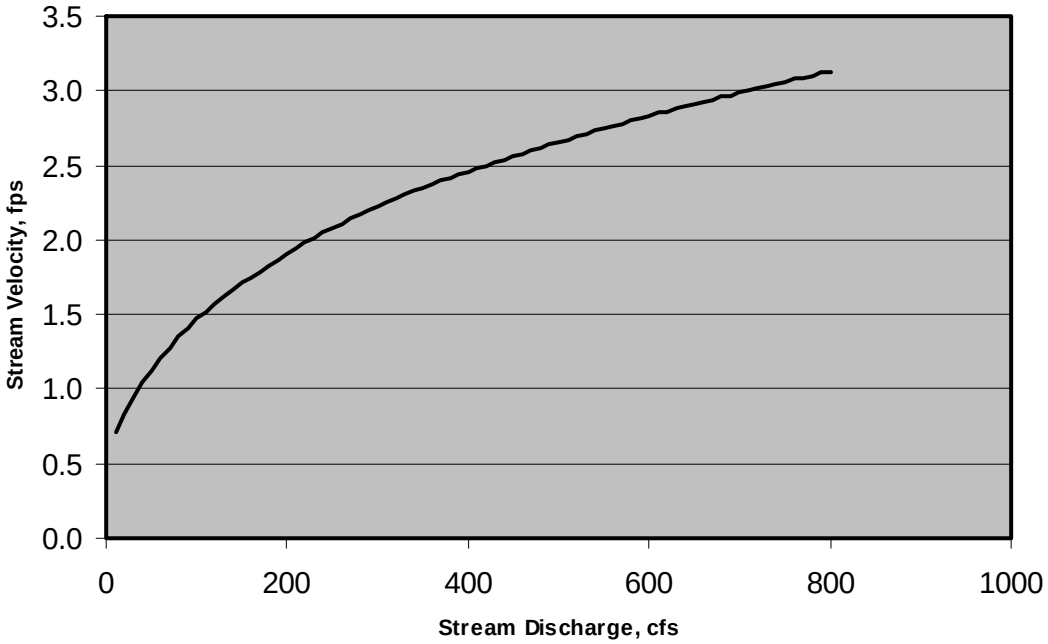


Figure 3-11. Relationship between Stream Flow And Stream Velocity at the Mouth of Moose Creek (Source USFS 2003e)

Table 3-17. Summary of Aquatic Habitat Characteristics in the Moose Creek Project Area [a]

Habitat Parameter	*Moose Creek*	*Independence Creek*	*Deadwood Creek*
Rosgen Classification (see Table 3-1	42% A, 45% B, 13% C	B3-B5 100%	A2/A3 100%
Average Gradient	4.8 %	3.2 %	5.5 %
Stream Width	8.2 m	2.8 m	3.0 m
Stream Depth	0.198 m	0.133 m	0.123 m
Thalweg Depth	0.38 m	0.255 m	0.236 m
Bank Stability [b]	4.4 (Stable)	4.5 (Stable)	4.8 (Stable)
Cobble Embeddedness [c]	22.5 %	33.5 %	25.3 %
Pool:Riffle Ratio [d]	9 : 59	15 : 51	25 : 63
Acting Debris / Potential Debris [e]	6 / 20	17 / 20	23 / 72
Pool Quality	1.5 (Poor)	1.6 (Poor)	1.0 (Poor)
Instream Cover	1.6 (Sparse)	1.5 (Sparse)	1.3 (Sparse)
Bank Cover	1.3 (Sparse)	2.1 (Moderate)	1.6 (Sparse)

a = Averages from 1990 summer stream survey (Clearwater Biostudies, Inc., 1991)
b = Largely due to abundant vegetation and large channel/bank substrate.
c = The target cobble embeddedness rate for the Forest Plan should be less than 35 %.
d = The target pool:riffle ratio is 40:60 for Rosgen B channels and 50:50 for C channels
e = Acting debris = Pieces of in-channel wood per 100m. Potential debris = riparian conifers available for recruitment into the channel per 100 m. (Forest Plan recommends 40 pieces Acting and 80 pieces potential per 100 meters of stream)

Table 3-18 provides the average percentages of material comprising the substrate in the Moose Creek project area. The data show that the substrate is dominated by cobbles, large rubble, and coarse gravel. This substrate provides limited spawning-sized gravels for salmonids and good fish rearing habitat. Table 3-19 summarizes the average percentages of spawning habitat for various fish within the Moose Creek project area, based on the 1990 habitat survey. The data indicate that less than one-half of one percent of the total stream habitat for the three creeks is available for salmonid spawning. This includes potential spawning habitat in both dredging and non-dredging areas.

Table 3-18. Average Percent Substrate Composition in the Moose Creek Study Area			
Size Category	*Percent*		
	Moose Creek	*Independence Creek*	*Deadwood Creek*
Bedrock	1.6	0	0
Boulders (>30.5 cm)	8.0	12.5	1.3
Large rubble (15.2 – 30.5 cm)	33.3	8.0	17.9
Small rubble (cobbles, 7.6 – 15.2 cm)	47.7	34.3	53.0
Coarse gravel (2.5 – 7.6 cm)	6.5	32.6	20.0
Small gravel (0.6 – 2.5 cm)	1.3	8.8	5.8
Sand (<0.6 cm)	1.1	2.4	2.0
Silt	0.2	0	0
Muck	0.1	0	0
Organic debris	0.2	1.6	0
Source: Clearwater Biostudies, Inc., 1991			

Table 3-19. Percent of Moose Creek Study Area Available for Spawning [a]				
Fish	*Good*	*Fair*	*Poor*	*Total %*
Resident salmonid (spring)	0.13	0.16	0.07	0.36
Resident salmonid (fall)	0.11	0.12	0.05	0.28
A = Combined average for Moose Creek, Independence Creek, and Deadwood Creek based on habitat area. Source: Clearwater Biostudies, Inc., 1991				

3.3.4.2 Threatened, Endangered, and Sensitive Species

Chinook Salmon (*Oncorhynchus tshawytscha*). The Moose Creek drainage is located over 100 miles upstream of Dworshak Dam. The dam provides a complete migration barrier to anadromous fish, so chinook salmon do not exist in the Moose Creek project area.

Steelhead Trout (*Oncorhynchus mykiss*). The Moose Creek drainage is located over 100 miles upstream of Dworshak Dam. The dam provides a complete migration barrier to anadromous fish, so anadromous steelhead trout do not exist in the Moose Creek project area.

Bull Trout (*Salvelinus confluentus*). A limited presence of bull trout within the Moose Creek drainage has been documented by several sources. Overall, westslope cutthroat trout is the

dominant species with low numbers of rainbow/steelhead trout and bull trout (Clearwater BioStudies Inc., 1991). Available bull trout population information is summarized in Table 3-20.

A few age 1+ and 2+ bull trout were found in Moose Creek below the confluences with Deadwood Creek and Independence Creek during a stream survey conducted in 1990 (Clearwater BioStudies, Inc., 1991). A re-survey of the 1983 survey by Moffitt and Bjornn (1984) by the Idaho Department of Fish and Game (IDFG, 1998) did not find any bull trout at the stations in Little Moose Creek and Ruby Creek. The Osier Creek drainage was surveyed in 1995 with no bull trout observed (Isabella Wildlife Works, 1996). No bull trout were observed during surveys on Ruby Creek, Craig Creek and the Little Moose Creek drainage in 1998 (Clearwater BioStudies, Inc., 1999b).

All this data indicated that only limited bull trout spawning and rearing was occurring in the Moose Creek drainage prior to 2000. However, additional snorkeling surveys conducted during 2000-2001 found an increase in the numbers of adult bull trout in the Moose Creek drainage. Further, spawning has also been documented within the lower Osier Creek drainage. Moose Creek is proposed as critical habitat from its confluence with Kelly Creek upstream 9.5 miles to a gradient break near the headwaters (67 FR 71276, 11/29/02).

Westslope Cutthroat (Oncorhynchus clarki lewisi) generally have a wide distribution and can be found in streams with channels as narrow as 18 inches. The highest densities are found in the small tributary streams, and in the mid and upper reaches of the larger streams where competition with other trout or salmon species is limited (USFS, 1999). Cutthroat spawning occurs in pool tailouts and in runs in pockets of gravel with 0.5- to 2-inch diameter. Gravel pockets can be relatively shallow and still be adequate for egg incubation, which is why this species does so well in small or headwater streams. Rearing occurs in pools, along stream margins, and in pocket water habitats.

Spawning and rearing habitat is present in the Moose Creek study area for supporting populations of westslope cutthroat trout. This species was reported to be the dominant salmonid in the drainage, with densities averaging 2.8 (age 2+) fish per $100m^2$ (Clearwater BioStudies Inc., 1990).

Pacific lamprey (*Lampetra tridentata*) do not occur in the Moose Creek drainage due to the presence of the Dworshak Dam.

Mountain whitefish (*Prosopium williamsoni*) prefer cold (8-10 ^{o}C) mountain streams with large riffles or pools averaging 3-4 feet in depth (Lusch, 1985). They are primarily bottom feeders with a preference for insects, snails, amphipods and crawfish. They have also been known to eat salmonid fry and eggs of its own kind. Whitefish are broadcast spawners and require a gravel bottom surface on which the eggs will attach themselves. Mountain whitefish occur in very low numbers within the Moose Creek drainage (Clearwater Biostudies, Inc., 1999b).

Table 3-20. Summary of Bull Trout Data Within the Moose Creek Drainage 1983-2001

Stream	*Number of Fish Population Stations*	*Number of Stations with Bull Trout*	*Bull Trout Age Classes and Densities*
Moose Creek – mainstem	28	7	Age 1 = 0.2/100m^2 * Age 2 + = 0.2/100m^2 Age 4 + = 1 fish ** Age 4 + = 3 fish ***
Little Moose Creek [a, b, c]	17	3	
Swamp Creek	3	0	
Osier Creek (mainstem)	8	2	Age 4 + = 2 fish ****
Independence Creek	5	0	
Deadwood Creek [d]	2	0	
Ruby Creek [e]	4	1	Age 1 = 1.3/100m^2 Age 2 = 1.3/100m^2

* In Moose Creek, there were two stations with age 1 bull trout with a density of 0.2/100m^2.
** One adult bull trout observed in mainstem Moose Creek in 2000 directly downstream of Deadwood Creek.
***Three adult bull trout observed in mainstem Moose Creek in 2001; two downstream of Osier Creek and one upstream mouth.
**** Two adult bull trout observed in Osier Creek in 2001, downstream of Swamp Creek.

a = IDEQ survey on Little Moose Creek on 7/29/1998. During their electro-shocking, they captured one (age 4) bull trout (240 – 249 mm) approximately 0.25 miles upstream from the mouth.
b = The Nez Perce tribal fisheries program conducted a genetics survey on westslope cutthroat trout in Little Moose Creek in the summer of 1999. They captured a small bull trout (approx. 50 mm) about one mile downstream from Wapito Creek. They also noted a 3 yr. old bull trout natural mortality near their shocking site (USFS 2002b).
c = IDFG have three snorkel transects in Little Moose Creek that have been surveyed from 1994-1997. They observed no bull trout at these transects. (IDFG 1998)
d = Two stations snorkeled in 2000.
e = IDFG has one snorkel transect in Ruby Creek and have snorkeled this site from 1994-1997. They observed no bull trout during their surveys. (IDFG 1998)

Sculpins (*Cottus spp.*) generally prefer small cobble-sized substrate for breeding and non-embedded substrate in run/pool type habitats for cover. They are an important food source for other aquatic and terrestrial animals (USFS 2000). Sculpins exist in the Moose Creek drainage but the population size is unknown.

3.3.4.3 Other Aquatic Organisms

Aquatic Invertebrates. Aquatic insects are a primary food source of juvenile salmon and trout, and are a large part of the diet of resident adult trout and other coldwater fish. The presence, distribution, and abundance of aquatic invertebrates are dependent upon basic habitat conditions such as water temperature, water quality and chemistry, substrate, and flow. In general, the four most important aquatic insect groups or "orders" that comprise the diet of salmonids and many other fish include true flies (order *Diptera*), mayflies (*Ephemeroptera*), caddisflies (*Tricoptera*), and stoneflies (*Plecoptera*).

Macroinvertebrate survey data are not available for the Moose Creek drainage to determine if indices such as species diversity and abundance area within regional background stream conditions. However, the aquatic invertebrate community in streams in the Moose Creek study area could be expected to be abundant and diverse.

3.3.5 Wildlife

3.3.5.1 Wildlife Use

Birds. Riparian forests and wetlands along the Clearwater River and larger tributaries provide perching and nesting opportunities and concentrated prey for raptor species. Bald eagles are discussed in Section 3.3.5.2. Osprey nest along the corridors of the mainstem rivers of the Clearwater basin and although there may be some transitory use of Moose Creek, Independence Creek, or Deadwood Creek, but are not known to nest there. Marsh hawks use meadow areas located in the watershed. These birds feed mostly on rodents (Asherin and Orme, 1978).

Blue heron forage and nest along mainstem rivers. Occasionally, they are observed in the larger tributaries of the upland drainages. Kingfishers and dippers are relatively common in area tributaries foraging on aquatic insects and fish, and nest in streambanks or nearby slopes. Waterfowl may temporarily use the riparian habitats during migrations.

Blue and ruffed grouse make transitory use of upland riparian habitats. Other upland game birds such as ring-necked pheasant, mourning doves, chukar partridges, and valley quail may occasionally use the riparian habitats in the Moose Creek watershed.

Mammals. Aquatic fur bearers such as beaver, muskrat, fisher, mink, and river otter occur in Clearwater River corridors and in upland watersheds. In general, these animals depend on riverine areas, bays, ponds, tributaries, and riparian forests for den sites and foraging areas. Riparian zones also serve as dispersal, travel, and prey base corridors (Jones and Heinemeyer 1994). Beaver are found in the Moose Creek watershed. Beaver distribution is strongly related to the presence of riparian food sources such as cottonwood trees and willows plus protected areas such as sloughs, inlets, and ponds (Asherin and Orme, 1978). Mink use slackwater habitats for foraging and denning. Fishers typically use mid-to-late successional forests and riparian zones. These forest types have multilayered canopies which help regulate temperatures and provide suitable denning sites (cavities and downed logs). Raccoons frequent stream and riparian habitats and forage on fish and mussels found in the tributary streams.

Big game species such as white-tailed deer, mule deer, elk, black bear, cougar, and moose may occur in the project areas. These animals may use riparian corridors to move between summer and winter ranges and sometimes for calving and fawning. During severe winters, riparian habitats can provide cover necessary for survival.

3.3.5.2 Threatened and Endangered Wildlife

Four wildlife species in the Clearwater National Forest have been listed by the U.S. Fish and Wildlife Service under the Endangered Species Act as being endangered or threatened: gray wolf (listed as endangered), bald eagle (threatened), grizzly bear (threatened), and lynx (threatened). There are no grizzly bear in or near the Moose Creek drainages and they are not expected to inhabit the watershed. The potential occurrence of the remaining three species within the study area is as follows:

- Bald Eagle (*Haliaeetus leucocephalus*). No historical or current evidence documents nesting or breeding on the Clearwater National Forest. Bald Eagles neither nest nor forage in the Moose Creek project area. Essential habitat for bald eagles on the Clearwater National Forest is restricted to 0.5 miles on either side of the Lochsa River, Middle Fork of the Clearwater River, North Fork of the Clearwater River, and lower portions of the Weitas, Kelly, and Cayuse Creeks. Wintering eagles have been observed downstream on the North Fork Clearwater River and mainstem Clearwater River.

- Gray Wolf (*Canis lupus*). The Moose Creek drainage is within the boundary of the Central Idaho nonessential population area for the gray wolf. However, there have been no confirmed observations of breeding pairs, pack formation, young pups, denning, or suspected rendezvous sites within the project area.

- Lynx (*Lynx canadensis*). The Moose Creek project area is within Lynx Analysis Unit 12 and 13. Nine lynx sightings were recorded in Clearwater County between 1942 and 1995 (USFS 2001d). The Moose Creek project area does not contain suitable lynx denning habitat (USFS 1999).

3.3.5.3 Forest Service Sensitive and Management Indicator Species

Table 3-11 above provided a list of the sensitive wildlife and management indicator species and their likely occurrence in the Moose Creek project area. Many of the wildlife species listed in Table 3-11 may occasionally occur in the riparian zone of Moose Creek. The following species are considered not likely to occur in the riparian areas due to habitat preferences and lack of documented occurrences: wolverine, Townsend's big-eared bat, flammulated owl, black-backed woodpecker, Harlequin duck, and the northern leopard frog.

3.3.6 Vegetation

3.3.6.1 Riparian Vegetation

The riparian habitat along Moose Creek varies considerably but is comprised mostly of mixed shrubs with alder, spruce, and mixed conifer trees. Mature conifers (e.g., spruce, lodgepole pine, grand fir, and Douglas fir) generally dominate along upper reaches of the creek, and deciduous species (alder, cottonwood, and willow) usually dominate in the lower reaches of the creek. Alder and spruce are the dominant canopy species, followed by mixed conifers and willows.

Associated understory species include huckleberry, dogwood, forbs, grasses, and meadow communities.

The riparian canopy in Independence Creek is dominated by alder, followed by spruce and mixed conifers. Forbs/grasses, mixed shrubs are the dominant understory along with young conifers.

Deadwood Creek is dominated by spruce, mixed conifers, cedar grand fir and alder trees. Understory vegetation along the streams is comprised of mixed shrubs, forbs/grasses, and small alder.

3.3.6.2 Forest Service Sensitive Plant Species

Table 3-11 provided a list of the sensitive plant species and their likely occurrence in the Moose Creek project area. Of the twelve sensitive riparian plants listed in Table 3-11, seven of them (deer fern, Mingan moonwort, green bug-on-a-stick, Henderson's sedge, light moss, short-styled triantha, and Idaho strewberry) could occur in the Moose Creek project area, although no populations have been reported.

3.3.7 Recreation

Section 3.2.7 described recreational resources in Clearwater National Forest, and how the Forest Service manages these resources.

Moose Creek is managed as Roaded Natural (see section 3.2.7 for description of this management category). The natural settings with limited road access and campsites provide more of a semi-primitive recreational experience than at Lolo Creek. Moose Creek, due to its more remote location, has fewer visitors than Lolo Creek.

Recreational opportunities in the Moose Creek area include fishing, hunting, camping, and hiking, as well as suction dredge mining. Camping is the primary recreational activity in the area. Since many streams in the Clearwater region, including Kelly Creek, contain trophy size fish, Moose Creek is not used as much as other tributaries for fishing. There are no developed campgrounds in the Moose Creek area. Most visitors, including small-scale suction dredge miners, camp in undeveloped areas near the creek. Few trails are located in the area. There is one lightly-used secondary trail (Trail 690 - Moose Creek Trail) that runs along the ridge above Moose Creek.

Access to Moose Creek is off of Deception Saddle Road 255. This road is an arterial route that extends from Road 250 at Kelly Forks to Road 250 near Deception Creek. Road 255 is an alternative route to the Black Canyon segment of Road 250 for through traffic. Most visitors use this road to access the Kelly Forks Campground and other dispersed recreation sites. It also serves as a haul route for timber management in the area.

Dispersed recreation activities occur year-round, but the majority of activity occurs during snow-free months from mid-May to early November. Roads and trails are not maintained during

winter. Little use occurs from mid-November to mid-May although a few hardy snowmobilers travel Roads 247 and 250 to sightsee.

3.3.8 Visual Resources

Section 3.2.8 describes how the Forest Service assigns and uses Visual Quality Objectives (VQOs) to manage visual resources, and also describes how most of the North Fork Clearwater Basin retains a high scenic integrity (with a VQO of *Retention*).

Moose Creek sits in a river canyon and ridge system surrounded by forests. Views in the foreground and tributaries consist of water forms, rock forms, large boulders, deep pools, and gravel bars. Vegetation consists of large stands of conifers interspersed with deciduous vegetation. The creek provides the only distinctive attraction, other areas are scenic but common and do not provide a unique attraction to the area. The Moose Creek area has not had a specific VQO assigned to it. Adjacent areas are managed for *Retention* in the foreground, *Partial Retention* in the middleground, and *Modification* in the background.

There are no developed campgrounds in the Moose Creek study area; visitors camp in various dispersed areas, where no amenities are provided. In general, while scenic, the area does not have any unique characteristics and is similar to other drainage systems found throughout the Clearwater National Forest.

For the Moose Creek area, there are no visual travel corridors adjacent to Moose Creek, but the 255 road from Kelly Forks to the mouth of Moose Creek and the Little Moose Ridge Trail are nearby, and each has a VQO of *Retention*.

3.3.9 Noise

See section 3.2.9 for a description of how noise levels are measured and evaluated. Forest Roads 255 and 5440 parallel portions of Moose Creek and tributaries.

Natural noises would include flowing water, insects, birds, and other animals. There would also be noises from human activities, such as vehicles on the roads, recreational vehicle engines and power generators on dispersed campsites, and aircraft. Background noise levels have not been measured in the Moose Creek study area. However, average noise levels could be expected to vary from 25 to 75 db (Figure 3-4).

3.3.10 Socioeconomics

Clearwater National Forest is influenced by conditions occurring at National and Regional levels. However, the area most affected by activities in the Forest, and that would most affect activities in the Forest, is local in nature. Visitors to Clearwater National Forest come from across the country, but a large majority are from the Pacific Northwest. Most visitors reside in northern Idaho and northeast Montana, with fewer visitors from increasing distances.

The nearest sizable city to the Moose Creek area is Missoula, Montana, the county seat of Missoula County. This would be the economic area most affected by activities in Moose Creek.

In 2000, the population of Missoula County was 95,802, and per capita annual income was $17,808 (U.S. Department of Commerce, 2001).

The actual amount of gold recovered by small-scale suction dredging in Moose Creek is unknown; thus, it is not known what contribution the income from suction dredge mining would make to any individual's income or to the local or regional economy. None of the prospective operators are known to rely on suction dredging as their sole source of income, or even as a major source of income.

3.3.11 Heritage Resources

Much of the historical setting for Moose Creek is similar to Lolo Creek and is repeated here for clarity.

As discussed in detail in section 3.2.9, heritage resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious, or other purposes. Native American Treaty rights and traditional uses are described in more detail in section 3.4.

3.3.11.1 Historical Setting

Aboriginal land use of the project region probably dates to at least 10,000 years ago, although this early period is poorly understood for the Clearwater Region (USFS 2002e). Inhabitants are likely to have lived in small groups, using a diversity of canyon and upland floral and faunal resources (including large game animals) as encountered. Tools included short-bladed projectile points, knives, and scraping tools. As the climate gradually warmed, the population increased, and shifts in subsistence practices are represented by small campsites along the rivers and streams of the region. Game such as deer, elk, rabbits, birds, and fish were taken locally, and plant use increased. Tool types increased in variety and included dart points and plant processing tools such as ground cobbles and pestles (USFS 2002e). After about 3,500 years ago, bow and arrow technology was introduced and pithouse villages became more common. Deer, elk, and bison, among other large game, were hunted as locally available. Semi-permanent villages were established in the Clearwater River region. The larger dart points of earlier periods were replaced with small arrow points and major root processing is represented by large mortars and digging sticks (USFS 2002e). After the introduction of the horse to many (though not all) Plateau groups between 300 and 400 years ago, mobility increased and dwellings shifted to more portable structures (USFS 2003f).

At the time of Euroamerican arrival in the region in 1805, the Nez Perce people occupied villages in the Clearwater River region, among other areas (USFS 2002e). Traditional Nez Perce territory in the Clearwater, Snake, and Salmon River basins provided game animals, plants and fish resources. Estimates suggest that the majority of Nez Perce resource use focused on the acquisition of fish, including Chinook, coho, chum and sockeye salmon, and lamprey (USFS 2002e). Non-anadromous fish included dolly varden, lake and cutthroat trout, squawfish, suckers and sturgeon. Plant resources included camas and couse, among many others. Section 3.4 provides a more detailed description of Nez Perce use of plant and animal resources.

Lewis and Clark's Corps of Discovery expedition entered the region along the Lolo Trail in 1805. Between 70 and 130 Nez Perce villages are estimated to have been located in the river basins of central Idaho when Lewis and Clark came through (USFS 2002e). The trail, known as *Khoo-say-na-is-kit* by the Nez Perce, was used by Native Americans to travel to and from buffalo country. In the 1830s, the trail was used by fur traders, and in the 1850s was investigated by John Mullan for its potential as a military trail (USFS 2002e). Today, the Lolo Trail is a National Historic Landmark (USFS 2003f) and the Lewis and Clark Trail is a National Historic Trail.

As Euroamerican settlers moved into the region following initial exploration, settlers and miners began to encroach on the Nez Perce homeland. In 1855, Isaac Stevens, the governor of the newly formed Washington Territory, called the Nez Perce leaders to a council at Walla Walla to create a reservation. An agreement was reached that reserved most of the traditional Nez Perce homeland (7.7 million acres) as their exclusive domain.

In 1860, gold was discovered on the Nez Perce Reservation at a location that would become known as Orofino Creek (Hoggatt 1997). The discovery of gold created a rush to the Nez Perce Reservation. By 1863, the U.S. government was unable to control Euroamerican incursions into Nez Perce lands and attempted to negotiate a second treaty, dramatically reducing the size of the reservation that had been established in 1855 (Hoggatt 1997).

Eventually the U.S. government directed all non-treaty Nez Perce to move onto the reservation. On the way to the reservation, young warriors (independent of the Nez Perce leadership) sought out specific settlers to avenge the deaths of certain Nez Perce people (Hoggatt 1997). The outbreak of violence ignited the Nez Perce War of 1877. The route of the non-treaty Nez Perce as they fled U.S. military forces across the Northwest is memorialized as the Nez Perce (or Nee-Me-Poo) National Historic Trail in 1986 (USFS 2003f). The trail began in Oregon, led eastward over the Lolo Trail, and into Montana (USFS 2003f).

The Flathead people are known to have come into Nez Perce territory from east of the Bitterroot Divide to use salmon fisheries and camas meadows. Although the western extent of Flathead use of the region is not well defined, it may have included the Lochsa River and its tributaries in Idaho (USFS 2002).

Initial mineral explorations in the region did not locate gold in the North Fork Clearwater River drainage. However, after 1860, when gold was found on Orofino Creek and the Lolo Trail was improved as a route into the region, a gold rush to Moose City, in the present Moose Creek study area, ensued. Mining north of the town of Pierce also extended into some North Fork streams, although those placers did not compare with Orofino Creek (ISHS 1981). The Moose Creek mines were discovered by prospectors in 1862. An influx of population in the late 1860s resulted in the establishment of Moose City, with a saloon, restaurant, hotel, and three general stores (Western Historical Publishing 1903). During the early 1870s the mines began to fail, although limited mining continued in the district and the region for more than 100 years, with upswings at the turn of the 19th century when the Pioneer Mine was established, in the 1920s, and then again in the 1930s.

In the early 1900s, large-scale commercial logging began to gain importance in the Clearwater region (ISHS 1981). North Fork log drives were prominent until Dworshak Reservoir was constructed. New towns such as Headquarters and Elk River grew up in association with logging (CHM 2003). Logging continued throughout the 20th century. USFS operations became prominent in the region after 1906. The Bitterroot Forest Reserve in Idaho and Montana was established in 1897. In 1907, part of the Bitterroot Forest that included the Lolo Trail became the Clearwater and Lolo National Forests (USFS 2002e). The Clearwater National Forest continues to manage the project region today.

3.3.11.2 Identified Heritage Resources

Heritage resource inventories in the Moose Creek study area began in the 1970s and continue into the present. According to SHPO records, previous surveys have identified 22 heritage resource sites in the Moose Creek study area. All are associated with historic Euroamerican use of the watershed. Although there are no heritage resources listed in the National Register of Historic Places (NRHP) in the study area (NRIS 2003), there are resources that are eligible for listing. The USFS has identified the Moose Creek mining area as a Historic District that is eligible for listing in the NRHP. Previously recorded sites include the Independence Mine location (ca. 1920s); the NRHP-eligible Johnson/Pollock Cabin (10CW146) used from about 1880 through the 20th century, the historic mining town of Moose City; a number of cabins and mining features associated with mining during the 19th and 20th centuries; the USFS Kelly Creek Work Center (ca. 1920s); and the USFS Independence Ridge Lookout (ca. 1930s).

In addition, there were many historic mining claims filed along Independence Creek, Deadwood Creek, and Moose Creek, as well as around Moose City, that have not yet been recorded as heritage resources. Until a formal determination of NRHP eligibility is made, all recorded and unrecorded heritage resource sites are treated as eligible for nomination to the NRHP.

According to the records of the Idaho SHPO, Native American resources have not yet been recorded in the Moose Creek study area. The USFS has initiated contact with the Nez Perce Tribe to identify potential traditional resource concerns in the Moose Creek study area.

3.4 Native American Treaty Rights and Traditional Uses

Tribal governments have an increasing influence on the formulation of public land policy through agency recognition of their legally established rights as well as their unique trust relationship with the U.S. Government. A series of Indian trade and intercourse acts, adopted in 1834, became the cornerstone of Federal Indian policy. The Marshall Trilogy (three Supreme Court decisions made between 1823 and 1831) established that: (a) only the Federal government has the pre-emptive right to procure Indian land; (b) the Federal government has trust responsibilities toward American Indian tribes; and (c) treaties take precedence over state laws.

Treaty Rights: For the purposes of western expansion, keeping the peace, and adding new states to the union, the U. S. government negotiated treaties with Indian tribal governments and obtained the vast majority of public domain land in the lower 48 States. Approximately 60 tribes

negotiated and reserved their treaty rights to off-reservation lands and resources. Off-reservation treaty rights on National Forest System lands may include grazing rights, hunting and fishing rights, gathering rights and interests, water rights, and subsistence rights. In some treaties in the Pacific Northwest the U.S. government is obligated to protect the tribes' right to access usual and accustomed fishing places and open and unclaimed lands, and must ensure that Forest Service actions protect treaty resources and do not prevent tribes or their members from accessing such locations to exercise tribal rights.

Trust Responsibilities: The trust responsibility is the U.S. government's permanent legal obligation to exercise statutory and other legal authorities to protect tribal lands, assets, resources, and treaty rights, as well as a duty to carry out the mandates of Federal law with respect to American Indian and Alaska Native Tribes. For the Forest Service, trust responsibilities are those duties that relate to the reserved rights and privileges of federally-recognized Indian tribes as found in treaties, executive orders, laws, and court decisions that apply to the national forests and grasslands. Forest Service policy (FSM 1563.03) is to: (a) maintain a governmental relationship with federally-recognized tribal governments; (b) implement Forest Service programs and activities honoring Indian treaty rights and fulfill legally mandated trust responsibilities to the extent they are determined applicable to National Forest System lands; (c) administer Forest Service programs and activities to address and be sensitive to traditional Native religious beliefs and practices; and (d) provide research, transfer of technology, and technical assistance to tribal governments.

Nez Perce Tribe: The valleys, prairies, and plateaus of north-central Idaho, northeastern Oregon, and southeastern Washington, encompassing approximately 17 million acres (approximately 27,000 square miles), were home to the Nez Perce people who call themselves Nimi'ipuu, which means the “real people” or “we the people” (Nez Perce Tribe 2002). The Nez Perce aboriginal territory included the Clearwater River Basin, and the South and Middle Forks of the Salmon River Basin, and its tributaries where the people fished the streams, hunted in the woodlands, and used the plants of the high plateaus in a seasonal subsistence cycle. In early spring, the women traveled to the lower valleys to dig root crops while the men traveled to the Snake and Columbia rivers to intercept the early salmon runs (Nez Perce Tribe 2002). In mid-summer, all the people moved to higher mountain areas setting up temporary camps to gather later root crops, fish the streams, and hunt big game. By late fall, they settled back into their traditional villages along the Snake, Clearwater, and Salmon rivers. Salmon and other fish, game, dried roots, and berries provided winter foods. In addition, hunting parties would travel to the hills and river bottoms where the deer and elk wintered.

Roots gathered for winter storage included camas bulb (kehmmes), bitterroot (thlee-tahn), khouse (qawas), wild carrot (tsa-weetkh), wild potato (keh-keet), and other root crops (Nez Perce Tribe 2002). Fruit collected included serviceberries, gooseberries, hawthorn berries, thorn berries, huckleberries, currants, elderberries, chokecherries, blackberries, raspberries, and wild strawberries. Pine nuts, sunflower seeds, and black moss were also collected. Large game animals that were hunted include deer, elk, moose, bear (black, brown, and grizzly), mountain sheep and goats (Nez Perce Tribe 2002). After the introduction of the horse, the men traveled to the Montana Plains to hunt bison and antelope with the Flathead (Sa-likh) people. Even after bison was introduced into the Nez Perce diet, deer and elk meat were still important foods for the

winter storage. Small game was hunted when needed, including rabbit, squirrel, badgers, and marmots. Birds, such as ducks, geese, ruffed grouse, and sage hens were also hunted (Nez Perce Tribe 2002).

The Nimi'ipuu lived in bands making up the Upper Clearwater River Nimi'ipuu and the Lower Nimi'ipu of the Wallowa Valley. The bands included small groups of people living in villages along streams and rivers, together making up a larger, politically unified composite band. The bands were generally identified by the name of the stream they lived near.

In 1855, Isaac Stevens, the governor of the newly formed Washington Territory, called the Nez Perce leaders to a council at Walla Walla to create a reservation. An agreement was reached that reserved most of the traditional Nez Perce homeland (7.7 million acres) as their exclusive domain. Article 3 of this treaty states:

> *"The exclusive right of taking fish in all the streams where running through or bordering said reservation is further secured to said Indians; as also the right of taking fish at all usual and accustomed places in common with citizens of the Territory; and of erecting temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land."*

After the discovery of gold on the reservation, a new treaty was signed in 1863 that reduced the size of the original reservation to 780,000 acres. Not all of the Nez Perce bands were in agreement with the new treaty, and a division arose between the "treaty" and "non-treaty" groups.

Nez Perce leaders who opposed the treaty (non-treaty Nez Perce) included Big Thunder, Hah-tal-ee-kin, Eagle from the Light, Old Looking Glass, Old Joseph, Too-hool-hool-zote, Speaking Eagle, and White Bird (Hoggatt 1997). Less than one third of the Nez Perce leaders supported the treaty (treaty Nez Perce). One of the supporters was Chief Lawyer, the Head-Chief, who felt that resistance was futile and reconciliation with the government was in the best interest of the Nez Perce people. A number of the leaders who opposed the treaty left the Treaty Council after abolishing the Nez Perce Federation and the position of Head-Chief of the Nez Perce People (Hoggatt 1997).

Four years later, the U.S. government launched a campaign to remove Chief Joseph's Wallowa Band of non-treaty Nez Perce from the Wallowa Plateau to the new, smaller reservation. At the same time all other non-treaty Nez Perce were also ordered to move onto the reservation (Hoggatt 1997). On the way to the reservation, young warriors (independent of the Nez Perce leadership) sought out specific settlers to avenge the deaths of certain Nez Perce people, touching off the Nez Perce War of 1877 (Hoggatt 1997).

After a number of skirmishes with the U.S. Army, about 750 Nez Perce men, women, and children attempted to escape to Canada on what is now known as the Nez Perce (Nee-Me-Poo) National Historic Trail. They traveled 1,170 miles from the Wallowa Valley in eastern Oregon to the plains of north-central Montana, where Chief Joseph surrendered 40 miles from the

Canadian boundary, near Bear Paw, Montana. Chief White Bird and about 150 to 200 Nez Perce escaped through the battle lines and fled into Canada.

In 1893, the Nez Perce Tribe ceded and sold to the U.S. government all un-allotted lands on the reservation with exception of certain lands held for the benefit of the entire Tribe. The current reservation consists of 750,000 acres, of which the Tribe owns approximately 90,000 acres. However, the Nez Perce Tribe still retains the treaty rights reserved in the 1855 Treaty. These rights apply to most of the Clearwater National Forest, including all of the Lolo Creek and Moose Creek study areas.

The Nez Perce Tribe has identified salmon as an integral part of tribal religion, culture, and physical sustenance, and has indicated that the annual return of the salmon allows the transfer of traditional values from generation to generation (CRITFC 2002). The Yoosa Creek tributary of upper Lolo Creek, outside the present study area, is the location of a satellite facility site for the Nez Perce tribal hatchery program (see Figure 2-1). The tribe has further indicated that Lolo Creek is an important stream in restoration efforts for chinook salmon in the Clearwater River Subbasin (Mancuso 1996).

It is part of the vision of the Nez Perce Tribe to “recover and restore all populations, all species, of anadromous and resident fish within Nez Perce Territory” (Nez Perce Tribe 2003). Its fisheries management goals are to provide technical, scientific and policy support to for treaty rights protection; to provide anadromous and resident fish recovery and restoration actions; to expand harvest opportunities for tribal members and the regional community; to monitor and evaluate production, habitat harvest, and applied science activities; to restore and recover habitat for healthy watershed environment; and to ensure harvest and conservation actions comply with tribal laws and policies (Nez Perce Tribe 2003).