Gold Creek

Development to Restoration

Gold Creek
Kittitas County, Washington

Report Date:
June 1, 2011

Prepared for:
United States Forest Service
Okanogan/Wenatchee National Forest
803 W. 2nd St.
Cle Elum, Washington 98922

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Prepared as Practicum Project for:

University of Washington
Environmental Law and Regulation Certificate Program

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ACRONYMS AND ABBREVIATIONS

°F	degrees Fahrenheit
CEA	Connectivity Emphasis Area
Ecology	Washington State Department of Ecology
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
I-90	Interstate 90
in.	inches
mi^2	square miles
MSL	mean sea level
NEPA	National Environmental Policy Act
NPRC	North Pacific Railroad Company
NRHP	National Register of Historic Places
PCBs	polycyclic biphenyls
Railway Act	Pacific Railway Act of 1862
ROW	right-of-way
TCWRA	Tri-County Water Resources Agency
US-10	United States Highway 10
USBR	United States Bureau of Reclamation
USDA	United States Department of Agriculture
USFS	United States Forestry Service
USFWS	United States Fish and Wildlife Service
UST	Underground Storage Tank

UYWAG	Upper Yakima Watershed Action Group
WDNR	Washington State Department of Natural Resources
WRIA	Water Resource Inventory Area
WSDF	Washington State Department of Fisheries
WSDH	Washington State Department of Highways
WSDOT	Washington State Department of Transportation
WSOFM	Washington State Office of Financial Management
WWTP	Wastewater Treatment Plant
yds^3	cubic yards
YRBWPU	Yakima River Basin Watershed Planning Unit

1.0 INTRODUCTION

A major component of watershed restoration planning is combining the influence of people, policies and community resources to form strategic partnerships to improve watershed conditions. To this end, the Upper Yakima Watershed Action Group (UYWAG) formed in 2007 with a mission to restore the health of the Upper Yakima watershed while balancing the economic, ecological, and social demands on the landscape. According to Yakima River Basin Watershed Planning Unit (YRBWPU) and Tri-County Water Resources Agency (TCWRA) Watershed Assessment of the Yakima River Basin, the larger Yakima River Watershed encompasses 6,150 square miles (mi^2), with many tributaries that supply the mainstream river from Keechelus Dam near Snoqualmie Pass in the northwest corner. The history of settlement in the west and the impacts of development in the Yakima River watershed, reflect government policies focused on both development and the environment. These changes evolved over 150 years during which the Kittitas County waters endured unrestricted impacts (2001).

In 2010, UYWAG participants included representatives from:

- Cascade Land Conservancy
- Washington Stated Department of Transportation
- United States Fish and Wildlife Service
- Kittitas Conservation Trust
- Kittitas Conservation District
- Mount Baker Snoqualmie National Forest
- Okanogan-Wenatchee National Forest
- Washington State Department of Ecology
- Conservation Northwest
- Washington State Snowmobile Association
- Washington State Department of Fish and Wildlife Service
- Grizzly Bear Outreach Project
- The Nature Conservancy
- Mid Columbia Fisheries Enhancement Group
- Washington State Water Trust
- Yakima Basin Fish & Wildlife Recovery Board
- The Yakama Nation

1.1 DOCUMENT PURPOSE AND SCOPE

The United States Forest Service (USFS) required a historical profile specific to the Gold Creek area, where restoration is planned. As students enrolled in the Continuing Education Environmental Law and Regulation certification course at the University of Washington, we offered our time and effort to create the needed historical profile. Though Gold Creek is a lesser known area of Snoqualmie Pass, it has paramount ecological significance and is a key element in the scope of restoring the Upper Yakima Watershed.

This document summarizes major disturbances and changes in the Gold Creek area over a span of more than 100 years. Topics include Native American influence and pre-history, land use and landownership, mining, highway development, and logging. The research focuses on how the abovementioned events and other naturally occurring disturbances affected the ecology and natural environment of Gold Creek and its surrounding area within the context of major regulations that affected the evolution of Gold Creek. These regulations are largely made up of legislative acts that exhibit a range of popular policy from the late 19th and early 20th Century development eras, to the late 20th Century environmental push.

1.2 APPROACH AND LIMITATIONS

The focus of research included natural and manmade disturbances up to the late 20th Century and how federal regulatory measures influenced the current condition of the Gold Creek area. We developed study parameters based on the availability of historical information and documentation of the Gold Creek area, especially information relevant to how the area was altered over time. Our research was comprised of a review of historical narratives; technical documents; archived aerial photographs and maps; and county, state, and federal records.

We created a timeline using findings from our research. We start with Native American prehistory because Native American accounts allow for information relative to the evolution of the Gold Creek area. We take up again in the mid 1800s when settlement and mining, logging, and transportation industries in Washington State gained momentum.

Limitations to our research included the lack of quantitative data specific to Gold Creek prior to the 1990s. Historical and ongoing effects on the Gold Creek area are therefore extrapolated and not exact. Because of the lack of project-specific information, events described herein are broad in scope and are primarily comprised of major local and regional events and disturbances. However, the document should provide enough information to draw conclusions that may be beneficial to the restoration efforts at Gold Creek.

1.3 RELATED STUDIES

Washington State Department of Transportation (WSDOT) has prepared the Snoqualmie Pass East Interstate 90 (I-90) Final Environmental Impact Statement (EIS) and Section 4(f) Evaluation. A phase of the proposed Snoqualmie Pass East Project will include removing and upgrading several existing features in the vicinity of Gold Creek, and will include creating the Gold Creek Connectivity Emphasis Area (CEA) to allow for safe wildlife passage. WSDOT has designated approximately 265 acres of land adjacent to I-90's Snoqualmie Pass East as the Gold Creek CEA. The EIS provides a detailed analysis of the environmental and socio-economic effects of the project.

2.0 GOLD CREEK PROJECT AREA

Gold Creek is located within the Cascade Mountain Range in Kittitas County, Washington (Figure 1), immediately east of I-90's Snoqualmie Pass. The stream generally flows south-southwest into Gold Creek Valley, crossing beneath I-90 and draining into Keechelus Lake, a natural lake that has been converted into an irrigation reservoir.

2.1 CURRENT IMPROVEMENTS

Aerial photographs, topographic maps, WSDOT records, and Kittitas County's online map service were reviewed in order to identify manmade improvements in the vicinity of Gold Creek. Current improvements are depicted on Figure 2.

Two 140-feet long, single-span I-90 bridges cross Gold Creek Valley at mile post 55.1. The eastbound bridge consists of seven lanes; the westbound bridge consists of six lanes. The eastbound embankment of I-90 serves as Keechelus Lake's shoreline during seasonal high lake levels (URS 2008). Beneath the bridges, Gold Creek flows through an artificially channelized stream. These bridges have been proposed to be replaced as a part of WSDOT's I-90 Snoqualmie East Project.

Photograph 2-1 View facing west of the eastbound Gold Creek Bridge, beyond which is Keechelus Lake. May 2011.

Several private and public right-of-ways (ROWs) are present in the vicinity of Gold Creek. USFS Road 4832-000 is present to the north of I-90. USFS Road 4832-142 intersects 4832-000 approximately 0.25 miles east of Gold Creek, runs parallel to Gold Creek, and forks toward the northwest and northeast. The northeastern portion of the road becomes Huckleberry Peak Road and connects to a small, privately-owned housing development to the north, called Ski Tur Valley. Nearby USFS Trails 1314 and 1250 are present near Gold Creek Pond, a former pit site located to the east of Gold Creek. A parking lot, a picnic area and portable toilets are located to the south of the Pond.

Photograph 2-2 View facing north of west side of USFS Road 4832 and fill embankment. In the background toward the northwest is I-90. May 2011.

The abandoned railroad, formerly operated by Chicago, Milwaukee, St. Paul, and Pacific Railroad Company, runs along the western border of Keechelus Lake and is now the Lake Keechelus Ski Route. The Route travels northeast toward the abandoned Snoqualmie Tunnel, which now operates as the John Wayne Trail.

A WSDOT maintenance facility is located along I-90 near milepost 55 on the south side of exit 54. Washington State Department of Ecology's (Ecology) Underground Storage Tank (UST) database indicates that three USTs are for refueling vehicles operate at the facility. The three 8,000-gallon capacity 1987-vintage USTs reportedly contain unleaded gasoline and diesel. A fourth UST, installed in 1964, operated at the facility and was likely removed around during the mid-1990s. The WSDOT maintenance facility is not listed on any Ecology cleanup databases.

Snoqualmie Pass Utility District Wastewater Treatment Plant (WWTP) operates southwest of Gold Creek's drainage basin along Keechelus Lake's northwestern shore.(The facility utilizes a two-cell aerated sewage treatment lagoon and a sprayfield to treat and discharge wastewater. Cells 1 and 2 of the lagoon have capacities of 3.51 and 7 million gallons, respectively, with an emergency storage capacity of 10 million gallons. The sprayfield is located within USFS forested land and operates under a Special Use Permit (Ecology 2006).

2.2 LAND USE AND ZONING DESIGNATION

The current land use of the Gold Creek area is primarily a mix of rural, commercial forest, and recreational. Gold Creek is located with the Okanogan-Wenatchee National Forest. Kittitas County has

several zoning designations for Gold Creek area. They include commercial forest to the east, planned unit development to the northeast and southwest; forest and range to the north and west; light industrial, highway commercial, residential, and a small parcel of forest and range to the south. Gold Creek's surrounding current parcel owners generally include:

- **West:** The USFS, WSDOT, and private land owners to the northwest. To the southwest, parcel owners include Washington State Parks and Recreation, Puget Sound Energy, and private land owners and developers.
- **East:** Current parcel owners to the east include the USFS, Cascade Land Conservancy, and private land owners and developers.

The current land use, parcel boundaries, parcel owners, and parcel improvements in the vicinity of Gold Creek are presented on Figure 2.

2.3 PHYSICAL CHARACTERISTICS

The following subsections describe the physical characteristics of Gold Creek and its surrounding area, including meteorology, topography, geology, and hydrology.

2.3.1 Meteorology

The climate of Snoqualmie Pass is generally very cool and wet. The average annual precipitation at Snoqualmie Pass is 84.15 inches (in.). Prior annual precipitation measurements have ranged from 68.20 in., measured in 1966 (Washington State Department of Fisheries [WSDF] 1967), to 85.9 in., measured in 1975 (EPA 1977). Temperatures fluctuate from 21 to 50 degrees Fahrenheit (°F) between the winters and summer months. The coldest month of the year is January, with an average minimum temperature of 21.70 °F. The surfaces Keechelus and its neighboring reservoirs freeze over most winters. The warmest month is August, with an average maximum temperature of 65.80 °F (Idcide 2011).

2.3.2 Topography

Gold Creek is located within the rugged Cascade Mountain Range. The Creek flows within a glacier-carved, u-shaped valley. According to the United States Geologic Survey's topographic maps for the area, the stream is bound to the southeast by Rampart Ridge and to the northwest by Snoqualmie Pass and Kendall Peak. Gold Creek has an approximate maximum elevation of 5,240 feet above mean sea level (MSL) at its catchment basin near Chikamin Peak and an approximate minimum elevation of 2,500 feet above MSL at its drainage basin in Gold Creek Valley (Figure 1).

2.3.3 Geology

Several surficial and deeper geologic units have been identified in the Cascade Region. Bedrock in the vicinity of Keechelus Lake has been identified as the Naches Formation, composed of highly folded and faulted rhyolitic and basaltic volcanic rocks from the Eocene to early Oligocene age (Tabor et al). Outcrops near Rampart Ridge indicate that the formation has an approximate thickness between 5,000 and 10,000 feet. Surficial geology includes Quaternary-age, dense, glacial drift and outwash sediments which overlay the Naches Formation and extend across the Yakima River Valley floor. The glacial drift unit, deposited in a terminal moraine, has an unknown maximum

depth. It contains higher percentage of gravel and larger-sized clasts and is generally less permeable than the glacial outwash unit. The glacial outwash has a maximum depth of 42 feet (USBR 2011).

Near-surface geology in the vicinity of Gold Creek is variable dispositional origin. To the east of the stream are Eocene- and Miocene-age volcanic and igneous rocks. To the west of Gold Creek are primarily younger unconsolidated sediments. Gold Creek is underlain by valley fill deposits primarily composed of unconsolidated Quaternary alluvium and Frasier-age glacial deposits (WDNR 2011). Its drainage basin is primarily composed of alluvial deposits.

According to boring logs advanced in the vicinity of Gold Creek during I-90 construction projects six major sedimentary units and one bedrock unit exist beneath Gold Creek Valley. The uppermost unit has been identified as man-made fill, consisting of sand, cobbles and boulders (up to two feet in diameter), and ranges from 9 to 21 feet thick. The fill was placed beneath the bridges as part of construction activities for the existing road embankment. Beneath the fill is an organic soils unit, ranging in thickness from 1 to 15 feet. Underlying the organic soil unit is native soil, consisting of gravel with sand and cobbles. The upper portion of the unit is likely a fluvial deposit, while the lower portion of the unit is glacial. It ranges in thickness between 6 and 24 feet. Fine sands and silt underlie the native gravels, and is inferred as fluvial or lacustrine deposits. Localized deposits of stiff, clayey silt and silty clay underlie the fine sands. The Naches Formation bedrock unit has been encountered beneath the sediments at elevations below 2,382 feet MSL.

Gold Creek lies within the headwaters of the Yakima River Basin aquifer system. Groundwater near Keechelus Lake is found at elevations at or above the lake elevation due to the high surrounding water table and upland streams (WSDOT 2009).

2.3.4 Hydrology

The following subsections describe the hydrologic setting that influences Gold Creek.

2.3.4.1 Watershed

According to the Washington State Department of Ecology (Ecology), Gold Creek is located within Water Resource Inventory Area (WRIA) 39, Upper Yakima Basin. The closest water quality monitoring station is located in the Yakima River, approximately 22 miles southeast of Gold Creek's terminus.

2.3.4.2 Gold Creek and Lake Keechelus

Gold Creek drains into Keechelus Lake, with an estimated drainage area of 36.3 square kilometers and a mean flow of 2.61 meters per second (EPA 1977). Prior to the construction of the Keechelus Dam in 1917, the original elevation of Keechelus Lake was 2,454 feet above MSL (U.S. Department of Interior 1901). After the dam's construction, lake levels rose upwards of 61 feet, flooding much of the surrounding area, including the drainage basins of headwater streams, like Gold Creek. Normal surface water elevation is now 2,517 feet above MSL with total water storage of 157,800 acre-feet (USBR 2011). Lake levels fluctuate approximately 60 feet per year. High lake levels result in the inundation of water into Gold Creek's drainage basin. Low precipitation during the summer months typically results in the exposure of the reservoir bottom, reducing conductivity to headwater streams including Gold Creek. The construction of the dams within the Yakima River System is discussed further in Section 3.2.5, Yakima Project.

2.3.4.3 Water Quality

Both State and Federal agencies have performed water quality assessments of Keechelus Lake and its headwaters. In 1965 and 1975, limnological surveys were conducted by the former state agency Washington State Department of Fisheries (WSDF) and the United States Environmental Protection Agency (EPA) to evaluate the lake's nutrient loading. The EPA noted in their survey that no algal blooms or macrophytes were observed. Lake transparency was "excellent" and the lake had some of the lowest phosphorus and inorganic nitrogen values of the thirteen Washington State lakes sampled as part of the survey. These results indicated that typical sources for nutrient loading, such as agricultural run-off or septic systems, or municipal or industrial point sources, septic tanks, or sewage treatment plants were present near Keechelus Lake at the time of the survey. Gold Creek was estimated to contribute 30,000 kilograms (kg) of nitrogen and 1,025 kg or total phosphorus, approximately 31.6 and 22.6 percent, respectively, to Keechelus Lake annually. Keechelus Lake was categorized as an oligotrophic (low-nutrient) system by both the WSDF and EPA (WSDF 1967, EPA 1977).

More recent records indicate that Keechelus Lake and Gold Creek may no longer have such pristine water quality parameters. Inspections in 1984 and 1988 of the WWTP indicate that a fractional volume of effluent had breached the lagoon and flowed into State Waters. Analyses of effluent collected during the inspections contained elevated concentrations of Nitrogen and Phosphorus. The second cell of the treatment lagoon was constructed in response to the findings. Similar issues were observed during an inspection in 1988; components of the sprayfield were in poor physical condition (Ecology 1989). WWTP currently operates under the State Waste Discharge Permit Number ST-9005 which allows the WWTP to discharge effluent into State waters- in this case, groundwater. The permit is up for renewal on June 30, 2011. The treatment plant is listed under Ecology's Facility database. Since it began operating, WWTP has had 324 violations/triggers, mostly due to failure to report and analyze for chemicals related to the treatment and 23 enforcement actions (Ecology 2011).

Recent data also indicates that anthropogenic sources of polycyclic biphenyls (PCBs), a known human carcinogen, have impacted Keechelus Lake and its headwaters. In 2006, Ecology conducted tissue bioassays on several species of fish caught in Keechelus Lake to assess progress in meeting Total Maximum Daily Load (TMDL) targets. The tissues contained mean concentrations of PCBs between 5.6 and 17 micrograms per kilogram, exceeding the EPA's National Toxics Rule (40 CFR 131.36[14]) human health criterion for fish consumption of 5.3 micrograms per kilogram (Ecology 2007). The PCB source has not been identified.

2.4 BIOLOGICAL CHARACTERISTICS

The Gold Creek project area is situated within the wilderness terrain of the Cascade Mountains. In particular, the Alpine Lakes Wilderness is located north of the project area and the Norse Peak Wilderness is approximately 15 miles to the south. The Gold Creek Valley begins at the head of Keechelus Lake and stretches to the northeast, over seven miles, to Chikamin Ridge. Watershed analysis is an important method for providing aquatic and riparian habitat protection. In addition to type of stream channel and riparian areas, watershed conditions include uplands, distribution and type of vegetation, land use history, effects of previous land-use and natural disturbances, and abundance of species throughout the watershed (Plum Creek Timber Company 1996).

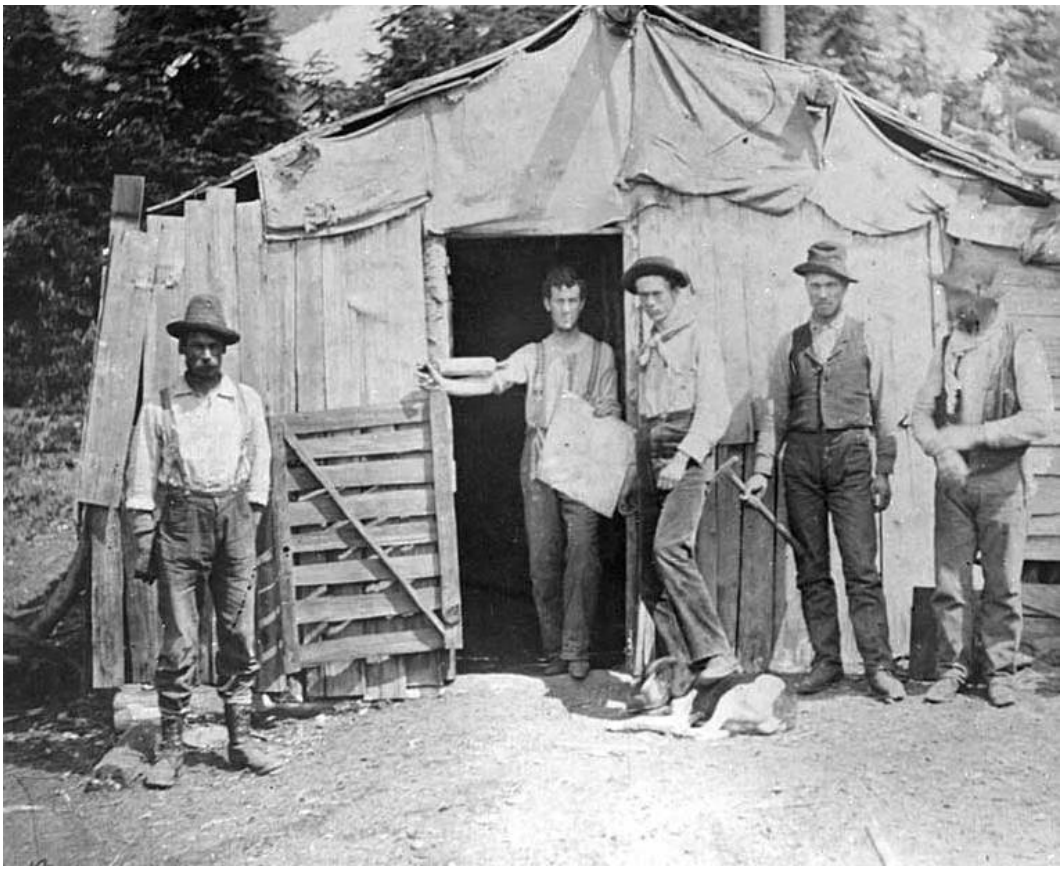
According to the I-90 Snoqualmie Pass Wildlife Habitat Linkage Assessment, "Snoqualmie Pass is a 'keystone' area in regard to federal lands… (and) the area is a critical connective link in the north-south movement of organism in the Cascade Range" (United States Department of Agriculture [USDA] 2000). Numerous studies have been conducted over the past years to record the types of species that inhabit the area and evaluate habitat quality in order to determine the ecological connectivity of the region. For more detailed information regarding the parameters of ecological connectivity, the reader is referred to the technical data and detailed analyses contained within I-90 Snoqualmie Pass East Final EIS and Section 4(f) Evaluation (2008).

2.5 SOCIO-ECONOMIC CHARACTERISTICS

The closest city to the Gold Creek area is Cle Elum. Washington State Office of Financial Management (WSOFM) reported that Cle Elum had a population of 1,870 people as of April 2009. The WSOFM reported that nearly 1,000 homes are present within the city limits, mostly single-family homes. A third of these homes are owned by out-of-state residents. The majority of the population is within the age range of 35 to 44 years. No predominant industry employs the community; instead, a diversified economy is supported by arts, entertainment, and recreation; educational, health and social services; retail trade; construction; and manufacturing. Downtown businesses are currently a mix of service, retail, and industrial supply.

3.0 HISTORICAL PROFILE

Throughout the history of the Snoqualmie Pass trail humans have influenced the natural habitat, resulting in modifications near the confluence of Gold Creek with Keechelus Lake. The historical profile of the Gold Creek area has its roots in early Native American history and in the industrious logging, mining, and railroad enterprises of the mid-late 1800s and beyond. The earlier years of Kittitas Valley saw the rise of cattle grazing and ranching. The Indian tribes had started this trade and the advent of increased white settlement caused this trade to turn into a prosperous industry. Closer to the Gold Creek project area, the mining and logging industries became the preferred trades for the time period. Logging camps were established near the shores of the region's largest lakes: Cle Elum, Kachess and Keechelus lakes. Sawmills were established at most locations where loggers had access to timber. As logging groups expanded, so did the sawmill industry, which led to increased migration of settlers to the region. Facilitating the growth in the region was the rise and dependence on the railroad system.



Photograph 3-1 Group of men with dog in front of Easter Mine Cabin at Ptarmigan Park head of Gold Creek, ca. 1897 University of Washington (UW) Libraries, Lawrence D. Lindsley Photograph Collection.

Mining and the quest for minerals in the Gold Creek area began around 1880. Coal mining was a key industry in Cle Elum and in the surrounding mountains. Other precious metals such as gold, silver, copper, lead, iron, chromium, mercury, manganese, molybdenum, nickel, and antimony were later sought after and mined in the region as well.

Improvements to transportation infrastructure were needed as populations of local industries flourished. Early explorations by Captain George McClellan and Major J. H. H. Van Bokkelen were intended to find a railroad road through the Cascades and build a military road (Prater 1981). Pioneers immigrating to Puget Sound utilized the Indian trail across Snoqualmie Pass starting in the 1850s. The Snoqualmie Wagon Road traversed along the eastern shore of Lake Keechelus and crossed the downstream portion of Gold Creek. Although logging, mining, and railroad industries faded in the region, the need for transportation through the pass grew. Technological advances transformed a former one-lane, unpaved wagon road which crossed Gold Creek into the major Highway now called I-90. These consecutive changes impacted the environmental conditions of Gold Creek and the lake.

The following subsections summarize previous land use history and its potential affects upon current watershed conditions in the Snoqualmie Pass East region. Historical features in the vicinity of Gold Creek including Native American trails, mining claims, railways, roads, and construction features are depicted on Figure 3. Aerial photographs taken between 1944 and 2009 are attached to this document in Appendix A.

3.1 NATIVE AMERICAN AND PRE-HISTORY

The naming of the Confederated Tribes and Bands of the Yakima Indian Nation was established with the signing of the Steven's Treaty in 1855. In 1994, two resolutions passed by the Yakama Tribal Council that changed the naming of the Confederated Tribes to The Confederated Tribes and Bands of the Yakama Nation. All references to the previous naming convention in this report are a reflection of the referenced literature of the time.

The ethnographic composition of the Gold Creek area is one of duality. The project area is situated in close proximity to the crest of the Cascade Mountains and within the Kittitas Valley and upper Yakima River drainage basin. Original research by Verne Ray (1936) and Angelo Anastasio (1972) suggests that this area was inhabited by the Kittitas Indians, who were part of the Shahaptian tribal group and of the coastal Indians west of the Cascades. Both tribal entities used the Gold Creek and Keechelus Lake areas for berry gathering, fishing, and hunting game. Coastal and plateau Indians likely established a summer campsite at the mouth of Gold Creek where it connects to Keechelus Lake. A historical summer campsite has been documented to be as close to Gold Creek as the southern tip of Cle Elum Lake (Glauert, 1972). A description of seasonal campsites is discussed in Section 3.1.3.

3.1.1 Chronology of Kittitas Indians

The following timeline presents major events that shaped the lives of Kittitas Indians, as summarized in "The Kittitas Indians," by Earl T. Glauert and Merle H Kunz (1972).

c. 4600 B.C.	Permanent Indian settlements within Kittitas County are documented though radiocarbon dating artifacts discovered near Vantage, Washington.
c. 1000 A.D.	Indians create petroglyphs near the west bank of the Columbia River.
c. 1750	The horse arrives to the Yakima River Valley.
c. 1770	The creation of the Yakima Indian Nation is established when Chief We-ow-wikt I, Kittitas (or Psch-wan-wap-pam) Indian, extends control over the Wenas, Naches, and Yakima River Valleys.
c. 1800	Territories within the present Kittitas County boundaries are divided by Chief We-ow-wikt II, father of Ow-hi and grandfather of Ka-mi-akin, among his oldest sons, Ow-hi, Te-i-as, and Te-wi-not.
1807	The estimated population of Yakima and Klickitat Indians is 3,000, as observed by Lewis and Clark. Their populations were likely drastically reduced due to a small pox epidemic thirty years earlier.
1833	Kittitas Indians begin trading furs for blankets, guns and ammunition at Hudson Bay Post, Fort Nisqually.
1843	Yakima Indians are exposed to a second major epidemic of small pox.
1855	The Stevens Treaty, which provides for the establishment of a reservation, is signed by Chief Ow-hi after attending the treaty council meeting near Walla Walla. The Chief previously protested against giving away Yakima lands.

1855	Miners begin entering Yakima Lands. Ow-hi's son Qual-chen leads attack on miners in Umtanum and Selah Valley, commencing the Indian Wars.
1856	Chief Ow-hi and Colonel George Wright unsuccessfully negotiate ending the war.
1858	Chief Ow-hi and Qual-chen are captured south of Spokane and are killed. With the Chief of the Kittitas Indians dead, the resistance ends.

3.1.2 Indian Myths

Indian mythology dictates that nearly all of the Pacific Northwest Indian tribes originated from one single Indian God by the name of Coyote. According to the myth, Coyote formed the tribes of the Northwest out of the various portions of a great beaver. Legend further states that this great beaver was named *Wishpoosh* and that he was the god of Lake Cle Elum. Legend claims *Wishpoosh* dominated the lake and preyed upon all other Indian animal gods and people in and around the lake. Due to *Wishpoosh's* destructive way of life, Coyote took up the task of destroying him. Coyote prepared himself for a very challenging encounter by taking up a powerful spear which he bound to his wrist with cords of twisted *ta-hooh* (Indian flax). As legend further states, when Coyote confronted Wishpoosh in the waters of Lake Cle Elum, he thrust his spear into the beast. As the wounded water god plunged down to the bottom of the lake, legend states that it dragged Coyote down with it as the spear was still tightly wrapped around Coyote's wrist by the *ta-hooh*. As the two struggled, the enraged beaver thrashed and swam through lakes and mountains all along the Yakima Valley, dragging Coyote along with it. Every mountain range the beaver plowed through carved out and created the Yakima Valley. When the two finally washed up ashore in the Columbia River, Coyote had survived the battle and *Wishpoosh* had perished. Coyote then took on the task of carving up the beaver's carcass and making the various Indian tribes of the Yakima Valley out of sections of the carcass. The Yakimas or *Pishwan-wa-pams* were made out of the ribs. The Lower Columbia and Coast Indians were made from the belly; the Cayuse were made from the legs and the Northern tribes were made out of the head. The legend ends with Coyote ascending up to the sky with his arms outstretched (Glauert, 1972).

3.1.3 Historical Vegetative Zone Resources

A semi-nomadic band of Yakima Indians lived within the boundaries of Kittitas County. This band moved to different regions of Washington State, pursuing available food by moving each season to areas known as cyclical vegetative zones (Billings 1991). The following is a summary of the camps and villages set within each of these vegetative zones by the semi-nomadic band:

Zone 1 - Winter Villages: During the winter months, at elevations from zero to 1,000 feet MSL, camp sites were set up enabling anadromous and non-anadromous fishing. Lomatium, yellowbell, balsamroot, wild hyacinth, hackberry, serviceberry, currant, hawthorn and elderberry were gathered where available.

Zone 2- Early Spring Camps: During the beginning of spring, tribes moved up to higher elevations of 2,000 feet MSL and hunted whitetail deer and mule deer where available. Wild onion, lomatium, gooseberry, chokecherry, spring beauty, wild carrot, thistle berry, serviceberry, and mountain elderberry were gathered and collected.

Zone 2 - Summer Camps: As summer drew near, campsites were moved to elevations between 2,000 and 4,000 feet MSL. Elk remained a key hunting source as well as salmon fishing; and sego lily, frasera, rose, camas and kouse roots were gathered.

Zone 3 - Late Summer Camps: As the summer drew to a close, campsites were moved to elevations of 7,000 feet MSL where elk, whitetail deer and mule deer continued to be hunted. Mountain elderberry and huckleberry were gathered as supply was available.

Zone 4 - Early Fall Camps: As early fall took shape, huckleberry, fireberry and pine moss were collected and elk and mule deer hunted in preparation of storage for the winter months. Along with those, anadromous fish were caught and prepared for storage as well.

The function of the spring and summer campsites located along the Yakima River and the Kittitas Valley was to serve as a location for tribes to dig for roots such as camas (also known as kamas or quamash) and kouse which were key staples of the native diet. During the fall and winter, local tribes would travel to hunt game and fish to supplement their diet in order to prepare food for winter storage (Cochran 2005). A review of records pertaining native Kittitas villages near the Cle Elum revealed that a summer campsite was historically present near the south end of Cle Elum Lake, where the Yakima River would flow out. Historically, this campsite would hold close to 1,000 members of the Yakima band of Indians for the purpose of maintaining the large salmon traps. This site was mostly occupied during the summer months of June and July. As the summer drew hotter, most would move on to the late summer camps, though some would remain to continue fishing the abundance of salmon in the region (Billings 1991).

3.1.4 The Steven's Treaty background

The Confederated Tribes and Bands of the Yakama Indian Nation were formed with the signing of the 1855 Steven's Treaty. Fourteen tribes and bands participated in the signing which resulted in the formation of the Yakama Nation. The Palouse, Pisquose, Yakama, Wenatchapam, Klinquit, Oche Chotes, Kow way saye ee, Sk'in- pah, Kah-miltpah, Klickitat, Wish ham, See ap Cat, Li ay was and Shyiks. The historical significance of the signing of this treaty is fundamental in understanding the conflicting perspectives on current land and water rights in existence today.

In brief, the Steven's Treaty stipulated the cessation of 9.5 million acres of traditional Indian territories over to the United States government. The Yakima Nation was consolidated onto a few Indian reservations within Washington (and Oregon) territory, with the largest of the reservations located in the south eastern part of Washington State. From the original 10.8 million acres of original Indian Territory, only 1.3 million acres were left for the various consolidated factions of the Yakima Nation.

Of the eleven articles within the original 1855 Steven's Treaty, Article III addresses the issue that drives Yakama interests today: "The exclusive right of taking fish in all the streams, where running through or bordering said reservation, is further secured to said confederated tribes and bands of Indians, as also the right of taking fish at all usual and accustomed places, in common with the citizens of the Territory, and of erecting temporary buildings for curing them".

3.1.5 Cultural and Historical Places within Gold Creek Area

A review of Washington State Department of Archeology and Historic Preservation Office's (WSDAHP) Washington Information System for Architectural and Archaeological Records Data was

conducted to identify potentially significant historical and/or archeological sites in the vicinity of Gold Creek. The research was not exhaustive. The WSDAHP does not allow users to disclose the locations of archeological sites in order to secure future integrity. However, WSDOT's I-90 Snoqualmie Pass East Project Draft EIS states that a total of 58 cultural resources have been identified in the project area: 43 historic, 12 prehistoric, and 3 with components of both. Past investigations in this project area revealed the Yakama Nation had ancestral ties to the area. Given the Gold Creek project area is within the scope of the original I-90 Snoqualmie Pass East Project, it is prudent to consider the potential for the discovery of significant archeological finds. Further, protected reserved rights to fish, hunt, and gather resources would also apply in the Gold Creek area.

The Draft EIS indicated that one site is listed on the National Register of Historic Places (NRHP), and 6 are recommended as eligible for listing on the NRHP eligibility (2004). Portions of Snoqualmie Pass were researched in the 1999 Cultural Resources Investigation performed for WSDOT's I-90 Snoqualmie Pass East Project. Though the highway retained some of the integrity conditions of location, feeling, and setting, the aspects of design, materials, and workmanship were no longer in existence. It was determined that the highway, the 1928 bridge over Coal Creek, and the 1960 bridge over Gold Creek were not eligible for the NRHP due to deterioration and modifications of the structures over time.

3.2 EARLY DEVELOPMENT AND LAND USE

The following subsections describe land use operations conducted in the vicinity of Gold Creek.

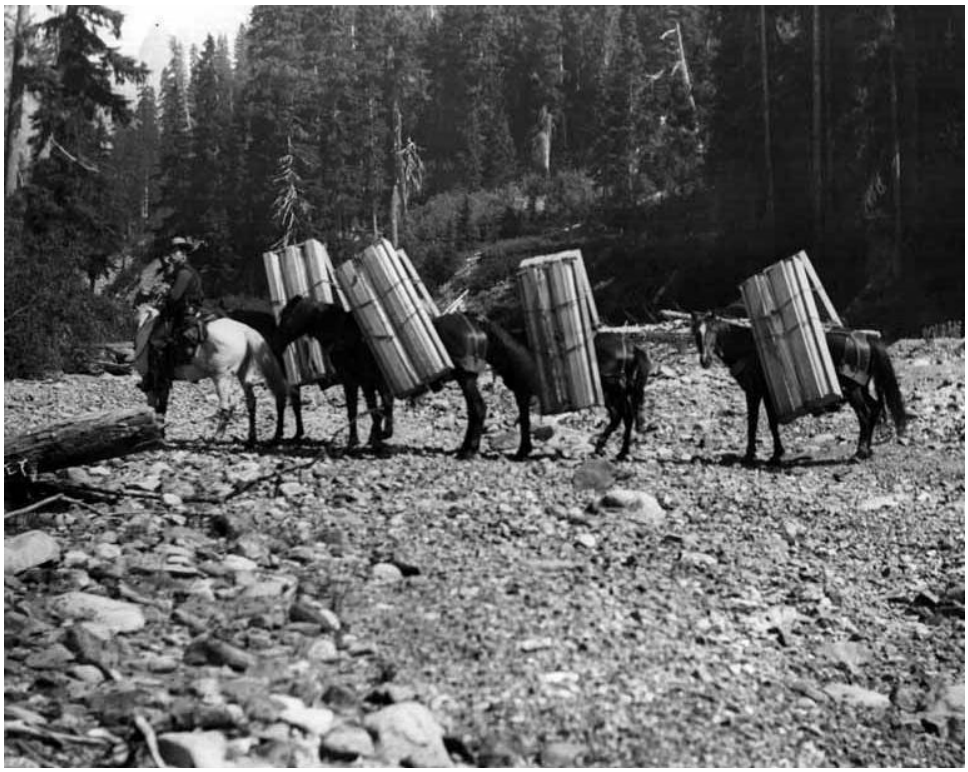
3.2.1 Land Ownership History

Early land ownership in the vicinity of Gold Creek was primarily the North Pacific Railroad Company (NPRC) and the U.S. Government until the mid 19th century. Both entities allowed timber harvesting to be conducted on their parcels. Timber sales and cruise maps and Metsker maps depicted a checkerboard pattern of land ownership between NPRC and the U.S. Government from 1922 to at least 1956, with mining claims peppered throughout the area. Private entities were the predominant owners of land closer to Keechelus Lake.

3.2.2 Mining Operations

The primary mines that operated historically in the vicinity of Gold creek were coal and precious metals. Gold was first discovered in Kittitas County in 1853 (YRBWPU and TCWRA 2001). Settlers shortly thereafter rushed to the Yakima Basin to stake claims. Between 1867 and 1873, gold was discovered in the Swauk Creek area, located approximately 35 miles east of Gold Creek (Washington Geological Survey 1902). Gold was extracted in the region primarily by placer mining, an operation which consists of excavating an open pit or tunnel from the ground surface to access much older alluvial sediment containing precious metals (Tozer, 1965).

5.5



Photograph 3-2 Tom Denny leading a pack train of horses carrying ventilation pipes, Gold Creek, ca. 1898
UW Libraries, Lawrence D. Lindsley Photographs Collection.

Research indicated that at least three major mining companies operated along Gold Creek during the turn of the 19th century: Esther, Giant, and Granite King Mines. Approximately 50 tons of high-grade ore containing gold, silver, and copper were extracted from Esther Mine in 1905 (U.S. Treasury Department 1906). Giant Mine, owned by Flanagan Mining Company, was a copper mine (USBM 1905). There was no documentation during the course of the historical review of what type of ore was mined at Granite King, owned by Devine Mining Company. Early improvements made in 1904 At Giant Mine, totaled $50,000 and included the construction of 250 feet of shaft and 500 feet of tunneling, the erection of a 100-ton strength Chilean Mill (a horse-powered machine that crushed ore), in addition to an unknown quantity of houses and outbuildings. At Granite King Mine property, a total of 1,000 feet of tunneling had been constructed an unknown quantity of outbuildings were constructed by 1904. They also were in the process of designing a stamp mill (a machine that crushed ore) to be constructed on the mining property.

Photograph 3-3 Lewis Witt in tunnel inside Esther Mine, near Gold Creek, Kittitas County, 1898 UW Libraries, Lawrence D. Lindsley Photographs Collection.

More recent records suggest that smaller mining claims existed in the vicinity of Gold Creek. According to Metsker Atlases dated 1934 and 1956, Silver King and Silver Queen mines operated east-adjacent to Gold Creek near toward the north and ten additional mining claims toward the south of Gold Creek, parallel to I-90. Mining in the region continued for several years until its peak around the 1930s. The limited mining activity that exists in the region today is mostly surface gravel mining on private lands and some permitted exploratory precious metal mining (Cochran 2005). No records of historical operations at these smaller mining claims were revealed during the course of the research. It is not apparent how or even if any of these mines were abandoned.

3.2.3 Snoqualmie Pass Wastewater Treatment Plant

The current WWTP was constructed in 1968. The facility originally discharged effluent through an outfall into Coal Creek (west-adjacent to Gold Creek). In 1983, the two-cell, aerated lagoon and sprayfield were constructed and the outfall abandoned. The second cell of the lagoon was upgraded in 1987 because groundwater had infiltrated and allowed effluent to drain into Keechelus Lake. The upgraded lagoon contained components which diverted groundwater to another outfall located in an unnamed creek connected to Coal Creek. USFS issued a Special Use Permit to allow Snoqualmie Pass Utility District to spray treated wastewater effluent into approximately 68.5 acres of USFS forested land south-adjacent to the WWTP (Ecology 2006).

3.2.4 Transportation Effects

Transportation from eastern to western Washington by way of Snoqualmie pass has been a priority since the early era of settlement in the state. Though the pass was used as a commerce trail for hundreds of years by the Yakima and Snoqualmie Indian tribes (YRBWPU and TCWRA 2001), it would be the modern-day construction and expansion of the highway system that would significantly impact the Gold Creek area. As stakeholders worked to transition the route from a wagon trail to a road fit for automobiles—and eventually a major interstate, major disturbances included:

- typical road construction cutting, dredging and filling
- Increased motor vehicle traffic
- Bridge construction
- Alterations to streams and ponds
- Runoff from roads into nearby water bodies
- Creation of impermeable surfaces
- Wildlife range fragmentation and destruction

3.2.4.1 Railroad and Highway

Early settlement in Washington State rallied largely around where the railroad would meet the water. The alignment of the Chicago, Milwaukee and St. Paul Railroad, completed over Snoqualmie Pass in 1909 (formerly the NPRC), did not parallel the roadway alignment, therefore there were no direct affects to Gold Creek. However, the development of the railroad did mark a distinct shift in policy focus. For example, in 1873, the Timber Culture Act awarded an additional 160 acres of free land if trees were planted. Thirty years later, Railroads were awarded major federal land grants, much of which was either sold or harvested for timber (YRBWPU and TCWRA 2001). Railroad companies routinely leased and sold the right to harvest timber on these parcels of land.

Demand for major roadways in Washington State started in the mid 1800s, specifically for an improved route over Snoqualmie Pass. King County records suggest that Washington locals petitioned for a wagon road over Snoqualmie Pass when the U.S. government was more focused on the travel over the Columbia River Gorge. Turn-of-the-century transportation milestones included:

1855 Seattle surveyors explored two routes, one of which followed the South Fork of the Snoqualmie River up from Rattlesnake Prairie, dropping over the 3,022-foot Snoqualmie Pass, and down to Lake Keechelus.

1865 Enough money was raised to build 25 miles of road from Ranger's Prairie (the future site of North Bend) toward Snoqualmie Pass, completed from Seattle to Ellensburg in 1867.

1883 The road was taken over by the Seattle and Walla Walla Trail and Wagon Road Co., who made investments of money and labor in its improvement.

1899 David Denny contracted with the county to make repairs to the road by laying corduroy road, building bridges, blasting rock, and improving alignments. Over the course of that summer he counted 1148 horses and 94 wagons and carriages carrying settlers crossing Snoqualmie Pass.

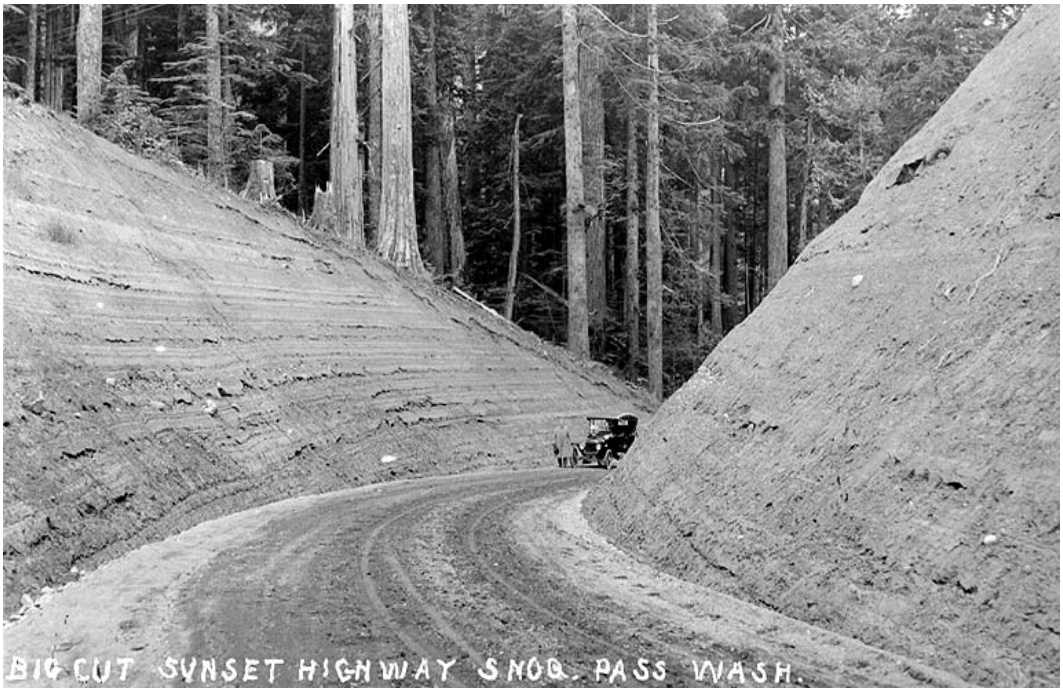
In 1909, the Alaska-Yukon-Pacific Exposition's transcontinental auto race designed the course over Snoqualmie Pass, the publicity lead to a new round of improvements the a roadway, now dubbed the Sunset Highway. In March of 1914, the State Highway Board accepted bids for major road work near on the Sunset Highway including clearing, grading, draining and bridging for about 23.4 miles between North Bend and Cle Elum (including the Gold Creek area).

Photograph 3-4 Victor Denny in automobile on west side of Snoqualmie Pass along the historic Sunset Highway, ca. 1917 UW Libraries, Lawrence D. Lindsley Photograph Collection.

For approximately 13 years, the Sunset Highway remained a graded, gravel road. Services and recreation opportunities are marked on maps of the era, including early-day strip maps of the Automobile Clubs of Seattle and Western Washington.

In the mid-1920s, Snoqualmie Pass Highway had opened; crews blasted snow drifts with dynamite (YRBWPU and TCWRA 2001). Beginning in 1923 and continuing into the 1930s, major

improvements to the Sunset Highway were accomplished with federal dollars made available under the Federal Highway Act of 1921. These improvements, initiated as Federal Aid Project #142, included hard-surface paving. New alignments would remove the upper switchbacks of the 1914-15 Route. By 1934, all sections of highway paving were complete from Seattle to Snoqualmie Pass. During this timeframe, the Sunset Highway received official designations as State Road No. 2, Primary State Route No. 2, and U.S. Highway 10 (US-10) *(*King County 2009*).*The extensive list of road aliases made researching the transportation system challenging.



Photograph 3-5 Automobile on Sunset Highway, Snoqualmie Pass, Washington, ca. 1917.
UW Libraries, Washington State localities Photographs

In 1956, the Federal government passed the Interstate Highway Act. This act called for the construction of a nationwide network of controlled access multilane freeways. In Washington, one of these routes was then designated US-10, including the stretch over the Snoqualmie Pass, and would now be known as I-90 (Johnson 2006). WSDOT archives office has list of projects in the Gold Creek (below) that were implemented over time, from the 1950s through the 1970s.

TITLE	DESC. OF WORK	DATE	MILEPOSTS
Airplane Curve & Lake Keechelus Snowshed	Grading, paving, drainage, curb & gutter, snowshed	1951	55 - 58
Hyak To Keechelus Inn	Paving	1957	52 - 58
Hyak To Rustic Inn	Grading, surfacing, paving	1958	53 - 62
Gold Creek Bridge	Bridge	1960	55
Lake Keechelus Slide Area	Grading, surfacing, drainage	1970	58.58 - 59.79

Hyak To Wolfe Creek	Grading, surfacing, paving	1971	55.11 - 58.57

Table 3-1 Projects scheduled in the Gold Creek area from 1951 until 1980
WSDOT, South Central Region Records.

During the 1970s, construction of the first expansion of I- 90 kicked off. Gravel was excavated for the new roadway at various locations along the route, creating ponds and lakes visible from the roadway. Today, some of these water bodies have been incorporated into public parks (YRBWPU and TCWRA 2001).

Construction of I-90 and Forest Service Road 4832 at Gold Creek further disturbed the area. Burrow pits and staging areas for highway construction were located on the floodplain along both sides of the highway. Aerial photographs from 1956 and 1970 depicted the Gold Creek Area during the construction events (Appendix A).

The Washington State Department of Highways ([WSDH], now WDSOT) started construction on the Keechelus Lake Slide Vicinity project in 1970. This project highlighted the extension of Pit Site PS-S-156, later known as Gold Creek Pond. The construction of the pit confined Gold Creek to the western margin of its historical floodplain. Design drawings for Pit Site PS-S-156 are included as Appendix B of this document and are described below.

According to 1970 Washington State Department of Highway's I-90 design plans, pit site PS-S-156 , was mostly composed of gravel backfill, mineral aggregate for asphalt concrete, sand, cement concrete aggregate, ballast, and crushed surfacing. The design states the stripping quarries and pits included:

- a haul of 55,255 cubic yards (yds^3),
- a haul of nearly 100,000 yds^3 of stockpiled strippings
- crushed surfacing top course was estimated to be 51,800 tons
- Ballast would total at roughly 87, 200 tons.

The reclamation plan for the PS-S-156 site describes early restoration efforts surrounding the site. The drawing depicts marked areas for re-vegetation and the construction of spawning beds for fish. Areas marked for plantings specifically say seeding, fertilizing & future restoration. The wildlife plans state "Spawning beds to be constructed by others" and "Pervious dam to be constructed by others". The notes on the design state:

- Depth of exaction 30 feet below overburden
- Pond banks dressed to 2:1 maximum ratio) to a point 2 feet below minimum low water
- Area Federal land- no zoning
- Proposed and existing land use – recreational
- Future reforestation planting – WSDH in cooperation with the USFS. (Native Species).
- Stockpiled material for use on future projects
- Stage reclamation pit to be utilized on future projects

In 1978, WSDH moved forward the Hyak to Wolfe Creek portion of the I-90 overhaul**.** This project specifically details the widening over Gold Creek, and incorporates details of restoration efforts mentioned in the Lake Keechelus Slide Vicinity Project design plans.

This widening of I-90 over Gold Creek affected the creek, the wildlife, and surrounding vegetation. In 1978, roadway work and materials used were noted to "be in accordance with the

requirements of the State of Washington Department of Highways, Standard Specifications for Road and Bridge Construction dated 1969". Also in 1969, Congress passed and signed into law the National Environmental Policy Act (NEPA). This Act has four major goals that have since influenced and all Federal agencies, including the Federal Highway Administration (FHWA):

- it sets a national environmental policy;
- it establishes a basis for conducting environmental impact statements (EISs);
- Requires to the extent possible, policies, regulations and laws of the Federal Government be interpreted and administered in accordance with NEPA.
- It also requires Federal agencies to use an interdisciplinary approach in planning and decision-making for actions that impact the environment.

There was no mention of NEPA in the design plans for the I-90 projects constructed in the 1970s. Notes were mainly focused on structures highlighting specific protocol:

- The concrete in all seals shall be Class D mix (use 10 yds^3);
- The concrete in the footings of all piers shall be Class B Mix (yds^3);
- All other cast in place concrete shall be class A mix (yds^3);
- The concrete seals are designed for a water elevation of 2508 feet
- The maximum design soil pressure per square foot is one and one-half tons for Piers 1 and 4
- Each pile shall be driven to a depth sufficient to develop a minimum load bearing capacity of 55 tons.

The 1978 Pit-Site PS-S-156 design plans did include the some environmental elements, like the construction of a pervious dam from the pond to the spawning stream. The design plans also included what the engineers deemed "mass planting explanations". The plans offered details on the layout and methodology for the proposed re-vegetation of the Gold Creek area. The plant list included:

- 1,750 Douglas Firs
- 875 Grand Firs
- 875 Lodgepole Pines
- 16,791 Big Whortleberries
- 720 Mountain Ashes
- 19, 125 Creeking Snowberries
- 488 Vine Maples

The number of plants in a given area was determined by the acreage of the area, multiplied by the quantities per acre. The plans described that the spacing of the plantings should vary to give an appearance of natural growth.

3.2.4.2 Present Day Transportation Projects

Today, WSDOT is working to improve connectivity between eastern and western Washington with federal transportation funding. This dedicated funding will go to projects that improve and expand I-90 over Snoqualmie Pass, where traffic volumes are expected to increase 2.1 percent each year , reaching an expected average daily volume of over 41,000 vehicles by 2030 (WSDOT 2011). These projects, referred to collectively as the Snoqualmie Pass East Project,

include modifications and enhancements to the Gold Creek area. WSDOT is acquiring a 265-acre property for habitat preservation in the Gold Creek Valley, known as the Gold Creek CEA, to prevent the chance of future high-density development in an area rich with wetlands, riparian habitat, and mature forest (WSDOT). To this end, WSDOT is replacing the existing 140-foot bridge over Gold Creek with a new bridge, approximately 900 and 1,100 feet long allowing wildlife passage when Keechelus Lake is at high pool.

The implementation of historic and modern day transportation systems illustrate an evolution in policy and development priorities. In the beginning, the Gold Creek was a stopping point for miners and auto-enthusiasts. It later became a significant fill site for a needed highway expansion of I-90 over Snoqualmie Pass. Though environmental regulations were starting to gain ground at the time of major I-90 construction in the 1970s, it would be the 1990s before NEPA would greatly affect highway construction practices. Today, there are three major priorities for a highway mega-project like the I-90 Snoqualmie Pass East Project: congestion relief, safety; and the environment.

Ultimately, preservation is an important component of reestablishing and maintaining ecological connectivity and protecting large connectivity investments made in the region associated with this and other projects.

3.2.5 Logging

The Keechelus-Kachess Subbasin watersheds are dominated by western hemlock/Pacific silver fir trees with subalpine species found at higher elevations. Timber harvest has been a significant industry in the Cascades for the past 50 years (YRBWPU and TCWRA 2001). Forest conditions were first assessed for the United States Geological Service in 1902 and written in a professional paper by Fred G. Plummer. The report covered areas of the Cascade Mountains between the Mount Rainier Forest Reserve and the Washington Forest Reserve. The purpose of the survey was to assess forest conditions and prepare land-classification maps.

Land Classification	Total Area
Naturally timberless (arid lands, lakes, glaciers)	261,350 acres
Lost to fires	204,140 acres
Lost to logging	41,640 acres
Timber lands	2,292,870 acres
Total:	2,800,000 acres

Table 3-2 Summary of Land Classification in 1902 at Township 19 to 28 North, Range 9 East eastward to the Columbia River.

The watersheds on the eastern slope of the Cascades, such as Snoqualmie, Cedar River, and Yakima, deserved special attention in 1902 because “the entire minimum flow from their catchment basins will be utilized in the near future for purposes of vital importance” (Plummer). Due to population growth and demand for services, these watersheds were evaluated for the potential to supply light, power, and water to the cities of Seattle and Tacoma, in addition to providing water for irrigation to farm lands.

The Cascade forests were generally considered free of serious defects or disease during this time. Most of the issues for quality of timber harvests depended upon old age, storms, and fires

(Plummer 1902). Early forest fires resulted in second growth in some areas surrounding Gold Creek.

Between the years 1956 and 1959, a timber cruise and survey for Kittitas County was conducted in the area of Gold Creek and Keechelus Lake. Merchantable fir trees were cut in 1941 and the fully stocked fir Hemlock was in good condition. The area was considered poor rangeland at the time.

The NPRC owned much of the land in a checkerboard pattern and gradually sold rights to the USFS, United States Bureau of Land Management, private timber companies, etc. Multiple land-use areas near Gold Creek have influenced the forestry habitat upstream, such as the Alpental ski area, which is situated northwest of USFS Road 4832. Various private landowners and efforts to expand development could increase pressures to cut down trees and further reduce habitat complexity in the watershed.

3.2.6 Yakima Project

The Yakima Project is a multi-faceted irrigation facility that was part of the United States Bureau of Reclamation's (USBR) early 1900s movement to irrigate areas in the arid west. It consists of a series of dams, reservoirs and other irrigation-related facilities located in Kittitas, Yakima, Benton and Franklin counties in south-central Washington State. The development of the Yakima Project in the early 1900s dramatically altered the landscape and hydrology of the Yakima River and many of its tributaries. Many of the original physical alterations (i.e. dams, canals, etc.) remain relatively unchanged since their original construction. These "improvements" continue to influence the hydrologic function and natural habitat of the Gold Creek area.

While irrigation efforts in the Yakima River Valley have been documented as far back as pre-European settlement, the earliest impetus was provided by the railroad companies. The Federal Government supported western expansion with The Homestead Act of 1862 by issuing government land grants to private citizens who were willing and able to improve their claim of 160 acres within five years. The Pacific Railway Act of 1862 even further influenced development of the West. In addition to monetary loans, the Pacific Railway Act of 1862 gave railroad companies land grants for every mile of track laid. The Act, available through National Archives, stated that railroad companies were to be issued 200 feet of ROW along installed track, plus 10 mi^2 of land per mile of completed track. The railroad companies saw huge profit potential with this land if it could be irrigated and developed, making it more desirable to potential settlers. The railroad was able to sell irrigated land for $40-50 an acre, compared to $4 an acre for dry land, and the cost of irrigating the valley was determined to be $10 per acre (USBR 1993).

Construction on the initial phases of what would become the Yakima Project began in 1891; 42 miles of the first canal were constructed within the first year of the project. Eventually, the irrigation efforts received government assistance when the Reclamation Act of 1902 was enacted. The primary goal of the Reclamation program was to develop the arid west by promoting farming opportunities for families on land that would benefit from the introduction of irrigated agriculture (USBR 2009). It wasn't until 1905 that final authorization for the Yakima Project came from Secretary of the Interior Hitchcock who approved the further development of the initial Sunnyside Canal, and the construction of a canal system in Tieton Canyon, under the name *Yakima Project* (USBR 1993). In its entirety, the Yakima Project includes seven divisions

and consists primarily of storage dams and reservoirs, but also includes diversion dams, canals, laterals, pumping plants, drains, power plants, and transmission lines (USBR 2010).

Photograph 3-6 Kachess Dam Construction 1910
View of cutoff channel from downstream end, crib structure across lower end of cutoff, looking east from dam (United States Library of Congress [USLC], Historic American Building Survey/Historic American Engineering Record [HABS/HAER]).

The two divisional elements of the Yakima Project closest to the Gold Creek restoration area are the Kachess and Keechelus Lakes and Dams. Kachess Dam was constructed in 1912 at the end of the naturally occurring Kachess Lake. The dam measures 115 feet high with a volume of 200,000 yds^3. The previous storage capacity of Kachess Lake before dam construction is unknown; however the current storage capacity is 245,000 acre-feet. A 2,877-foot long discharge channel was constructed to the intake structure of the dam, from the natural lake, enabling the lake to be used for water storage. The discharge channel consists of a combination of open cut inlet channel and enclosed 9-foot-diameter tunnel. According to the USBR, extensive siltation had

become a problem within the discharge channel, resulting in restricted water flow downstream. To combat this problem, USBR removed the sediment and excavated a new channel along the existing tunnel in 1996. Other improvements were also made to the existing facility to improve function, but overall the size and location of the original dam and other related improvements have remained relatively unchanged (USBR 2010).

Photograph 3-7 Kachess Dam Construction 1910
Looking downstream from Kachess dam crest, 1910, river cutoff channel with crib structure in center, bridge footing crib structure at right (USLC, HABS/HAER).

Closer to Gold Creek lies the Keechelus Dam and Keechelus Lake. Another earth-fill structure constructed between 1913 and 1917, the dam measures 128-feet high, extends over one mile in length, and has a capacity of 684,000 yds^3. Keechelus Lake was also a naturally occurring lake, and the dam was constructed at the end of the lake in similar fashion to Kachess. Keechelus Lake is partially fed by Gold Creek. As with Kachess, the original storage capacity of Keechelus Lake is unknown, but the current capacity is measured at 157,900 acre-feet.

Photograph 3-8 Keechelus Lake, east of Snoqualmie Pass, October 16, 1896
UW Libraries, Alvin H. Waite Photograph Collection.

Photograph 3-9 Keechelus Dam Aerial view, date unknown Downstream face (USLC, HABS/HAER).

At the time this report was prepared, quantitative data regarding the overall affects of the Yakima Project, and specifically those associated with the construction of the Kachess and Keechelus dams, was not available. However, considering the information provided on the historic species that once inhabited the area, and by observing construction photos of the two dams, the qualitative effects of the facilities become clear. The enclosed series of photos illustrating the construction of the Keechelus Dam show the grand scale of the project, and give an indication of how the project changed the natural structure and function of the area. Keechelus Dam – General Plan of Dam Site, 1911. The general plan of the Keechelus Dam Site, dated 1911, depicts the extent of the disturbance from dam construction, diversion of natural water courses, and various support faciities needed for the project and is included as Appendix C (Libraray of Congress, HABS/HAER WA-80-52).

Photograph 3-10 Keechelus Dam Construction, 1914.
View of steam shovel excavation and general view of north borrow pit. This photo also provides some sense of how dense the forest was in this area before clearing began (USLC, HABS/HAER).

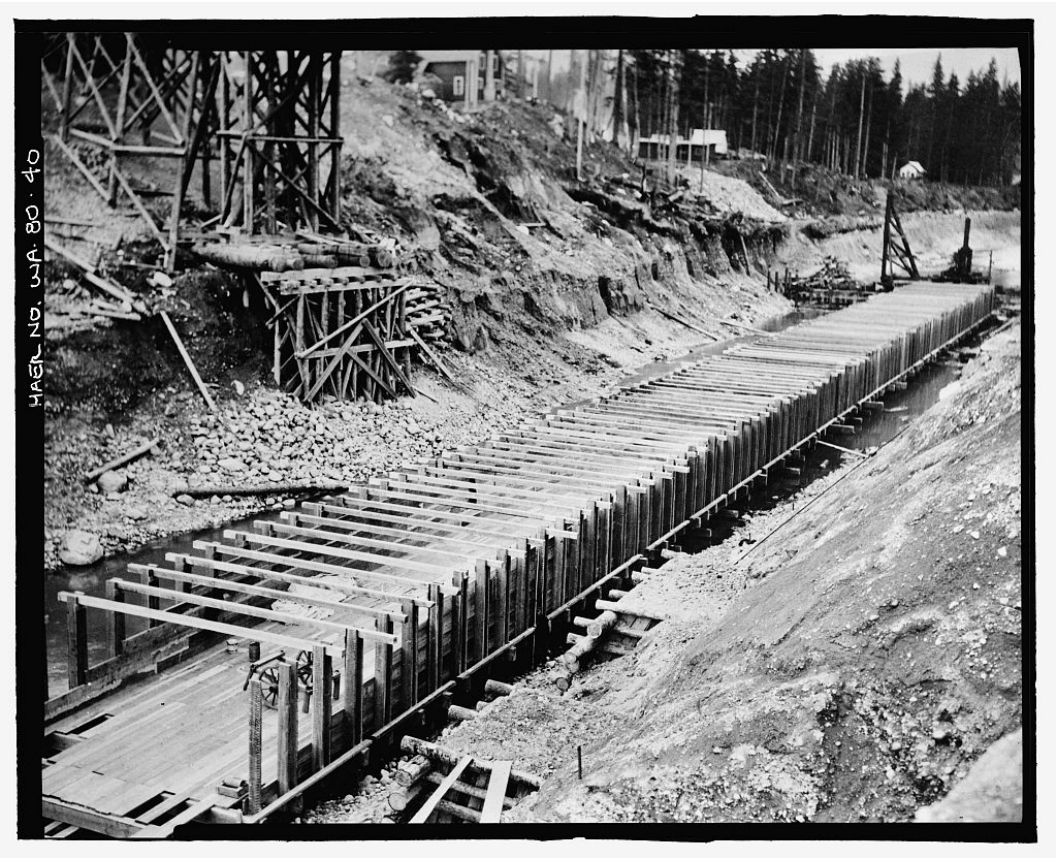
Photograph 3-11 Keechelus Dam Construction, 1913.
Stump puller pulling stumps on dam site (USLC, HABS/HAER).

Photograph 3-12 Keechelus Dam Construction, June 1914
Building the embankment; A section of the foundation and riprap rock in place is shown on the left (USLC, HABS/HAER).

Photograph 3-13 Keechelus Dam Construction, October 1913.
Pile driver driving piling for core-wall of dam (USLC, HABS/HAER).

Photograph 3-14 Keechelus Dam Construction, May 1915.
Progress view of embankment fill on north dam (USLC, HABS/HAER).

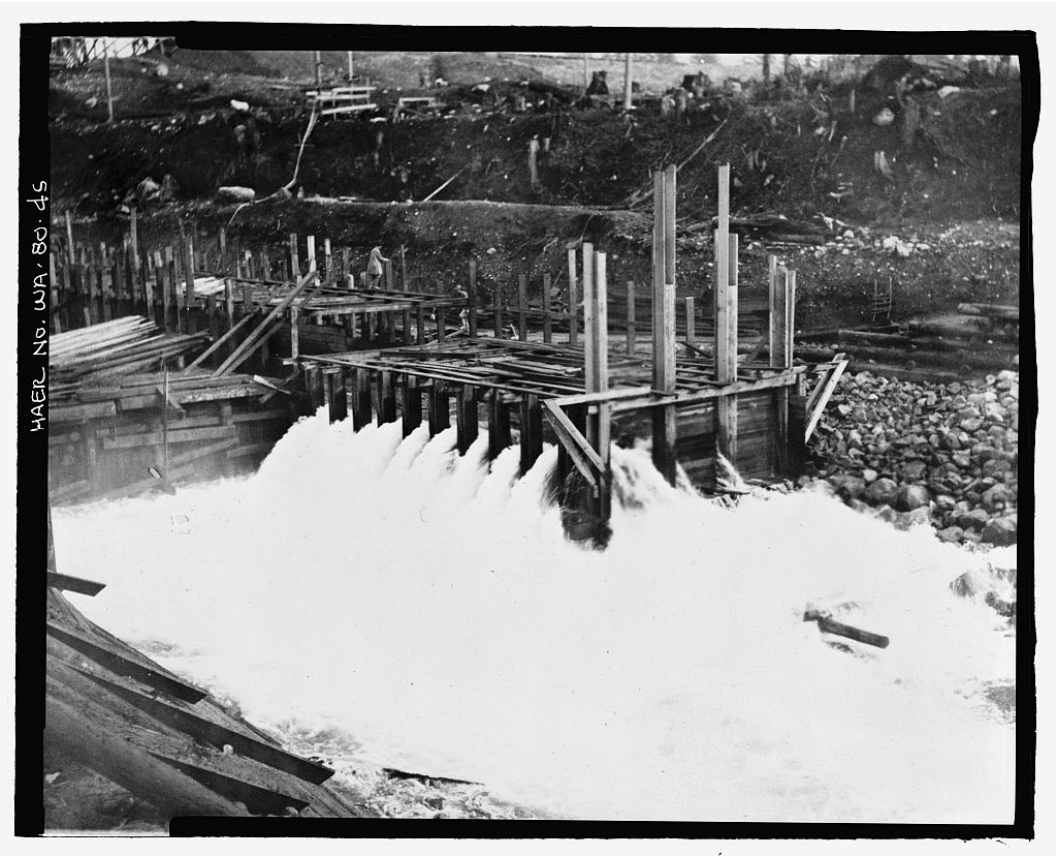
Photograph 3-15 Keechelus Dam Construction, October 1913.
Placing concrete in core-wall from concrete cars operating on the trestle. This image also illustrates the size and scope of the support facilities needed to construct the project (USLC, HABS/HAER).



Photograph 3-16Keechelus Dam Construction, May 1915.
Diversion flume construction; view looking downstream (USLC, HABS/HAER).

In later years, Keechelus Dam facility required additional work. Due to safety concerns, the maximum operating capacity of the Lake was reduced to 140,920 acre-feet for regular storage. This reduction in storage level was implemented in 1998. Documented improvements to the facility were constructed in 1976. These improvements included a new slide gate, a new concrete chute, stilling basin, and a 22-inch diameter pipe was installed in the outlet conduit "to bypass minimum flows for fishery and stream enhancement when the outlet gates are closed" (USBR 2010).

Upon completion of this project, the natural course of the Yakima River and its tributaries changed forever. Overall, without knowing the capacity of these natural lakes prior to construction of the dams, it is difficult to determine how the Yakima Project has affected these lakes' water storage capacities y. Unfortunately, the designers of the facility did not see the need to include a fish ladder or other types of fish passage at either Kachess or Keechelus dams. Because neither dam was constructed to include a fish ladder a population of sockeye salmon that used to migrate up into Keechelus Lake and up into Gold Creek became locally extinct after the dam was constructed (Westneat 1999), which is further discussed in Section 3.3.2 Wildlife Populations



Photograph 3-17 Keechelus Dam Construction, October 1915.
Flood water discharging though flume (USLC, HABS/HAER).

Another major effect resulting from the construction of the Yakima Project elements in the Gold Creek area includes the extensive clearing of each location. Timber that existed in these areas included fir, spruce, tamarack and cedar species. Many of the photos provided in this section illustrate the quantity and density of forest in the project area before the dam was built. Prior to the initiation of the Yakima Project, the Cascade Canal Company constructed a small crib dam at the mouth of Kachess Lake to provide water storage. For each of these dams, clearing timber and excavating diversion channels and materials used during construction would have significantly altered the landscape in these areas.

Since this large scale disturbance occurred so many years ago, and since the Yakima Project and all its divisions provide such an essential service to the region, removal of the dams is likely not a practicable solution to help restore Gold Creek. However, having a sense of how this area has changed over time can potentially provide restoration efforts with a baseline level of change that would be more supportive of indigenous species and pre-disturbance functions without the need to remove elements of the Yakima Project.

3.3 NATURAL HISTORY

Natural history is the study of the living world including plants, animals, and those events that modified the regional habitat such as floods and fires. The following subsections present a written account of catastrophic events, wildlife populations, and vegetative succession in order

to better understand environmental changes that occurred over time within the Gold Creek ecosystem.

3.3.1 Catastrophic Events

The influence of catastrophic natural events in the project area is not well documented. In general, fires, floods, earthquakes, landslides, and avalanches are naturally occurring events that disorder ecosystems and result in permanent changes. Fires and floods are often necessary to reestablish quality habitat. Certain species of trees rely upon fires for propagation. Natural flooding can be important for the riparian zone by depositing nutrient enriched soils on the upland slope that eventually leads to reestablishing vegetative communities.

A large forest fire occurred in 1865 that devastated the slopes of Denny Mountain which serves as headwaters of the Gold Creek valley. Another large forest fire occurred in 1894 and again destroyed the slopes of Denny Mountain. The land surveyors noted in 1902 that along the Snoqualmie Pass wagon road, there was “a remarkably small proportion of burned area as compared with the regions lying immediately eastward, but the numerous small burns in the vicinity of Keechelus Lake prove that campers and packer were not overly careful” (Plummer). There were several small forest fires in July of 1865 with the fires spreading south of the town of Easton. Approximately twenty-five years later, another sequence of fires burned many of the young trees that had restocked from the previous burn (Plummer 1902). Timber cruises dated 1957 also documented a fire within the region in 1941.

Construction of the Keechelus dam in 1917 reduced water levels in Gold Creek and changed fish populations because the dam became a barrier to fish migration. Drought conditions in Gold Creek significantly impacted bull trout populations according to a study conducted by Wissmar and Craig (1997).

There was a problem with late spring rains and early snow runoff in 1869-1870 which caused the Snoqualmie Wagon Road to be virtually impassable (Prater 1981). This was a severe setback to construction of the new road because the route was virtually impassable until late 1883.

3.3.2 Wildlife Populations

Although some environmental laws were established during the early 1900s, such as the Migratory Bird Treaty Act, it was not until the mid-60s that enforceable policies changed the progress of development and industry throughout the United States with regard to conservation efforts. Of particular importance to the restoration efforts at Gold Creek, the Endangered Species Act of 1973 created a set of rules for the protection of threatened and endangered species, as well as conservation of habitat. Species of concern in Gold Creek and the surrounding forests include the bull trout, Middle Columbia River steelhead, northern spotted owl, grizzly bear, Canada lynx, and gray wolf.

The checkerboard land ownership pattern across the Snoqualmie Pass landscape resulted in different land management objectives between public and private owners. The forest landscape is now highly fragmented which has made wildlife management and environmental conservation difficult to successfully achieve. An extensive land exchange is currently underway to consolidate land holdings and promote ecosystem connectivity.

. The following subsections provide an overview of the types of wildlife found in the forests, streams, and lakes of the Central Cascades region. Although there have been changes in the

population size and historical range for many of the wildlife species, the actual types of wildlife have not changed significantly over the past few hundred years.

3.3.2.1 Fish

The decline of fish species occurred in two major phases. The first phase took place between 1850 through approximately 1900 when salmon and steelhead populations in the Yakima runs declined about 90% from historical values (Freudenthal et al 2005). With a current estimate of bull trout abundance in the Yakima Core Area at approximately 2,550 to 3,050 migratory adults, historical values for the migratory life phase of one species would have been estimated at roughly 25,500 to 30,050 bull trout. The second phase of decline occurred from roughly 1900 to the present and involved the extirpation of native sockeye, Coho, and summer Chinook, as well as the significant reduction of the abundance of other species.

As stated by Freudenthal et al, “More than 100 years of water development for irrigated agriculture has altered flow regimes and severely affected native fish habitat” (2005). According to the USFWS Draft Bull Trout Recovery Plan for the Middle Columbia River Basin, Keechelus and other dams in the area, as well as numerous irrigation diversion dams, have severely altered the natural hydrographs of rivers in the Yakima River Basin. Other historic activities in the watershed including irrigated agriculture (storage dams, water conveyance, and diversions), hydropower development, urbanization, forestry, and road development all which have resulted in significant reductions of steelhead and bull trout populations.

Recovery of bull trout involves:

- Reducing threats to long-term persistence of populations and habitats
- Ensuring security of multiple interacting groups of bull trout
- Providing habitat conditions and access to them for expression of various life-history forms.

Bull trout have been found in isolated populations within the Yakima River System, including Kachess Lake, Keechelus Lake, and Gold Creek. The populations found in these water bodies most likely were native prior to the construction of the Kachess Dam and irrigation reservoir. The United States Fish and Wildlife Service (USFWS) reported that a bull trout was identified below the barrier culvert within Gold Creek in 2005 (2006). According to the USFWS's draft Bull Trout Recovery Plan, the species requires cold stream temperature, clean water with low turbidity and contaminants, and complex channel characteristics with relatively unobstructed migration pathways (2002). The salmonid was listed on the Endangered Species Act by the USFWS in 1999 and the draft Recovery Plan for Washington State was developed in 2002. The risk to bull trout's spawning and rearing critical habitat in Gold Creek was ranked as a moderate by the USWFS. According to the Yakima Subbasin Salmon Recovery Plan (2005), bull trout spawn in the fall utilizing low-gradient streams with loose, clean gravel and require cold, clean water. Historical human activities played a major role in negatively affecting “abundance, productivity, spatial structure, and diversity of Yakima steelhead and bull trout populations (Freudenthal et al 2005).

The westslope cutthroat trout was designated as species of concern by USFWS. After USFWS reviewed the status of the westslope cutthroat trout, it was determined they were not warranted for listing. Habitat improvements for bull trout and other sensitive species should also benefit the cutthroat trout.

Many non-native species have been introduced into the Yakima basin, including brook trout in mid-1900. Although these species are no longer stocked in the main stem river system, they have established self-sustaining, naturally reproducing populations. There is a serious risk of genetic threat to bull trout as the result of hybridization with brook trout. The USFWS Bull Trout Recovery Plan for the Middle Columbia Recovery Unit recommends increasing the fishing catch numbers for brook trout in an effort to reduce numbers and distribution of these competing species.

Kokanee salmon is the non-migrating form of sockeye salmon which has historically inhabited upper-basin storage reservoirs. Gold Creek Pond is located upstream of Keechelus Lake approximately one mile. The former Pit Site PS-S156 now serves as a constructed spawning channel. Although recently introduced to the stream, sockeye salmon previously spawned in Gold Creek prior to the dam that was built on Keechelus Lake in the early 1900s which raised the water level and blocked fish passage (Wild Fish Conservancy Northwest 2011).

Species	**Population**
Bull trout	Isolated adfluvial stocks: Pre and post-dam
Summer Steelhead	Pre-dam
Cutthroat trout	Gold Creek (lake access blocked)
Whitefish	
Kokanee	Resident form of sockeye salmon
Brook trout	Non-native; introduced

Table 3-3 Native Species Identified within the Yakima River System

Other fish species of importance within the Yakima subbasin include spring and fall Chinook salmon, reintroduced Coho salmon, pacific lamprey.

Perhaps the most significant alteration of Gold Creek and its channel habitat occurred when the Keechelus Dam was constructed in the early 1900s. The original lakeshore moved northward by approximately 1.25 miles and changed drainage basin of Gold Creek. During seasonal high lake levels, the basin of Gold Creek becomes obscured because of water inundation, making it difficult for bull trout and other fish to navigate up the correct channel for feeding and spawning. Furthermore, the flooded lake precludes use of the shoreline or culverts by mammals seeking passage between the north and south sides of the road barrier. This forces mammals to cross the highway and USFS Road 4832, increasing the potential for collisions, creating a safety hazard for motorists and wildlife populations.

The USFS Road 4832 creates a physical barrier between upstream and downstream aquatic habitats. Hydrologic processes have been modified to such an extent as to create different patterns of fish behavior than historically occurred in this ecosystem. Gold Creek flows year round into Keechelus Lake. In the more level portions of the valley floor, the creek bed becomes broad and, in dry summer months, part of the creek flows underground. The lower reaches of the creek are designated as flood plain in the Kittitas County Comprehensive Plan, and there are extensive wetlands near the valley entrance (2006). Due to road construction, recreational activities in the riparian areas, flooding, and past timber harvest in the area, there is a lack of large woody debris in Gold Creek with is a limiting factor to stream complexity and pool formation both of which are required for bull trout and salmon spawning.

3.3.2.2 Mammals

One of the objectives of the I-90 Snoqualmie Pass Wildlife Habitat Linkage Assessment was to determine the nature of highway and road barrier effects on animal movements and populations (USDA 2000). Automatic camera stations were situated in the national forests surrounding the I-90 project area. Detections of wildlife routinely occurred during the study and results included nineteen species, as summarized below:

Small Mammals	Large Mammals
Douglas squirrel	Mule deer
Snowshoe hare	Bobcat
Northern flying squirrel	Black bear
Coyote	Elk
American marten	Mountain lion
Chipmunks	Humans
Stripped skunk	
Weasel	
Porcupine	
Bushytailed woodrat	
Spotted skunk	
Beechy ground squirrel	
Domestic dog	

Table 3-4 Animals Spotted in Automatic Cameras

Another important component of the wildlife monitoring study included distribution of road-kill along I-90 between milepost 35 to milepost 89 by WSDOT personnel. The north end of Keechelus Lake was identified as a road-kill concentration area because of its high potential as an ecological connectivity route. Many small mammals would utilize drainage culverts for passage between the north side of I-90 and the Keechelus Lake shoreline. These opportunities for crossing should be maintained in order to facilitate the dispersal of seeds by small mammals that maintain the functions of old forest ecology (USDA 2000). Use of the Gold Creek Bridges and culvert for animal passage is dependent upon the level of water in Keechelus Lake since high water levels prevent ease of movement. Animals recorded during culvert tracking events included the following: deer mice, Pacific jumping mouse, raccoon, opossum, and river otter. Other large mammals that reside in the project area and were not captured in automatic camera monitoring stations include lynx, wolverine, fisher, grizzly bear, and wolf. Spotted owls also reside within the area. According to the Cascades Habitat Conservation Plan, spotted owls are found in low to moderate densities throughout the Cascade forests. Habitat management is an important component to facilitate interchange between owl populations in the North and South Cascades (Plum Creek Timber Company 1996).

3.3.3 Vegetative Succession

A healthy forested watershed results in clear, cold water subalpine streams, a natural stream-floodplain connectivity, healthy riparian vegetation, natural stream channel migration of alluvial fans at the stream-lake interface, natural wetland hydrology, and healthy wildlife populations. The Gold Creek project area has experienced historical changes over the past 150 years resulting in significant changes to the natural environment.

Washington State Native Plant Society (WSNPS) conducted a plant survey on the upper 3 miles of Gold Creek Trailhead. Native species encountered included Pacific silver fir, vine Douglas maples, Sitka alder, wild ginger, sedges, Douglas fir, salmon berry, western and mountain hemlock, among many others. Introduced, non-native species identified included ox-eye daisy, Canada thistle, hairy Cat's-ear, wall lettuce, and the common dandelion (WSNPS 2006). In comparison, an observation of plant species during a 1902 survey of the Central Cascades provides a different snapshot. A summary of the two inventories is shown below:

Plants Recorded in 1902 – Central Cascades		**Plants Recorded in 2006 – Gold Creek Trail**	
Alaska cedar	Noble fir	Aster	Pacific silver fir
Alpine larch	Oregon grape	Baneberry	Pearly everlasting
Arrow wood	Patton hemlock	Big-leaf sandwort	Pussytoes
Bearberry	Prickly gooseberry	Black alpine sedge	Queen's cup
Birch	Quaking aspen	Bleeding heart	Rattlesnake-plantain
Blackberried gooseberry	Raspberry	Bluejoint	Red columbine
Blackberry	Red alder	Bunchberry	Red-osier dogwood
Blueberry elder	Red cedar	Cleavers	Rush
Buckbrush	Red currant	Common harebell	Scarlet paintbrush
Chokecherry	Red fir	Common horsetail	Serviceberry
Cottonwood	Red huckleberry	Cow parsnip	Sharp-tooth angelica
Creeping juniper	Redberry elder	Deer fern	Showy sedge
Devil’s club	Sagebrush	Dewey's sedge	Sitka alder
Dogwood	Salmonberry	Douglas fir	Slender wintergreen
Dwarf maple	Silver willow	Douglas maple	Small-flowered alumroot
Engelmann spruce	Snowberry	Douglas' sagewort	Small-flowered blue-eyed Mary
Greasewood	Subalpine fir	Draba	Spotted coral-root
Hazel	Sumach	Fireweed	Spreading wood-fern
Highbush cranberry	Sweet myrtle	Goatsbeard	Subalpine daisy
Kinnikinick	Syringa	Hooker fairy-bell	Sub-alpine fir
Lodgepole pine	Tamarack	Horse thistle	Vanilla leaf
Longleaf willow	Thimbleberry	Indian's dream fern	Vine maple
Lovely fir	Thorn apple	Lady fern	Watson's willow-herb
Lyall willow	Vine maple	Large-leaved avens	Western hemlock
Manzanita	White fir	Leathery grape-fern	Western red cedar
Maple	White pine	Little pipsissewa	White marshmarigold
Mertens hemlock	White-bark pine	Maidenhair fern	Wild ginger
Mountain alder	Wild cherry	Merten's sedge	Wild strawberry
Mountain ash	Yellow pine	Mountain arnica	Yarrow
Mountain salal	Yew	Mountain hemlock	
		Oak fern	

Table 3-5 Observed Vascular Plant and Tree Species.

3.4 CONCLUSIONS FOR RESTORATION

In 1902, United States Geological Survey land surveyor, Fred Plummer, remarked that “The Cascades and the other mountain ranges which encircle the arid district (of Eastern Washington State) will afford, if properly conserved, an adequate supply of water for all of the land that can be watered within the limits of reasonable cost.” Furthermore, Plummer continued with “…the construction of these

reservoirs and the preservation of their natural watersheds is imperative. This means that logging should be done under the proper restrictions, and that the wanton destruction of the forests by fire must cease."

It is apparent observations and recommendations like Plummer's were generally unpopular in the past. The conditions of the Gold Creek watershed have changed over time as the result of many historical influences including, but not limited to, the construction of the Keechelus Dam and reservoir, timber harvest, mining, railway construction, recreation development, and establishment of the Sunset Highway/I-90 Snoqualmie Pass roadway.

Transportation efforts illustrate a dramatic change in priorities from the start of the 20th Century to present day. During early development, an area like Gold Creek was simply looked at as a stopping point for miners and auto-enthusiasts. It later became a significant fill site for a needed highway expansion of I-90 over Snoqualmie Pass. Though environmental policies were starting to be implemented in the 1970s at the time major construction began on I-90, highway construction would not be largely affected by them until the 1990s. At this time, policies such as NEPA play a large role in mitigating detrimental environmental effects caused by construction activities.

Understanding historical events that have impacted natural processes within the Gold Creek watershed can be helpful in successfully implementing its restoration. The USDA I-90 Wildlife Habitat Linkage Assessment recommended that "modifications to the northern end of the Keechelus lakebed should be combined with re-vegetation to promote the development of late successional forest habitat characteristics to provide connectivity for late successional associated in this area" (2000). Improvements to the Gold Creek watershed may include the control and prevention of road-related runoff and sedimentation, replanting native riparian vegetation particularly in the I-90 Snoqualmie Pass East road improvement project disturbance area, and restoring in-stream habitat complexity.

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FIGURES

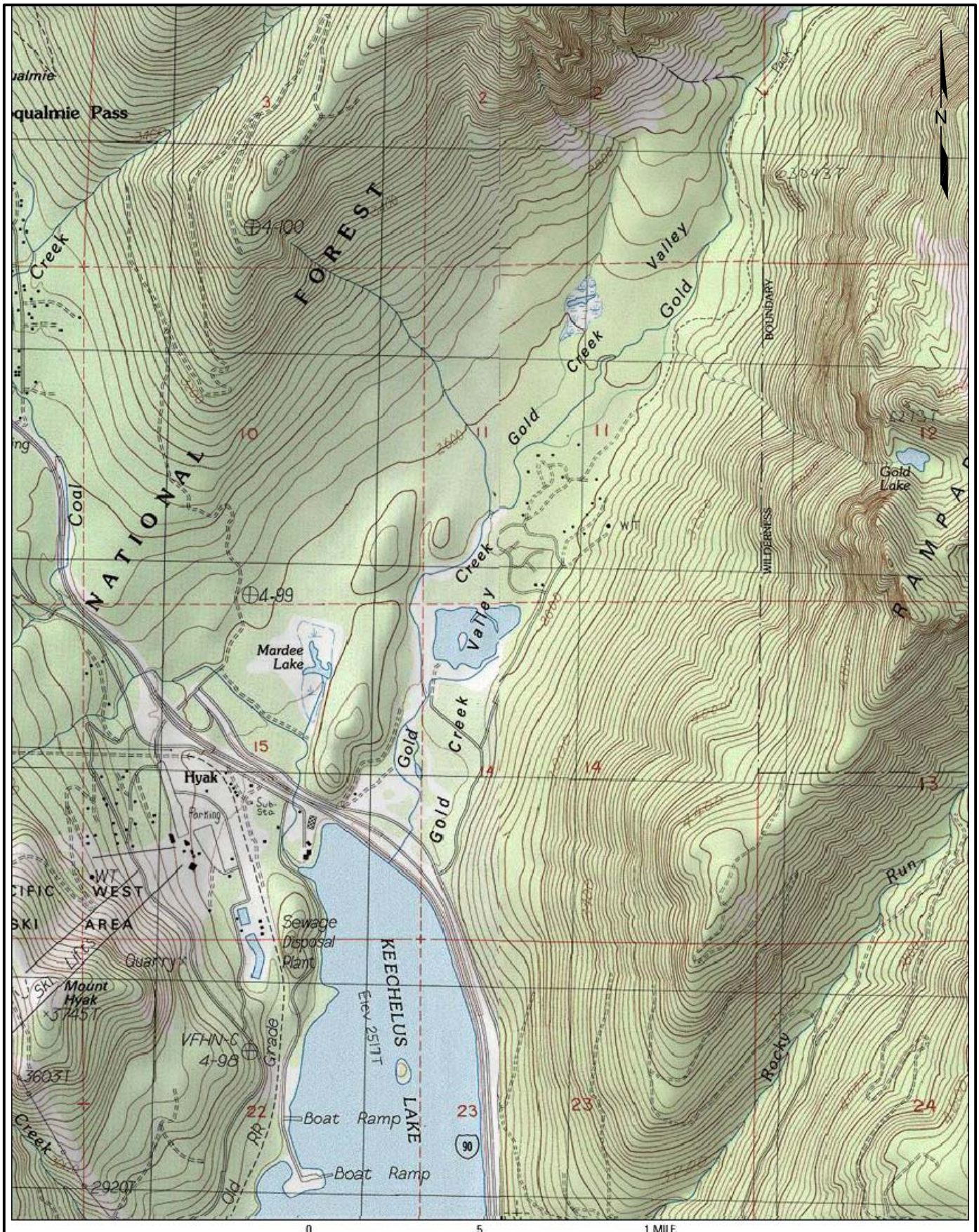

FIGURE COURTESY OF
SoundEarth Strategies
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DRAWN BY: NAC
CHECKED BY: APH
CAD FILE:

PROJECT NAME: GOLD CREEK PROJECT AREA
PROJECT NUMBER:
STREET ADDRESS: GOLD CREEK
CITY, STATE: WASHINGTON

FIGURE 1
PROJECT VICINITY MAP

5/4/2011
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SOUNDEARTHINC.COM

MINING CLAIMS AREA

GOLD CREEK

PRE-1970S PIT AREAS

1971-ERA EXCAVATION AREA

1970-ERA STOCKPILE AREA

HY AK CREEK

COAL CREEK

FORMER SNOQUALMIE TUNNEL

1950-ERA PIT AREA

1950-ERA STOCKPILE AREA

MINING CLAIMS AREA

FORMER CHICAGO, MILWAUKEE & ST PAUL RAILROAD

FORMER HIGH LAKE LEVEL (PRE-1917)

KEECHELUS LAKE

M I N I N G C L A I M S A R E A

LEGEND

- HISTORICAL SITES
- INDIAN TRAIL/CANOE ROUTE
- TAX PARCELS
- WATER BODY

0 500 1,000 1,500 2,000 Feet

REFERENCES: KITTITAS COUNTY GIS, STREETMAP USA, 1934 &1956 METSKER MAPS, WSDOT 1970-1978 AERIALS & ASBUILTS, "SNOQUALMIE PASS-FROM INDIAN TRAIL TO INTERSTATE", BY YVONNE PRAETER

N

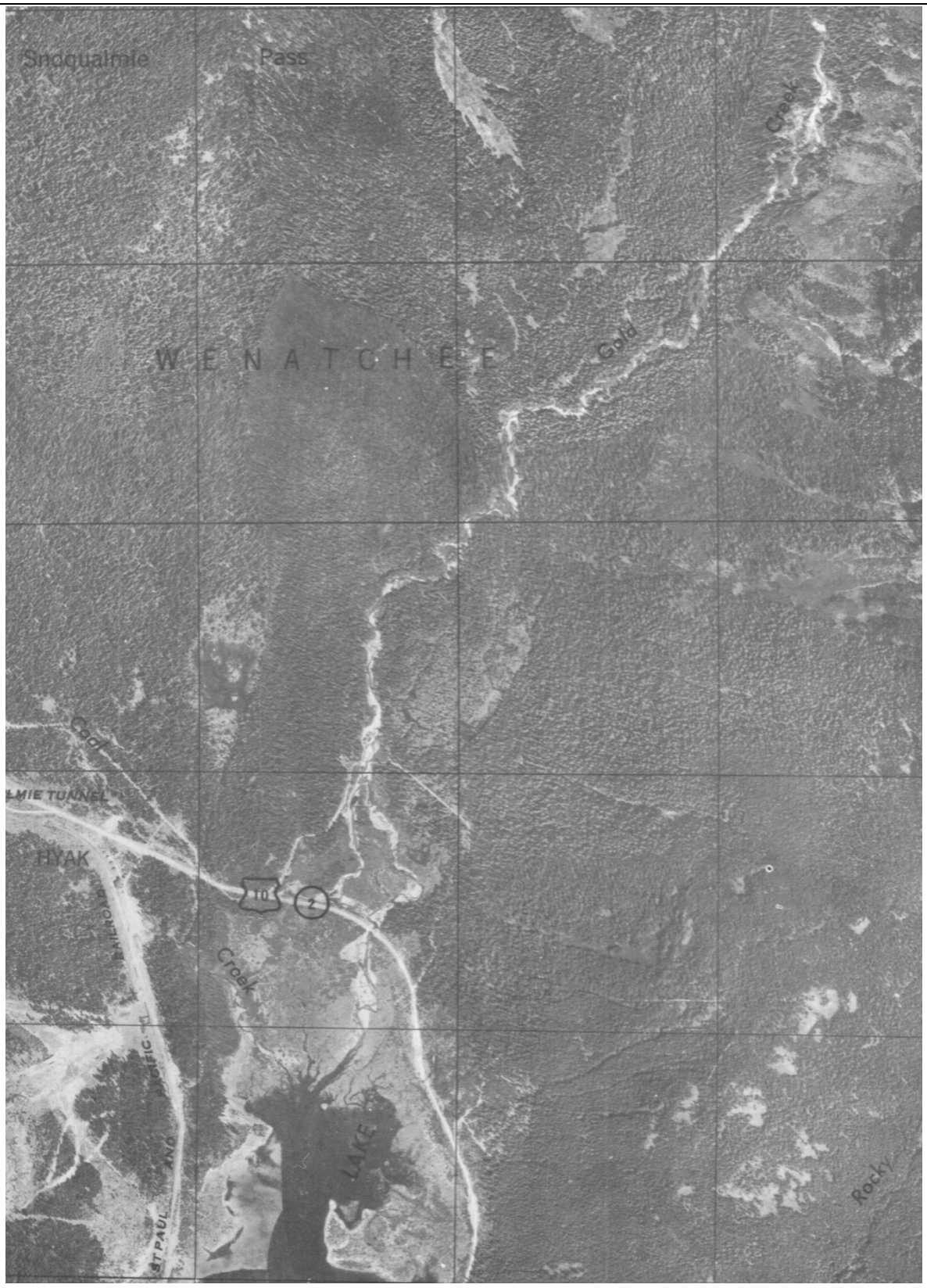
FIGURE 3
HISTORICAL FEATURES MAP

PROJECT NAME:..... GOLD CREEK PROJECT AREA
PROJECT AREA:..... GOLD CREEK
STATE:..... WASHINGTON

DATE:..... 05/18/11
DRAWN BY:..... NAC
CHECKED BY:..... APH

FIGURE COURTESY OF SoundEarth Strategies

APPENDIX A
AERIAL PHOTOGRAPHS



Source: University of Washington

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1944 Aerial Photograph

Source: Washington State Department of Transportation

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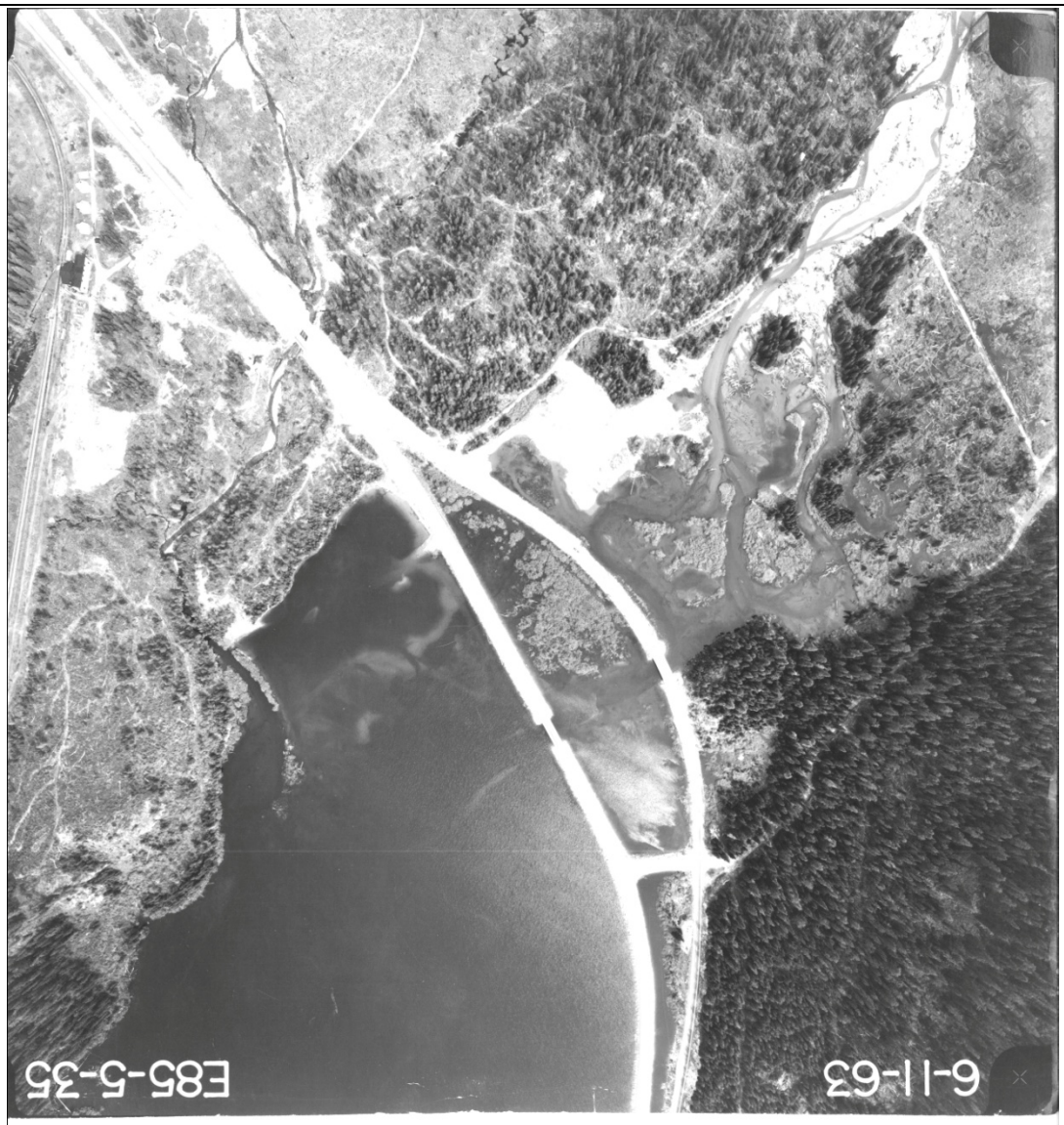
1957 Aerial Photograph



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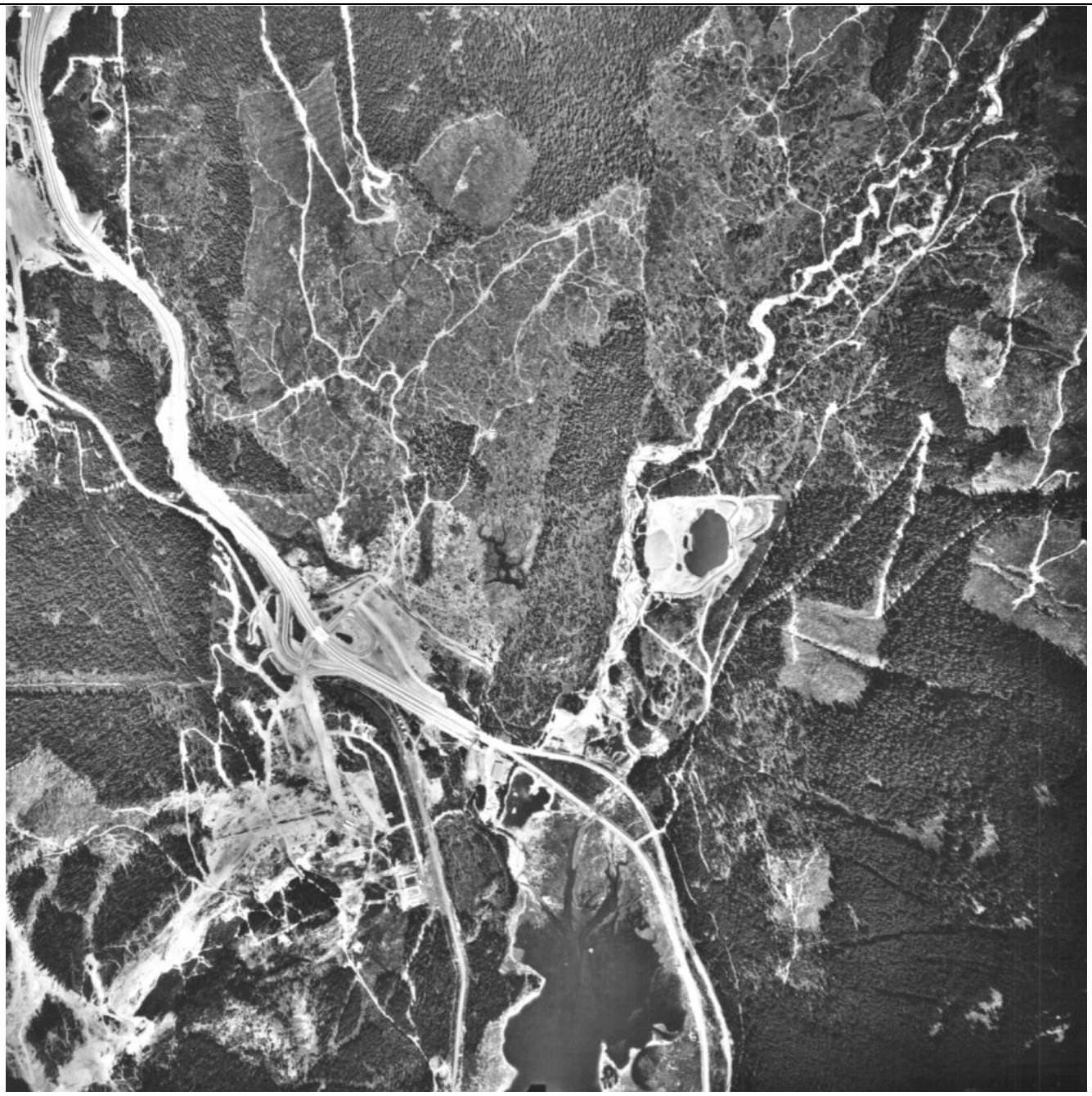
1963 Aerial Photograph



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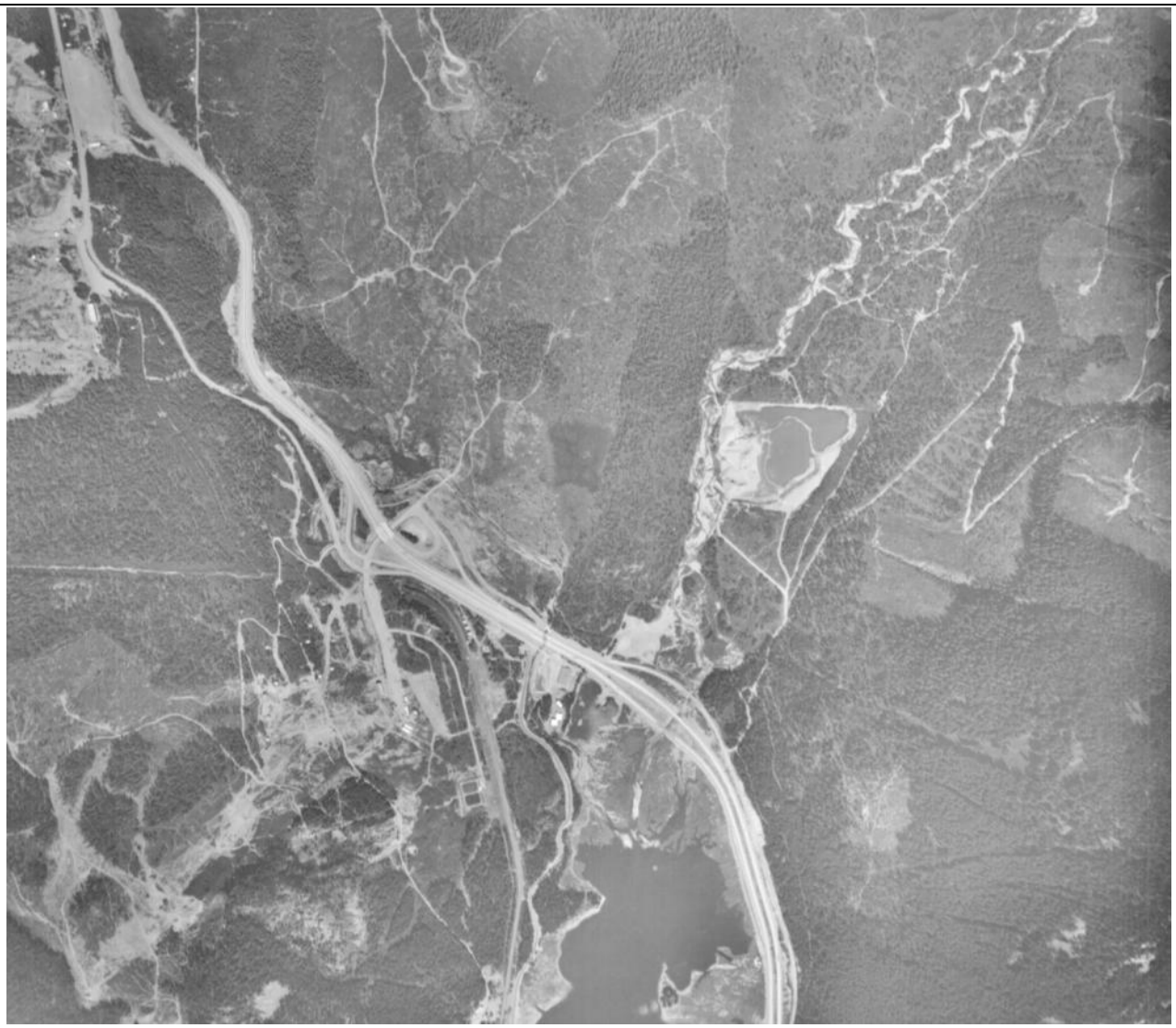
1970 Aerial Photograph



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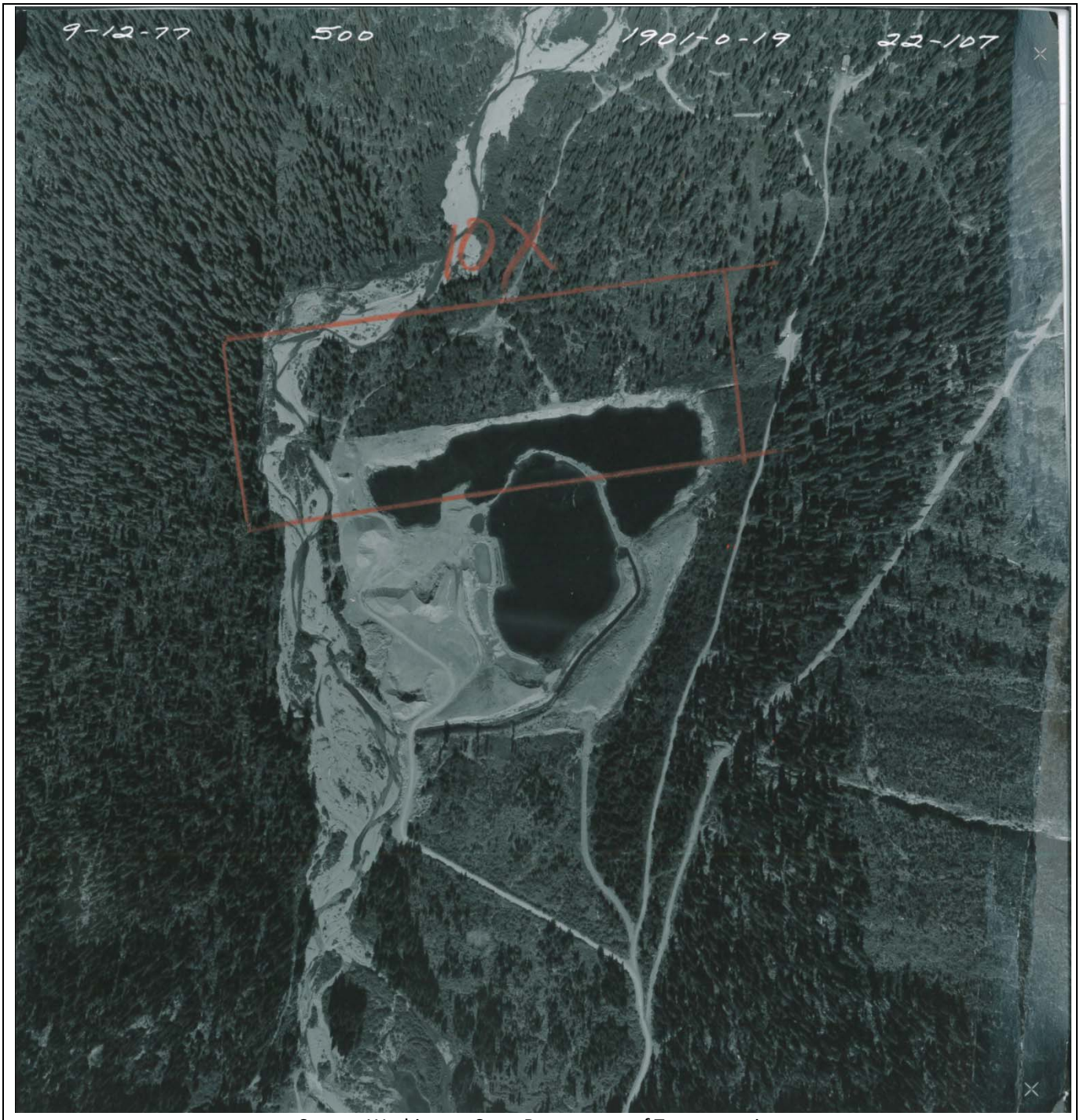
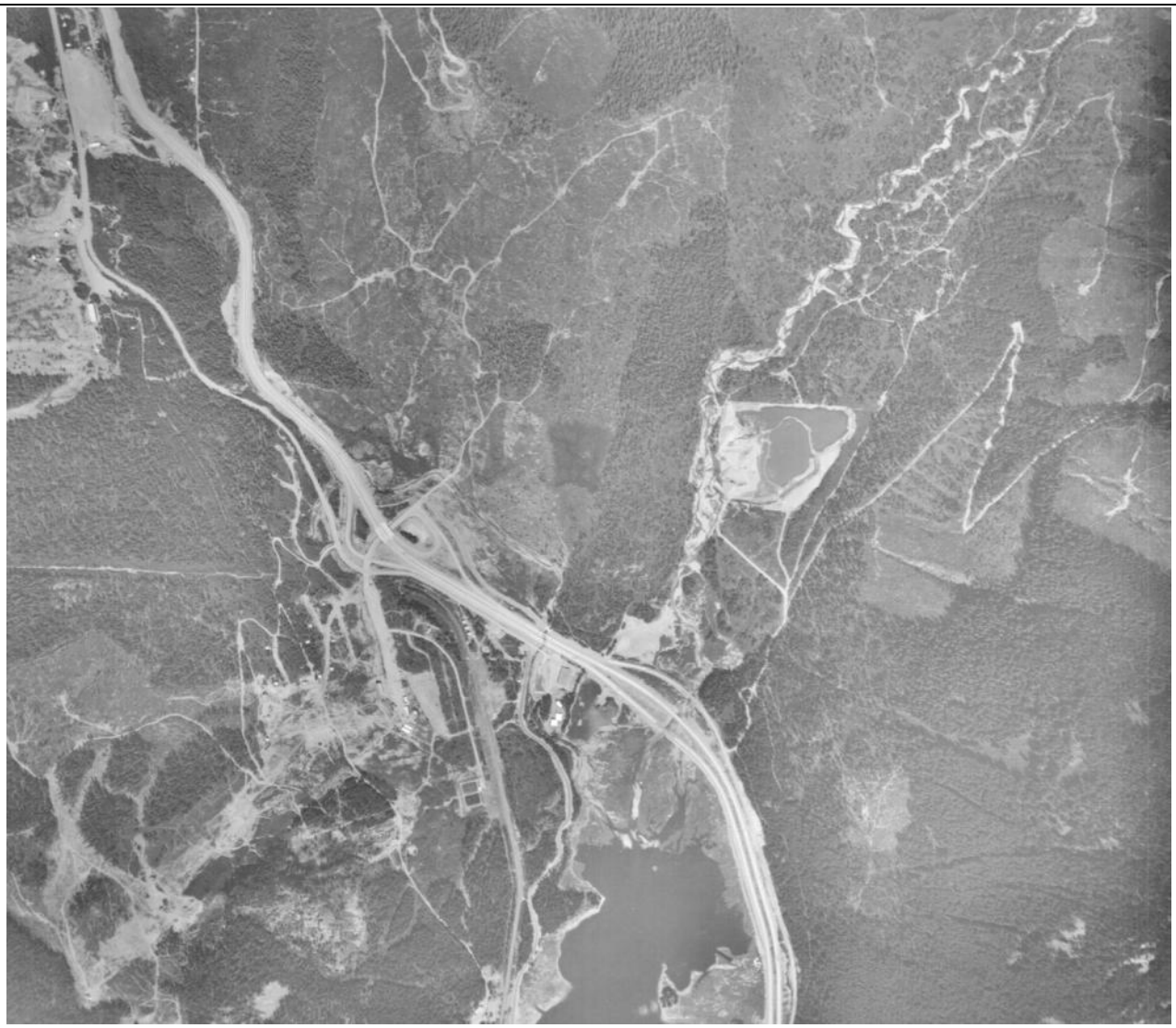
1975 Aerial Photograph



Source: Washington State Department of Transportation

N

1977 Aerial Photograph



Source: USGS, Google Earth

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1994 Aerial Photograph

Source: USGS, Google Earth

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2006 Aerial Photograph

Source: USDA Farm Service Agency, Google Earth

N

2009 Aerial Photograph

Map #	Parcel #	Owner	Acres	Improvements
1	298135	Wenatchee National Forest	639.39	None Listed
2	138135	WSDOT	303.1	None Listed
3	453337	Robertson, Jeff Et Al	8.86	192 ft^2 A-Frame Cabin built in 2003
4	328235	Ski Tur Valley Maintenance Assoc.	44.77	Ski Tur Housing development
5	954931	Cascade Land Conservancy	20.01	None Listed
6	748335	Christensen, Robert Trustee For (Class 4a Creditors)	8.72	Ski Tur Housing development
7	423337	Skone, Donald S. Etux	4.76	1,356 ft^2 SFR built in 2000 with septic service
8	433337	Skone, Suzanne S	5.35	1,808 ft^2 SFR built in 1998 with septic service
9	443337	Cascade Land Conservancy	5.57	None Listed
10	788335	Wenatchee National Forest	619.34	None Listed
11	373733	Miller, Michael	20.66	None Listed
12	798335	Darland, Michael L Etux	20	None Listed
13	937836	Darland, Michael L Etux	20	None Listed
14	617836	Darland, Michael L Etux	20	None Listed
15	287836	Darland, Michael L Etux	16.8	None Listed
16	None	None	--	--
17	534236	Kerslake, Dale E.	0.54	None Listed
18	544236	WSDOT	11.06	None Listed
19	238335	M L Mathieu Properties Llc	3.8	None Listed
20	248335	Pierce, Lee G Etux	0.42	1,512 ft^2 SFR with garage, with septic system and fuel tank.
21	028335	WSDOT	9.48	Salt storage shed, wash bay, 3 USTs
22	11810	WSPR	1.99	None Listed
23	038335	ASD Hyak LLC	17.4	None Listed
24	018335	WSPR	2	None Listed
25	868335	WSPR	4.5	None Listed
26	258335	Ravikovich, Alexander Pynda, Oleg	3.16	None Listed
27	168335	Puget Sound Energy	1.28	None Listed
28	858335	Hunter Michael Etux	0.56	None Listed
29	158635	Schneider, Ronald Etux	0.4	Bavarian Condos - 620 ft^2 condo built in 1985
30	908335	Craven, Greg	0.86	None Listed
31	808335	Mardee Lake, Inc.	50	None Listed
32	818335	Mardee Lake, Inc.	97.6	None Listed
33	15226	Cascade Land Conservancy	215.6	Designated as agricultural land
34	886036	SPUD	0.07	SPUD Wastewater Treatment Plant
35	171636	Hunter Michael Etux	0.005	None Listed

Notes
ft2 = square feet
SFR = single-family residence
SPUD = Snoqualmie Pass Wastewater Treatment Plant
WSDOT = Washington State Department of Transportation
WSPR = Washington State Parks and Recreation

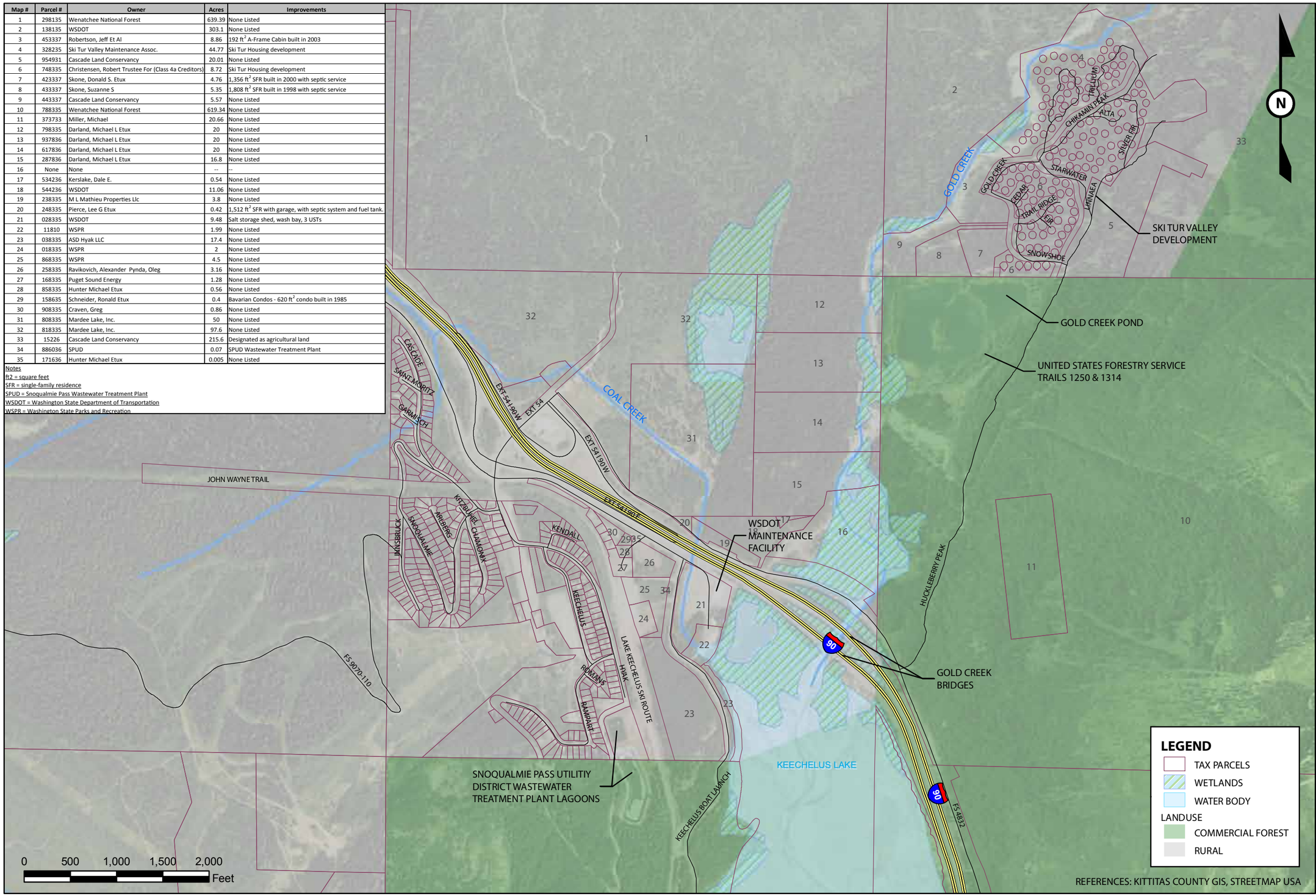


FIGURE 2
CURRENT FEATURES MAP

PROJECT NAME:..... GOLD CREEK PROJECT AREA
PROJECT AREA:..... GOLD CREEK
STATE:..... WASHINGTON

DATE:..... 05/18/11
DRAWN BY:..... NAC
CHECKED BY:..... APH

FIGURE COURTESY OF SoundEarth Strategies

APPENDIX B
PIT SITE PS-S-156 DESIGN PLANS

REGION NO.	STATE	FEDERAL AID PROJECT NO.	SHEET NO.
8	WASH.	I-90-2(82)51	12 of 88

PIT SITE PS-S-156 EXTENSION

MATERIAL EXISTING IN STOCKPILE:

~~CRUSHED SURFACING TOP COURSE~~	~~51,800 TON~~
~~BALLAST~~	~~97,300 TON~~

T. 22 N., R. 11 E. W.M.

SW 1/4 SW 1/4 SEC. 11

SE 1/4 SW 1/4 SEC. 11

EXISTING INTERMITTENT DRAIN

SECTION CORNER FOUND ROCK WITH WITNESS TREES

10 11 15 14

1724.00' S89° 23' 30"E

919.78' S89°23'30"E

11 4

1/4 CORNER FOUND ROCK WITH WITNESS TREES

S16°47'45"W 405.04'

NW 1/4 NW 1/4 SEC. 14

NE 1/4 NE 1/4 SEC. 15

PIT SITE PS-S-156 EXTENSION

PERVIOUS DAM

SETTLING POND

EXISTING POND

CREEK

GOLD

1322.83' N01°13'30"E

SPAWNING STREAM

EAST CUT ROAD

NE 1/4 NW 1/4 SEC. 14

S34°30'15"W 1130.00'

N89°09'03"W 995.14'

SW 1/4 NW 1/4 SEC. 14

APPROX. 0.7 MILE TO PROJECT

40'

40'

HAUL ROAD EASEMENT

100 50 0 100 200

SCALE IN FEET

FOR "AS CONSTRUCTED" PLANS ONLY

SR 90 **MP 55.11 TO MP 58.57**

HYAK TO WOLFE CREEK

KITTITAS COUNTY

PIT SITE PS-S-156 EXTENSION & STOCKPILE

WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS
OLYMPIA WASHINGTON
GEORGE O. FANN CHAIRMAN

APPROVED June 10, 1971

CONTRACT NUMBER 9204

SHEET 12 OF 88 SHEETS

SR 90/288

REGION NO.	STATE	FED. AID PROJECT NO.	SHEET NO.
8	WASH	I-90-2(76)55	4 OF 24

STOCKPILE AREA FOR FUTURE CONTRACT

MATERIAL ~~TO BE~~ STOCKPILED

CRUSHED SURFACING TOP COURSE	~~51,800~~ 32,700 TONS
BALLAST	~~32,700~~ 22,700 TONS
	~~84,500~~ 55,400

T. 22 N., R. 11 E. W.M.

SW¼ SW¼ SEC. 11

SE¼ SW¼ SEC. 11

EXISTING INTERMITTENT DRAIN

10' (MIN.)

SECTION CORNER FOUND ROCK WITH WITNESS TREES

1724.00'
S89°23'30"E

919.78'
S89°23'30"E

1/4 CORNER FOUND ROCK WITH WITNESS TREES

EXIST. STOCKPILE

PROPOSED STOCKPILE AREA

PLANT & STOCKPILE AREA

APPROX. LIMITS OF EXCAVATION THIS PROJECT

S16°47'45"W
405.04'

10' (MIN.)

EXIST. DIRT ROAD

EXIST STOCKPILE

NW¼ NW¼ SEC. 14

PIT SITE PS-S-156 EXTENSION

NE¼ NE¼ SEC. 15

SETTLING POND

EXISTING STRIPPINGS STOCKPILE

CREEK

GOLD

1322.83'
N01°13'30"E

STRIPPINGS REMOVED ON THIS PROJECT

NE¼ NW¼ SEC. 14

EXIST. STOCKPILE

PROPOSED STOCKPILE AREA

TEMPORARY STOCKPILE AREA FOR STRIPPINGS

S32°30'15"W
1130.00'

N89°09'03"W
995.14'

Appro 3.5 miles to 100 site

ACCESS ROAD (TO BE CONSTRUCTED)

SW¼ NW¼ SEC. 14

PIT SITE PS-S-156 EXTENSION

100 50 0 100 200
SCALE IN FEET

PIT SITE PS-S-156 EXTENSION

AVAILABLE RAW MATERIAL 155,000 CU. YDS.

SOURCE FOR THE PRODUCTION OF: GRAVEL BACKFILL FOR PIPE BEDDING, CRUSHED SURFACING, BALLAST, MINERAL AGGREGATE FOR ASPHALT CONCRETE, SAND AND CEMENT CONCRETE AGGREGATE.

~~55,255~~ 61,360

STRIPPING QUARRIES AND PITS INCL. HAUL ~~70,000~~ CU. YDS.

REMOVING STOCKPILED STRIPPINGS INCL. HAUL ~~100,000~~ CU. YDS.

NOTE: FOR RECLAMATION PLAN SEE SHEET 24.

LOCATION OF
PONDS
SETTLING PONDS
STOCKPILES OF
STRIPPINGS
SURFACING
CONC. AGG. (OTHER PROJECTS)

DATE	REVISION	BY
5-22-70	Source of Material Block Revised	G.H.

FOR BIDDING PURPOSES ONLY

SR 90 MP 58.58 TO MP 59.79

LAKE KEECHELUS SLIDE VICINITY

KITTITAS COUNTY

PIT SITE PS-S-156 EXTENSION

WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS
OLYMPIA, WASHINGTON

APPROVED April 24, 1970

CONTRACT NUMBER 8830

SHEET 4 OF 25 SHEETS

SR 90/251

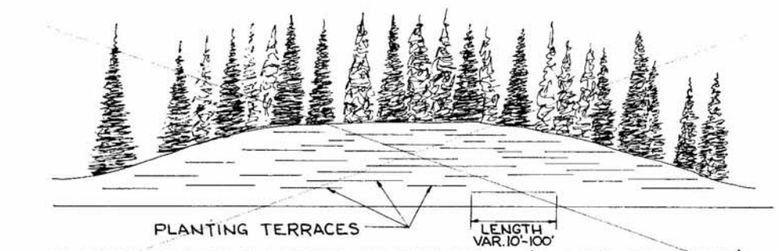
MASS PLANTING EXPLANATIONS

REGION NO.	STATE	FED. AID PROJECT NO.	SHEET NO.
8	WASH.	I-90-2(82)51	52 of 88

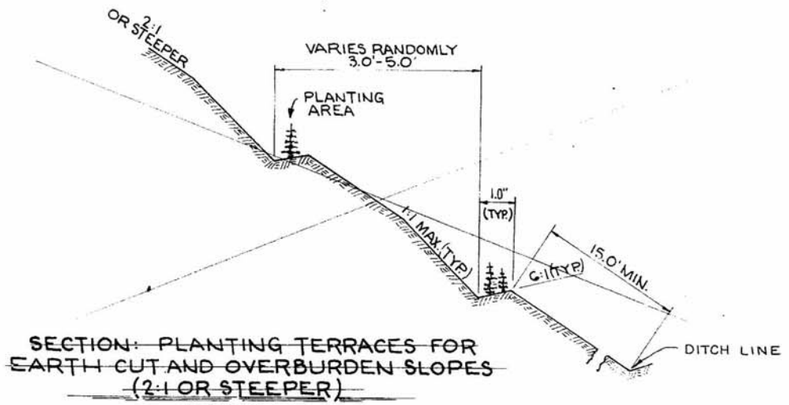
PLANT LIST

SCIENTIFIC NAME	COMMON NAME	SIZE	DESCRIPTION	U.S.A.S.* SECTION	TOTAL
PSEUDOTSUGA MENZIESII	COMMON DOUGLAS FIR	6"-9"	~~B.R.~~ CONTAINER	1003	1750 ~~4870~~
ABIES GRANDIS	GRAND FIR	6"-9"	~~B.R.~~ "	1003	875 ~~2440~~
PINUS CONTORTA LATIFOLIA	LODGEPOLE PINE	6"-9"	~~B.R.~~ "	1003	875 ~~2440~~
VACCINIUM MEMBRANACEUM	BIG WHORTLEBERRY	6"-12"	~~B.R.~~ "	1002	15,791 ~~9060~~
SORBUS AMERICANA	MOUNTAIN ASH	6"-12"	~~B.R.~~ "	1002	720 ~~1220~~
~~PACHISTIMA MYRSINITES~~ SYMPHORICARPOS CIRCINATUS	~~MYRTLE PACHISTIMA~~ CREEPING SNOWBERRY	6"-12"	~~B.R.~~ "	1002	19,125 ~~12,070~~
ACER CIRCINATUM	VINE MAPLE	6"-12"	~~B.R.~~ "	1002	488 ~~1570~~

* U.S.A.S. - U.S.A. STANDARD FOR NURSERY STOCK - 1969
(SEE SPECIAL PROVISIONS)



ELEVATION OF EARTH CUT SLOPE (2:1 OR STEEPER)
(SHOWING TYPICAL PLACEMENT OF PLANTING TERRACES)
NO SCALE



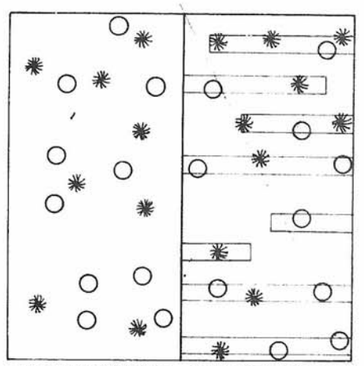
SECTION: PLANTING TERRACES FOR EARTH CUT AND OVERBURDEN SLOPES (2:1 OR STEEPER)
NO SCALE

PAYMENT: "ROADWAY EXCAVATION" (SEE SPECIAL PROVISIONS)

EARTH CUT SLOPES & PLANTING POCKETS

COMMON NAME	SIZE	QUANTITY/ACRE		AVERAGE SPACING
CONIFERS				
COMMON DOUGLAS FIR	6"-9"	~~1000~~ 545	RANDOMLY MIXED	~~3¼'~~ 3½'
GRAND FIR	6"-9"	~~500~~ 300		
LODGEPOLE PINE	6"-9"	~~500~~ 300		
SHRUBS & TREES				
~~BIG WHORTLEBERRY~~	~~6"-12"~~	~~500~~		
MOUNTAIN ASH	6"-12"	~~250~~ 240		
~~MYRTLE PACHISTIMA~~	~~6"-12"~~	~~1000~~		
VINE MAPLE	6"-12"	~~250~~ 160		

THE NUMBER OF PLANTS IN A GIVEN AREA IS TO BE DETERMINED BY THE ACREAGE OF THE AREA, MULTIPLIED BY THE QUANTITIES PER ACRE. THE AVERAGE SPACING FIGURE IS ONLY A GUIDE, AS THE DIAGRAMS SHOW; THE ACTUAL SPACING SHOULD VARY GREATLY, TO GIVE AN APPEARANCE OF NATURAL GROWTH.



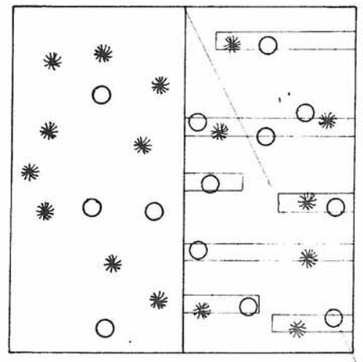
LESS THAN 2:1 SLOPE 2:1 SLOPE OR STEEPER

EXAMPLE OF PLANTING LAYOUT

✱ MIXED CONIFERS
○ MIXED SHRUBS & TREES
▭ PLANTING TERRACES

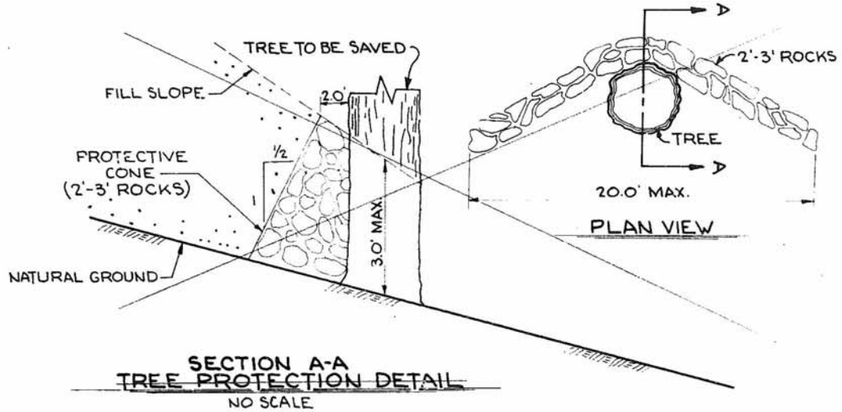
OBLITERATED ROADWAY

COMMON NAME	SIZE	QUANTITY/ACRE		AVERAGE SPACING
CONIFERS				
COMMON DOUGLAS FIR	6"-9"	1000	RANDOMLY MIXED	3½'
GRAND FIR	6"-9"	500		
LODGEPOLE PINE	6"-9"	500		
SHRUBS & TREES				
BIG WHORTLEBERRY	6"-12"	250		
MOUNTAIN ASH	6"-12"	250		
MYRTLE PACHISTIMA	6"-12"	500		
VINE MAPLE	6"-12"	675		



EXAMPLE OF PLANTING LAYOUT

✱ MIXED CONIFERS
○ MIXED SHRUBS & TREES
▭ PLANTING TERRACES



SECTION A-A
TREE PROTECTION DETAIL
NO SCALE

PAYMENT: "ROADSIDE CLEANUP" (SEE SPECIAL PROVISIONS)

FOR "AS CONSTRUCTED PLANS" ONLY

SR 90 MP 55.11 TO MP 57.36
HYAK TO WOLFE CREEK
KITTITAS COUNTY

LANDSCAPE NOTES & DETAILS

WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS
OLYMPIA, WASHINGTON

APPROVED June 10, 1971
CONTRACT NUMBER 9204 SHEET 52 OF 88 SHEETS

SR 90/288

HYAK TO WOLFE CREEK
SR 90
KITTITAS COUNTY
SHEET 48 OF 57 SHEETS

T. 22 N., R. 11 E. W.M.

SW¼ SW¼ SEC. 11

NW¼ NW¼ SEC. 14

NE¼ NE¼ SEC. 15

SW¼ NW¼ SEC. 14

NE¼ NW¼ SEC. 14

EXIST. CONIFER TREES & BRUSH

1724.00' S89°23'30"E

1322.83' N01°13'30"E

995.14' N89°09'03"W

405.04' S16°47'45"W

1130.00' S36°30'15"W

STOCKPILE

PIT SITE PS-S-156 EXTENSION

POND

CROSS SECTION LINE

CROSS SECTION

SEEDING, FERTILIZING & FUTURE REFORESTATION

EXISTING INTERMITTENT DRAIN

CONC. AGG.

CONC. AGG. FINE

APPROX. WATER ELEV. 2520

PERVIOUS DAM TO BE CONST. BY OTHERS

SETTLING PONDS

EXIST. POND

CONSTRUCTED BY OTHERS

BALLAST

SPAWNING BEDS TO BE CONSTRUCTED

SPAWNING STREAM

TRIPPING

TRIFFINGS

PERMANENT ACCESS ROAD FOR FUTURE RECREATIONAL ACCESS

EXIST. TIMBER ROAD

GOLD CREEK

TIMBER

2525 2530 2535 2540 2545 2550 2555 2560

STAGE RECLAMATION PLAN FOR PS-S-156 EXTENSION

100 50 0 100 200
SCALE IN FEET

CROSS SECTION LOOKING WEST

SOUTH PIT BOUNDARY — SPAWNING STREAM — EXIST. POND — NORTH PIT BOUNDARY

PIT BOUNDARY — STOCKPILE — EXIST. POND — EXIST. POND — PIT BOUNDARY — EXIST. ROAD

BANKS SLOPED ON 2:1 BETWEEN THESE POINTS ONLY

BACKFILLED STRIPPINGS — 10' MIN.

PIT BOUNDARY — EXIST. POND — EXIST. POND — EXIST. POND — PIT BOUNDARY — EXIST. ROAD

PIT BOUNDARY — SPAWNING STREAM — PIT BOUNDARY — EXIST. ROAD

CROSS SECTION

NOTES:
1. DEPTH OF EXCAVATION - ~~20'~~ 30' BELOW OVERBURDEN
2. POND BANKS DRESSED TO 2:1 (MAX.) TO A POINT 2.0' BELOW MIN LOW WATER
3. AREA FEDERAL LAND - NO ZONING.
4. PROPOSED AND EXISTING LAND USE - RECREATIONAL.
5. FUTURE REFORESTATION PLANTING - W.S.D.H. IN COOPERATION WITH U.S.F.S (NATIVE SPECIES).
6. ~~ALL RESTORED AREAS SHALL BE SEEDED & FERTILIZED IN ACCORDANCE WITH SPECIAL PROVISIONS.~~
7. STOCKPILED MATERIAL FOR USE ON FUTURE PROJECTS.
8. STAGE RECLAMATION. PIT TO BE UTILIZED ON FUTURE PROJECTS.

LEGEND

FOREST TIMBER LINE
ROAD
STRIPPING
STRIPPING STKPL. BOUNDARY

FOR "AS CONSTRUCTED PLANS" ONLY

SR 90 MP 58.58 TO MP 59.79
LAKE KEECHELUS SLIDE VICINITY
KITTITAS COUNTY

RECLAMATION PLAN
PIT SITE PS-S-156 EXTENSION

WASHINGTON STATE HIGHWAY COMMISSION
DEPARTMENT OF HIGHWAYS
OLYMPIA, WASHINGTON

APPROVED April 24, 1970
CONTRACT NUMBER 8830
SHEET 24 OF 25 SHEETS

SR 90/251

APPENDIX C
KEECHELUS DAM SITE PLAN

LAKE KEECHELUS

Scale - 1"=400'

Borrow Pit

Crib Dam

Concrete Conduit

Proposed Relocation

State Road

Old State Road to Snoqualmie Pass

To Seattle

Meadow Creek

Cabin Sta.

Road

RIVER

YAKIMA