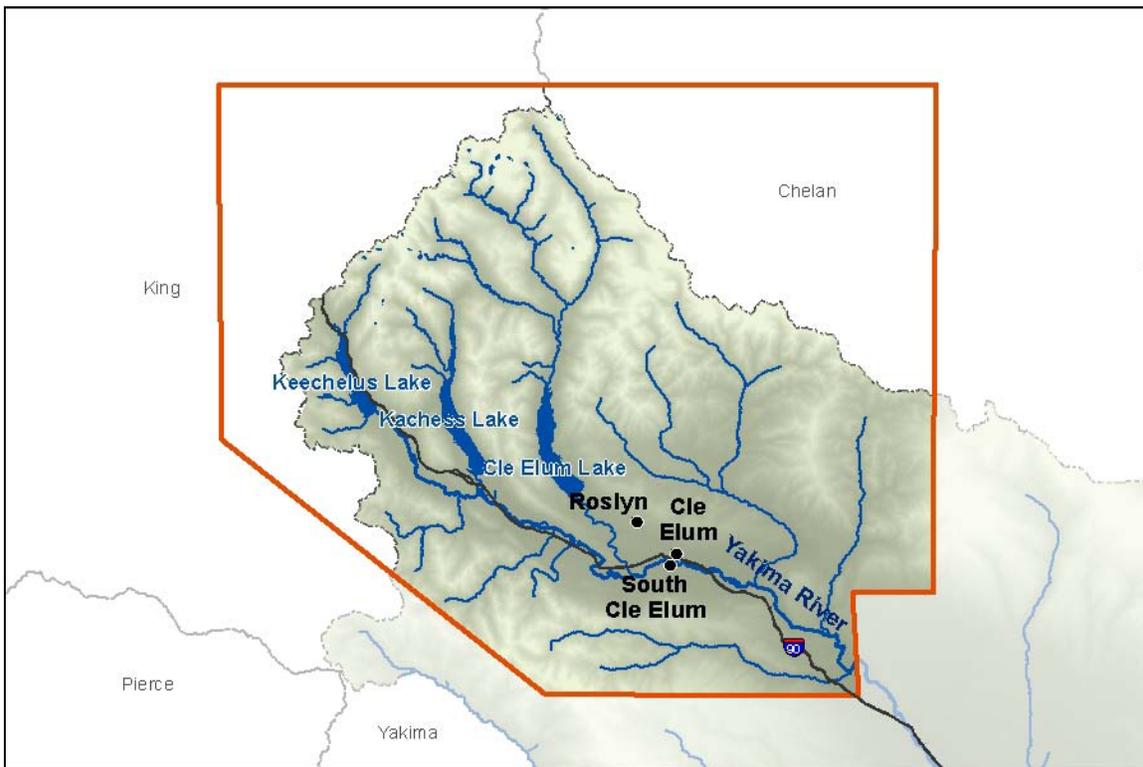


CHAPTER 3. UPPER COUNTY

This chapter describes the conditions within the shoreline inventory area of upper Kittitas County (including the City of Cle Elum and Town of South Cle Elum). The upper Kittitas County shorelines include the upper Yakima River and its tributaries from the Yakima River headwaters to the Taneum Creek confluence (Figure 3-1). The 35 streams and 29 lakes and ponds within the upper county are described in terms of their physical characteristics, ecological conditions, and human environment/land use characteristics. Readers are encouraged to review Chapter 2 and the maps in Appendix A for additional context on the information presented here.

Figure 3-1. “Upper County” shorelines.



Characteristics for the shoreline reaches are detailed on “reach sheets” included in this chapter. The information on the reach sheet is based upon available county-wide data sources that describe key physical, ecological, and land use characteristics. A description of the available data sources, including data limitations, is presented in Appendix B. Shoreline reaches that are located entirely on federal lands (e.g., National Forest lands) and therefore are generally not subject

1 to shoreline jurisdiction do not have reach sheets and are only briefly described
2 below.

3 **3.1 Keechelus Lake**

4 Keechelus Lake is located at the headwaters of the Yakima River in the northwest
5 portion of Kittitas County within the Cascade Range. It is designated as a “lake of
6 statewide significance.” The lake is an impoundment of the Yakima River behind
7 Keechelus Dam, used as a reservoir to supply irrigation water as part of the Yakima
8 Project.

9 **3.1.1 Physical Characterization**

10 Keechelus Lake was a natural lake prior to construction of Keechelus Dam on the
11 upper Yakima River (RM 214.5) in 1917. Keechelus Lake measures approximately
12 5.5 miles long and 0.7 miles wide and is oriented in a northwest to southeast
13 direction. The maximum depth is estimated at 310 feet. The lake surface area is
14 2,526 acres when filled to capacity. The active storage of the reservoir is
15 approximately 157,800 acre-feet behind the 128-foot-high dam at the lake’s
16 southern extent (Haring 2001). Major tributaries to Keechelus Lake are described in
17 Section 3.2.

18 Interstate 90 traverses the eastern shoreline of the lake. Steep slopes are mapped
19 near the northeastern, central, and southwestern portions of the lake (Kittitas
20 County 2012). The FEMA 100-year floodplain notably extends into the inventory
21 area at several locations, including: near the mouths of Coal and Gold creeks, along
22 the western shoreline south of the mouth of Cold Creek, south of the mouth of
23 Roaring Creek, and along the shoreline between the mouth of Meadow Creek and
24 Keechelus Lake Dam (FEMA 1996).

25 **3.1.2 Habitats and Species**

26 **3.1.2.1 Fish Use**

27 Keechelus Lake supports spawning of Dolly Varden/bull trout and kokanee. Other
28 species present include burbot, eastern brook trout, mountain whitefish, rainbow
29 trout, and westslope cutthroat (StreamNet 2010).

30 The lack of upstream fish passage facilities at Keechelus Dam has precluded
31 anadromous salmonids from accessing approximately 9 miles of highly productive
32 historic habitat (Haring 2001). The dam isolated the populations of bull trout and
33 redband trout that live in Keechelus Lake and spawn in Gold Creek but cannot

1 migrate to the Yakima River below the dam. The Keechelus Lake bull trout stock is
2 considered critical because of its low numbers and isolation (WSDOT 2005, 2008).
3 Bull trout were listed as a threatened species (under the federal Endangered Species
4 Act) in 1999.

5 Before construction of dams on the Yakima River in the early 1900s, Middle
6 Columbia River steelhead had access to most of the upper Yakima River watershed
7 including Keechelus Lake (Haring 2001; WSDOT 2005, 2008). Middle Columbia
8 River steelhead were federally listed as threatened in 1999. Major factors for their
9 decline in the Yakima River basin include the following (Conley et al. 2009):

- 10 • Alteration of streamflows due to development of irrigation systems;
- 11 • Fish passage barriers at roads and dams;
- 12 • Diking, channel simplification, and floodplain development;
- 13 • Impacts to riparian areas and upland hydrology due to grazing and forestry
14 practices; and
- 15 • Changed ecological dynamics, including reduction in beaver populations,
16 reductions in delivery of oceanic nutrients to headwaters by salmon,
17 introduction of exotic species, and increased predation by native species.

18 Efforts are underway to restore anadromous fish habitat upstream of Keechelus
19 Dam. The Integrated Water Resource Management Plan for the Yakima River basin
20 proposes installing upstream and downstream fish passage facilities at Keechelus
21 Dam, subject to further evaluation of alternatives to determine the most feasible
22 approach for providing passage (Reclamation and Ecology 2011a).

23 The "K to K" pipeline is another project proposed under the Integrated Plan. Water
24 would be conveyed from Keechelus Lake to Lake Kachess to reduce flows and
25 improve habitat conditions during high flow releases below Keechelus Lake and
26 provide more water storage in Lake Kachess for downstream needs. The pipeline
27 may also help Lake Kachess refill after using inactive storage (Reclamation and
28 Ecology 2011a).

29 *3.1.2.2 Water Quality*

30 Keechelus Lake is on Ecology's 303(d) list for polychlorinated biphenyls (PCBs) and
31 dioxin. According to a 1993 assessment by Ecology, the trophic status of the lake
32 was listed as oligotrophic, indicting a lack of nutrients such as phosphates, nitrates,
33 and organic matter, and high dissolved oxygen levels (Rector 1996).

1 *3.1.2.3 Riparian Habitat Conditions (Land Cover)*

2 Within the shoreline inventory area, the shores of Keechelus Lake are largely
3 unvegetated. I-90 runs along the eastern side of the lake, where the shoreline is
4 steep with some near vertical rock outcrops. Immediately outside of the shoreline
5 inventory area, vegetation is mainly commercial timberland in various stages of
6 succession. Some mature forest is present at the south end of the lake near I-90
7 (WSDOT 2005).

8 *3.1.2.4 Wetlands*

9 A fringe of unconsolidated shore, emergent, and scrub-shrub wetlands is associated
10 with the shoreline of Keechelus Lake. The largest wetlands along the lakeshore
11 occur where tributary streams enter the lake (WSDOT 2005).

12 Keechelus Marsh is a large wetland mapped immediately south of the lake.

13 *3.1.2.5 Wildlife Habitats and Species*

14 Several northern spotted owl occurrences (federally listed threatened species) are
15 mapped in the vicinity of Keechelus Lake, although the lake itself is not within
16 mapped critical habitat for this species.

17 Western toads, a state candidate species and federal species of concern, may
18 opportunistically use seasonal wetlands and pools formed in the large delta exposed
19 during the summer low pool of Keechelus Lake (WSDOT 2005).

20 As part of improvements to Interstate 90 between Hyak and Lake Easton, the
21 Washington State Department of Transportation (WSDOT) is constructing
22 "connectivity emphasis areas" or CEAs at several locations. The purpose of the CEAs
23 is to restore or enhance connections between habitats on both sides of I-90 to
24 benefit fish, wildlife, and hydrologic functions. CEAs are planned along Keechelus
25 Lake at several stream crossings: Gold Creek, Rocky Run Creek, Wolf Creek, Resort
26 Creek, Townsend Creek, and Price/Noble Creeks (WSDOT 2011).

27 *3.1.3 Land Use*

28 The entire eastern shore of Keechelus Lake is bordered by I-90, and the southern
29 and western shorelines are primarily National Forest land. The WSDOT Hyak
30 Operation Center is located at the northern end of the lake.

1 3.1.4 Public Access

2 The John Wayne Heritage Trail borders the western shore of the lake; cross country
3 ski trails roughly parallel the western and southern lake shorelines. A boat launch is
4 also located on the western shore of the lake, which can be accessed from Forest
5 Service Road 9070.

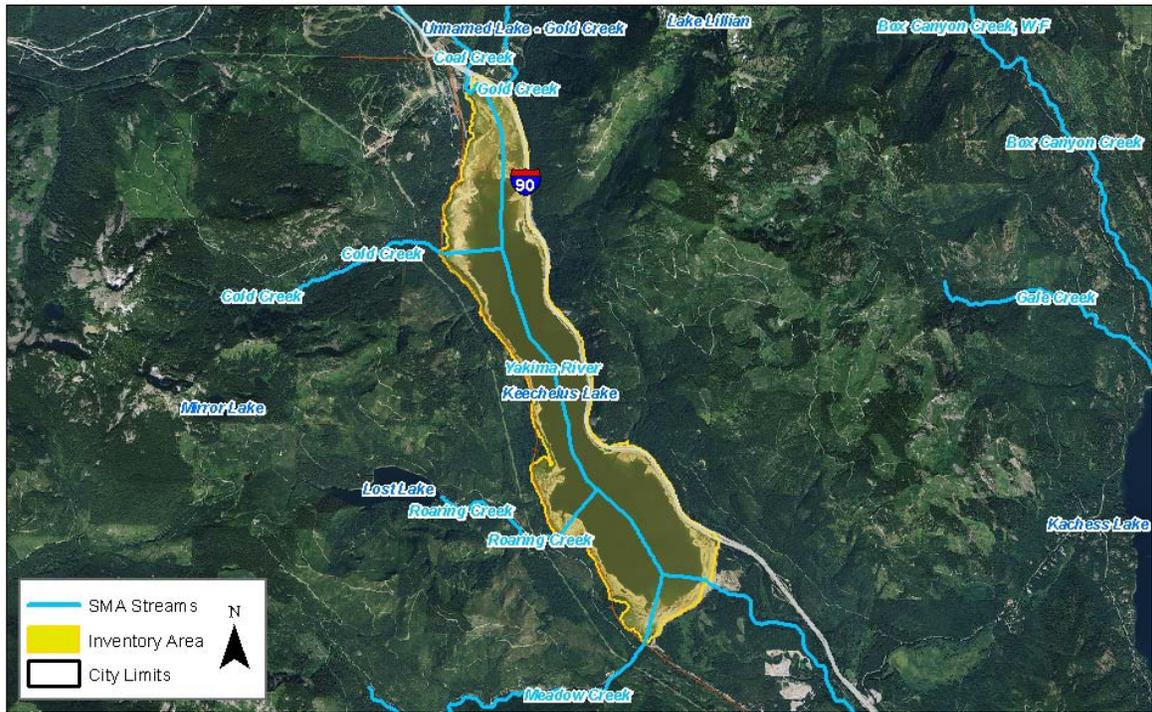
6 3.1.5 Reach Sheet

DRAFT

KEECHELUS LAKE

SHORELINE LENGTH:
49.5 Miles

WATERBODY AREA: 2,408.5 Acres
REACH INVENTORY AREA: 2,772.4 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

The lake is located in a valley, oriented northwest to southeast. The 128-foot-high dam, located at the south end of the lake, regulates pool elevations between 2,517 feet and 2,425 feet.

LAND COVER (MAP FOLIO #3)

This reach is primarily open water (49%), unvegetated (19%), and other (10%). Limited developed land (7%), conifer-dominated forest (7%), shrubland (6%), riparian vegetation (1%), and harvested forest (1%) are also present.

HAZARD AREAS (MAP FOLIO #2)

Roughly one-third of the reach (32%) is located within the FEMA 100-year floodplain and a few landslide hazard areas (1%) are mapped along the eastern shoreline of the lake.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the lake provides spawning habitat for Dolly Varden/bull trout and Kokanee salmon. The presence of burbot, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for dioxin, PCB, and temperature.

Patches of wetland habitat (3% of the reach) are mapped along the lake shoreline. No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The lake level is controlled by a dam (barrier to fish passage), and I-90 borders the eastern shore.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail is located along the west shore of the lake; cross-country ski trails border the western and southern shorelines of the lake. A boat launch is located on the northwest shore of the lake.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

The primary land use around the lake is forestry (95%), with some rural land along the north shore of the lake (5%). Land ownership is 25% private and 75% public (State and Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Land surrounding Keechelus Lake is zoned for commercial forestry (33%) at the north and south ends, and other (67%) [I-90 and John Wayne Trail] along the western and eastern shores.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A total of 44 recorded sites and 1 National Register site located within the reach. Recorded sites include 22 precontact sites, 13 historic sites, and 9 sites that featured both precontact and historic components.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The lake provides habitat for several priority fish species (including spawning habitat for Dolly Varden/bull trout and Kokanee salmon), but is primarily managed as an irrigation reservoir and has listed water quality impairments.

TERRESTRIAL HABITAT QUALITY

Medium: The lake is connected to a large area of contiguous forest habitat to the west, but the eastern shore is closely bordered by I-90.

VEGETATION FUNCTIONS

Medium: Over half of the lake circumference is bordered by forest cover, while the remaining shoreline has been altered by development (primarily I-90).

HYDROLOGIC FUNCTIONS

Medium: The lake provides significant floodwater storage and it's the origin of the Yakima River, but it is managed as an irrigation reservoir.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Keechelus Dam is a complete barrier to fish passage.
- Many important cultural and archaeological sites are located on the lakeshore.

3

3.2 Keechelus Lake Tributaries

Tributaries to Keechelus Lake with mean annual flows greater than 20 cubic feet per second (cfs) include Gold Creek and Coal Creek (draining to the north end of the lake); Cold Creek (draining to the northwest portion of the lake); and Roaring Creek and Meadow Creek (draining to the southwest and southern sections of the lake shoreline, respectively). Tributary lakes over 20 acres in size in the watershed above the lake include Lost Lake, Mirror Lake, Alaska Lake, Joe Lake, and Lake Lillian. Several of these waterbodies are located on National Forest lands, including Meadow Creek, Cold Creek, Lost Lake, Mirror Lake, Alaska Lake, Joe Lake, and Lake Lillian.

3.2.1 Physical Characterization

Topography within the Keechelus Lake watershed is relatively flat to moderately steep, with extensive flat areas along Gold Creek. Gold Creek experiences low base flows in the summer/early fall and complete dewatering has been observed near the mouth of the stream, despite Gold Creek Pond contributing flow in the lower portion of the stream.

Landslide hazard areas are mapped along each of the tributaries. Lost Lake (the headwaters to Roaring Creek) has a relatively extensive landslide area mapped along its northwestern, southwestern, and eastern shores; the eastern shore landslide area extends over the upper reach of the stream (WDNR 2010). These tributaries have steep slopes mapped adjacent to their upper reaches, with the exception of Coal Creek (Kittitas County 2012). The FEMA 100-year floodplain extends into and beyond the Coal Creek inventory area at its confluence with Keechelus Lake. The floodplain is also mapped along the downstream half of Gold Creek, extending outside of the inventory area for part of this segment. A portion of the western inventory area of Unnamed Lake-Gold Creek Reach 1 is located within the Gold Creek FEMA 100-year floodplain (FEMA 1996). The entire Coal Creek and Gold Creek reaches have potential for channel migration (Ecology 2011).

3.2.2 Habitats and Species

3.2.2.1 Fish Use

Table 4-1 summarizes mapped fish use in tributaries to Keechelus Lake. As discussed in Section 3.1.2, the Keechelus Lake Dam is a major barrier to anadromous fish passage into upper Yakima tributaries.

1 Natural falls at RM 11.4 on Gold Creek act as a barrier to upstream fish passage
2 (Haring 2001). Three overwater structures (bridges associated with I-90 and FS
3 Road 4832) are located over Gold Creek. Two mapped roads (SR 906 and Interstate
4 90) cross over Coal Creek; the latter road crosses the stream at multiple locations. In
5 addition, two culverts on Coal Creek act as fish passage barriers. A culvert at the old
6 Milwaukee Railroad grade (now the John Wayne Heritage Trail) crossing on Cold
7 Creek (100 yards upstream from the mouth) is perched and is a complete barrier to
8 fish passage. In addition, three road culverts on Meadow Creek exceed gradient
9 criteria for fish passage design. Nine other fish passage barrier culverts are located
10 on other tributaries to Keechelus Lake (Haring 2001).

11 Fish passage in Gold Creek is also impaired by channel confinement, lack of riparian
12 vegetation, and upstream dewatering. The highway fill, cut slopes, and drainage
13 structures for I-90 have affected the recharge and connectivity of aquifers in the
14 Gold Creek basin, potentially contributing to dewatering of Gold Creek upstream of
15 I-90. WSDOT recently completed new I-90 bridges over Gold Creek which may
16 improve fish passage (WSDOT 2005; 2008).

17 As shown in Table 3-1, cutthroat trout are common in upper Yakima watershed
18 streams. However, isolation of cutthroat populations by barriers and the presence of
19 introduced brook trout pose threats to the persistence of the cutthroat trout
20 population above Keechelus Dam (WSDOT 2005).

21

1

Table 3-1. Fish Use in Keechelus Lake Tributaries (Source: StreamNet 2010)

Species	Meadow Creek	Lost Lake	Cold Creek	Coal Creek	Gold Creek	Unnamed Lake - Gold Creek	Alaska Lake	Joe Lake	Lake Lillian
Dolly Varden/Bull Trout					S				
Rainbow Trout			P/M		P/M				
Westslope Cutthroat	P/M		P/M	P/M	P/M		P/M	P/M	P/M
Eastern Brook Trout		P/M			P/M				
Kokanee Salmon		P/M		S	P/M, S	S			
Burbot					P/M				
Mountain whitefish					P/M	P/M			

2

P/M = presence/migration; S = spawning

3

3.2.2.2 Water Quality

Lower Meadow Creek has a 303(d) listing for high water temperatures. WSDOT performed water quality monitoring of streams in the upper Yakima River watershed in 2001 as part of the I-90 improvements project. Their sampling found exceedances of state water quality standards in Coal Creek (temperature, turbidity, fecal coliform, dissolved oxygen, and heavy metals) and Gold Creek (temperature, dissolved oxygen). Possible reasons for high temperatures include a lack of riparian vegetation, disruption of groundwater flow by roads and drainage structures, and excessive sediment deposition leading to shallow water. Sediments may be eroded when stream channels are confined, such as by the I-90 bridges; sand applied to I-90 for traction may also contribute excess sediment. Low dissolved oxygen may result from elevated stream temperatures and decomposition of organic matter. Heavy metals are a common pollutant in roadway runoff. (WSDOT 2005)

3.2.2.3 Riparian Habitat Conditions (Land Cover)

The tributaries to Keechelus Lake flow mainly through managed forestland. I-90 crosses the riparian zone of Gold Creek and Coal Creek. The Summit at Snoqualmie Washington Ski Resort is located adjacent to lower Coal Creek. Limited residential development encroaches into the riparian zone along lower Roaring Creek (see Section 3.2.3).

3.2.2.4 Wetlands

Large wetlands are mapped along lower Coal Creek and lower Gold Creek. Before I-90 and the Keechelus Dam were constructed, the floodplain of Gold Creek was likely unrestricted and supported a diverse wetland and riparian community extending to a delta on the historic lake shoreline. Today, the edge of the lake is often drawn down to south of where Gold Creek crosses under I-90, and the Gold Creek delta is exposed (WSDOT 2005).

An unnamed lake is located adjacent to the lower reach of Gold Creek. This lake may have been a historic gravel pit excavated from scrub-shrub and emergent wetland (WSDOT 2005).

3.2.2.5 Wildlife Habitats and Species

One marbled murrelet sighting has been recorded in the Gold Creek Valley (WSDOT 2005). This species is federally listed as threatened.

The Washington Natural Heritage Program maps the Coal Creek shoreline inventory area as habitat for rare moss species.

1 WSDOT and others have identified the Gold Creek corridor as a "Connectivity
2 Enhancement Area", or an area with high potential for reestablishing wildlife travel
3 linkages. This area has a high incidence of deer and elk roadkill, indicating that these
4 species use the area for a movement corridor despite the danger of crossing I-90.
5 This area has also been identified as the best linkage area for other wide-ranging
6 species sensitive to high road densities, such as fisher, wolverine, gray wolf, and
7 grizzly bear. It also provides a good opportunity to link habitat for small mammal,
8 bryophyte, lichen, fungus, vascular plant, and mollusk species that only occur in the
9 Snoqualmie Pass area (WSDOT 2005).

10 3.2.3 Land Use

11 Extensive logging has occurred within the watershed and in the vicinity of each
12 tributary. Other major landscape alterations include a utility corridor that parallels
13 the western shoreline of Keechelus Lake and crosses Cold, Roaring, and Meadow
14 Creeks.

15 The majority of Roaring Creek is located on commercial forest-zoned lands (both
16 private and National Forest), with one moderate-density residential subdivision
17 located near the creek mouth. Land use varies along Coal Creek; the upper and
18 lower ends of the stream are located within the I-90 corridor, while the middle
19 section flows through undeveloped, forested land that is zoned for planned unit
20 development. Additionally, the Summit at Snoqualmie Washington Ski Resort is
21 located adjacent to Coal Creek.

22 The downstream end of Gold Creek is bordered primarily by a moderate-density
23 residential development, private commercial-forest zoned land, and undeveloped
24 land zoned for planned unit development. The remainder of the creek is located on
25 National Forest land.

26 The remaining stream reaches and lakes that drain to Keechelus Lake are located on
27 National Forest land.

28 3.2.4 Public Access

29 Most of the lakes and streams that drain to Keechelus Lake can be accessed by
30 hiking and/or cross-country ski trails, primarily on National Forest lands.

31 3.2.5 Reach Sheets

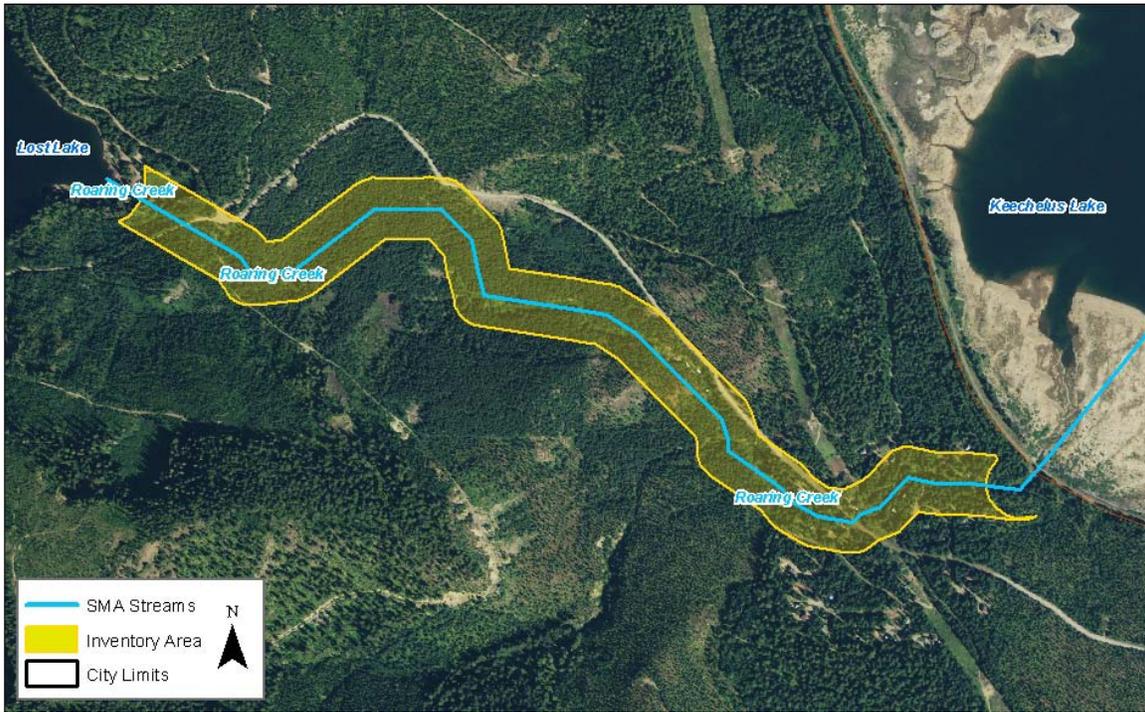
ROARING CREEK

SHORELINE LENGTH:

1.3 Miles

REACH INVENTORY AREA:

63.6 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach descends approximately 600 feet in elevation within a narrow ravine and is generally confined within a single channel.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is mainly harvested forest (70%) and conifer-dominated forest (23%), with patches of riparian vegetation (6%) and developed lands (2%).

HAZARD AREAS (MAP FOLIO #2)

A limited extent (3%) of the reach is located within the FEMA 100-year floodplain. The upstream half of the reach (51%) has mapped landslide hazard areas.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW has not identified any priority fish species within this reach.

No wetlands are mapped in this reach, and no priority habitats or species are identified by WDFW.

WATER QUALITY

The reach is not listed on the State's Water Quality Assessment list of 303 (d) waters.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

There are no shoreline modifications identified within the reach.

PUBLIC ACCESS (MAP FOLIO #4)

A snowmobile trail crosses the upstream and downstream portions of the stream.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use within the reach is forestry (100%). Land ownership is 68% public and 32% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (97%) and other (3%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There is 1 historic and 1 precontact site recorded within the reach. The recorded historic site has been determined not eligible for inclusion on the National Register.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The stream is largely unaltered, but there is no documented priority fish use within the reach.

TERRESTRIAL HABITAT QUALITY

High: The reach is connected to a large area of contiguous forest habitat to the west, and contains minimal existing development.

VEGETATION FUNCTIONS

High: The majority of the reach area consists of dense, mature forest cover.

HYDROLOGIC FUNCTIONS

Medium: The stream is largely unaltered, but is located within a narrow floodplain.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- In the recent past, some resource lands within the reach have been converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions.

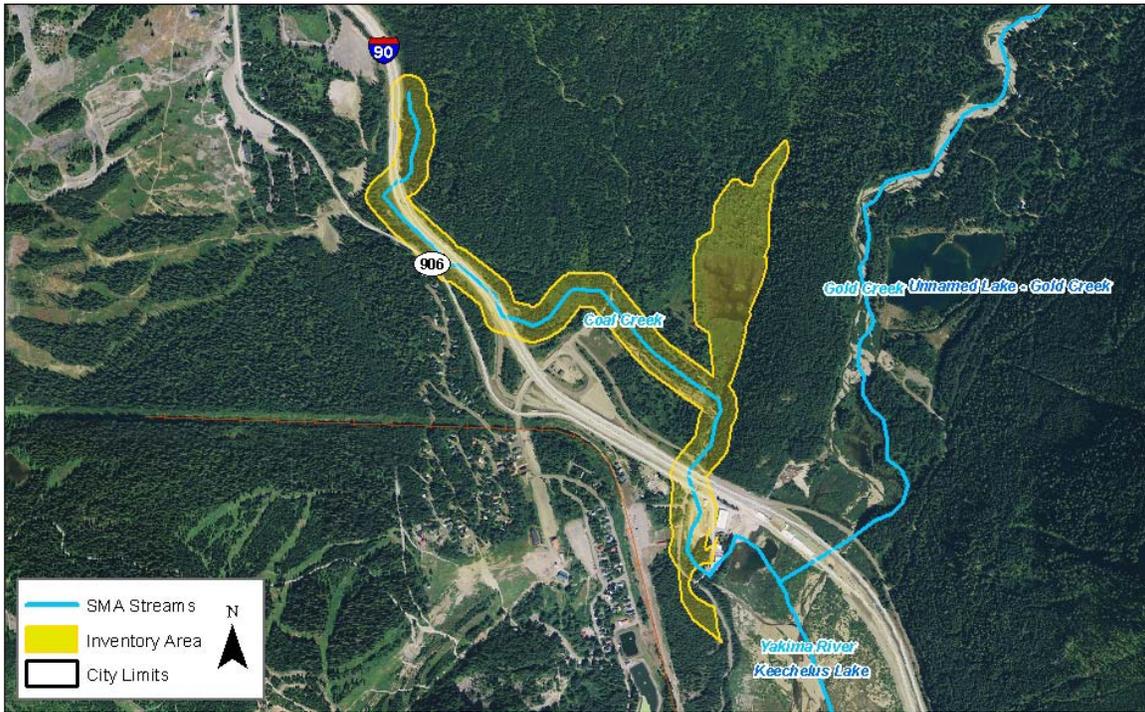
COAL CREEK

SHORELINE LENGTH:

1.7 Miles

REACH INVENTORY AREA:

122.8 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach drops roughly 250 feet in elevation, flowing under several roadways that confine its movement. A downstream portion of the reach is unconfined and exhibits limited channel migration.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is dominated by conifer-dominated forest (41%), other (27%), and developed lands (14%), with limited cover provided by harvested forest (7%), riparian vegetation (5%), unvegetated (4%), and shrubland (3%).

HAZARD AREAS (MAP FOLIO #2)

A small amount (8%) of the reach is located within the FEMA 100-year floodplain and a small number of landslide hazard areas (1%) are mapped near the upstream end of the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for Kokanee salmon. The presence of westslope cutthroat is also mapped.

WATER QUALITY

The reach is not listed on the State's Water Quality Assessment list of 303 (d) waters.

A large wetland (29% of the reach), which extends outside of the regulated shoreline, is mapped on the left bank of the stream. No priority habitats or species are identified in this reach by WDFW.

The Washington Natural Heritage Program maps the Coal Creek shoreline inventory area as habitat for rare moss species.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Portions of the reach are constrained by I-90, and two culverts act as fish passage barriers.

PUBLIC ACCESS (MAP FOLIO #4)

A cross country ski trail borders the northern regulated stream area; a hiking trail crosses the stream in two locations near the upstream extent of the reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use within the reach is rural (100%). Land ownership is 88% private and 12% public (State and Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for mixed use (53%), with some areas of forest & range (12%), urban/suburban residential (6%), commercial (2%), and other [I-90] (22%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There is 1 historic site is recorded within the reach. The site is a portion of the Sunset Highway and Snoqualmie Pass Highway that was built circa 1928.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The stream provides habitat for several priority fish species (including spawning habitat for Kokanee salmon), but has two fish passage barriers and it heavily modified in areas by I-90.

TERRESTRIAL HABITAT QUALITY

Medium: The reach contains a large wetland and is connected to a large area of contiguous forest habitat to the west, but portions of the reach are in close proximity to I-90.

VEGETATION FUNCTIONS

Medium: Much of the reach area consists of dense, mature forest cover, but significant areas have been impacted by the I-90 corridor.

HYDROLOGIC FUNCTIONS

Low: Significant portions of the shoreline and its floodplain are modified by I-90.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Two culverts (associated with I-90) are fish passage barriers.
- Significant portions of the reach are bordered by undeveloped, private land. Future new structures should be set back an adequate distance to protect stream functions and protect structures from channel migration.

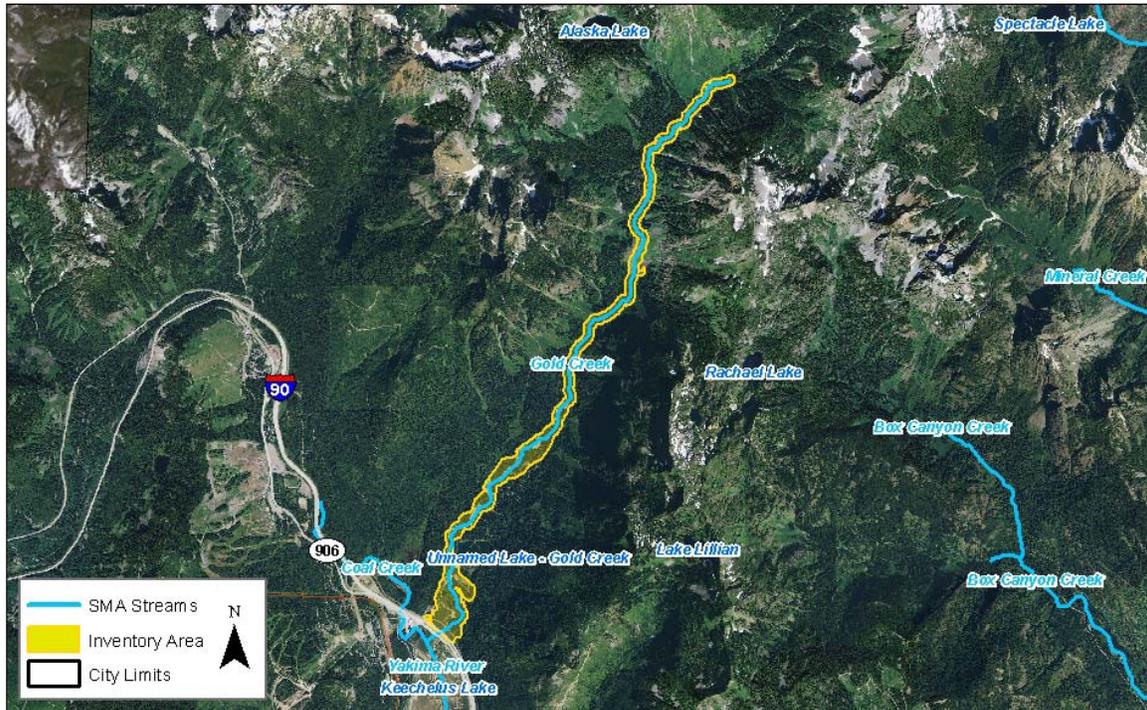
GOLD CREEK

SHORELINE LENGTH:

5.8 Miles

REACH INVENTORY AREA:

360.2 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach transitions upstream to downstream from a narrow ravine to a broad single channel with frequent channel migration, except in the vicinity of the I-90 crossing.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is largely conifer dominated forest (78%). The reach also contains the following land cover: riparian vegetation (8%), other (8%), developed land (3%), shrubland (2%), and unvegetated (1%).

HAZARD AREAS (MAP FOLIO #2)

Approximately 42% of the reach is located within the FEMA 100-year floodplain and a very limited amount of landslide hazard areas (<1%) are mapped in the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for Dolly Varden/bull trout and Kokanee salmon. The presence of burbot, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach meets water quality criteria for temperature, per the State's Water Quality Assessment.

Wetland habitat is mapped at multiple locations along the stream (12% of the reach), primarily along the lower portion of the reach. Priority mountain goat summer range is mapped at the upstream end of this reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

I-90 crosses the reach at the downstream end.

PUBLIC ACCESS (MAP FOLIO #4)

A hiking trail crosses the upstream portion of the stream at several locations.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along upper Gold Creek is forestry (59%), while land use along the lower creek is primarily rural (41%). Land ownership is 41% private and 59% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (59%), with some areas of forest & range (20%), mixed use (13%), and other (7%) at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There is 1 historic site is recorded within the reach. The site is a portion of the Sunset Highway and Snoqualmie Pass Highway that was built circa 1928.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The creek provides spawning habitat for priority fish species, but experiences low summer flows.

TERRESTRIAL HABITAT QUALITY

Medium: The reach contains significant wetland habitat and connectivity to large areas of forest habitat, but has been altered in some areas by I-90, residential development, and timber harvest.

VEGETATION FUNCTIONS

Medium: Much of the reach area consists of dense, mature forest cover, but some riparian areas have been disturbed by I-90, residential development, and timber harvest.

HYDROLOGIC FUNCTIONS

Medium: The upstream portion of the stream is relatively altered, but the downstream portion is impaired by channel confinement and low summer flows.

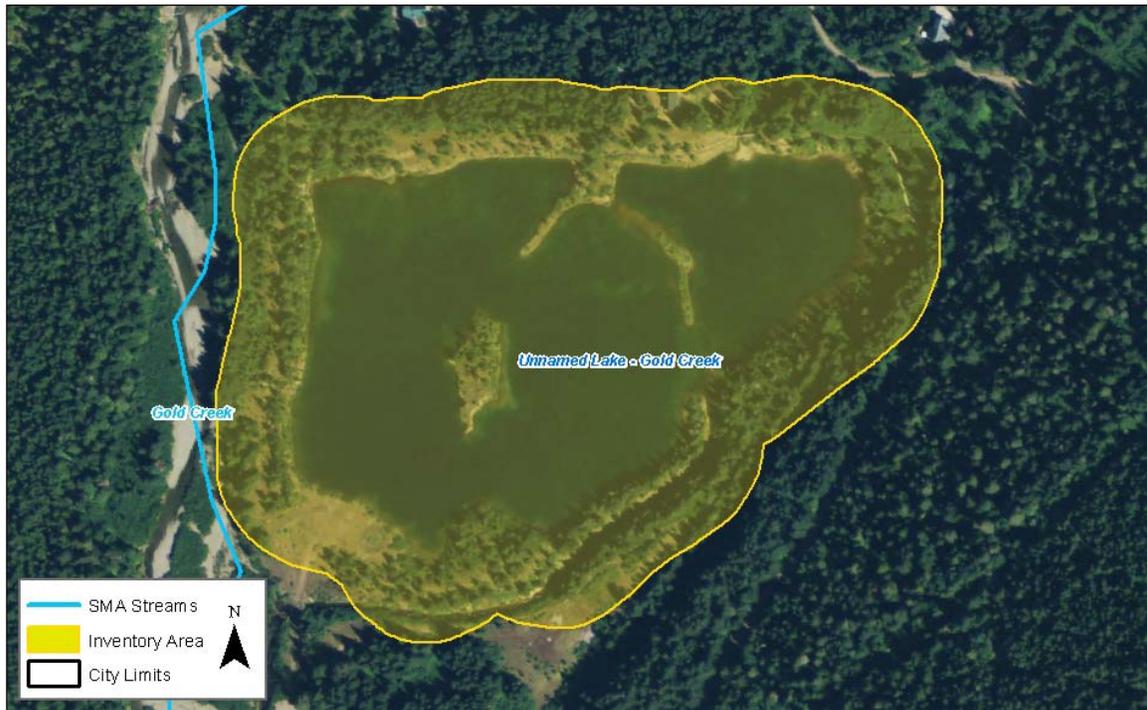
KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Resource lands within the reach have the potential to be converted to more intensive uses (e.g., from agriculture to residential subdivisions). New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Low summer flows in the river are a limiting factor for salmon.

UNNAMED LAKE-GOLD CREEK

SHORELINE LENGTH:
1.3 Miles

WATERBODY AREA: 21.7 Acres
REACH INVENTORY AREA: 45.9 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

With a largely undeveloped shoreline, the waterbody drains to Gold Creek via a single channel at its southeastern extent.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is dominated by open water (41%), conifer-dominated forest (39%), and other (12%). Shrubland (7%) and riparian vegetation (2%) are also present in this reach.

HAZARD AREAS (MAP FOLIO #2)

Approximately 11% of the reach is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the lake provides spawning habitat for Kokanee salmon, and the presence of mountain whitefish is also mapped.

WATER QUALITY

The reach is not listed on the State's Water Quality Assessment list of 303 (d) waters.

Approximately 3% of the shoreline is mapped as wetland habitat. No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

There are no shoreline modifications identified within the reach.

PUBLIC ACCESS (MAP FOLIO #4)

There is no known public access to Unnamed Lake-Gold Creek.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use within the reach is primarily forestry (79%), and rural along the north shore of the lake (21%). Land ownership is 18% private and 82% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (79%), with mixed use (21%) along the northern lake shore.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The lake provides spawning habitat for priority fish species (Kokanee salmon), but fish use is relatively limited.

TERRESTRIAL HABITAT QUALITY

Medium: The lake has an undisturbed connection to Gold Creek to the west and is directly adjacent to undisturbed habitat areas, but much of the reach area is separated from adjacent habitat areas by roads and other development.

VEGETATION FUNCTIONS

Medium: Much of the reach area consists of dense, mature forest cover, but some riparian areas have been disturbed.

HYDROLOGIC FUNCTIONS

High: The lake has an unaltered hyporheic connection to Gold Creek.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Potential new development should be set back an adequate distance to protect riparian functions.
- Decommission and revegetate any unused access roads along lake shore.

3

4

1 3.3 Upper Yakima River

2 This section describes the upper Yakima River from its origin at the outlet of
3 Keechelus Lake to the Taneum Creek confluence, a distance of approximately
4 44 miles. The river is designated as a “shoreline of statewide significance.”
5 Significant left-bank tributaries to the upper Yakima River include Kachess River,
6 Cle Elum River, Teanaway River, and Swauk Creek. Right-bank tributaries include
7 Cabin Creek, Big Creek, and Little Creek.

8 The upper Yakima River flows past the city of Cle Elum and the town of South Cle
9 Elum. Shorelines within the jurisdictions of these municipalities are described
10 below.

11 3.3.1 Physical Characterization

12 The upper portion of the Yakima River watershed lies in the Cascade Mountain
13 Range, including the Alpine Lakes Wilderness Area. The watershed continues to the
14 southeast on the eastern Cascade slopes and foothills. Much of the land adjacent to
15 the upper portions of the river is forested; however, downstream of Cle Elum and
16 South Cle Elum, development and agricultural activities have removed much of the
17 forest. This lower portion of the watershed also experiences drier climatic
18 conditions that favor different vegetation communities (e.g., shrub-steppe).

19 Relatively few railroad or vehicle bridges cross the river. The Lake Easton Dam is
20 the only significant obstruction located in the channel.

21 Landslide hazard areas are mapped at two locations along the upper Yakima River:
22 the left bank just downstream from Keechelus Lake Dam and both banks of the river
23 just upstream from Lake Easton (WDNR 2010). Steep slopes are mapped in several
24 locations along the river, primarily upstream from Lake Easton, downstream from
25 the confluence with Little Creek, and from upstream of the Teanaway River
26 confluence downstream to Taneum Creek (Kittitas County 2012).

27 Most of the reach inventory area located within the Upper Yakima River is mapped
28 in the FEMA 100-year floodplain. Virtually all of reaches 7-10 are within the
29 floodplain, except where railroads and steep topography limit flooding. Areas such
30 as Elk Meadows, Elk Meadows Park, Pine Glen, and Sun Island have experienced
31 damaging floods in the past (Tetra Tech, 2012). The middle portion of Reach 6 and
32 the upstream and downstream portion of the left bank of Reach 5 are also mapped
33 in the floodplain; Unnamed Lake 5 is mapped in the Yakima River Reach 7 floodplain
34 (FEMA 1996). Virtually the entireties of Reaches 7-10 are mapped for potential
35 channel migration, except for a short stretch where I-90 crosses the river in Reach 9.

1 The upstream portion of Yakima River Reach 6 and the downstream portion of
2 Yakima River Reach 5 also have potential for channel migration (Ecology 2011).

3 From Keechelus Dam to Easton Dam, the Yakima River floodplain function is
4 excellent, with a braided, meandering channel and numerous side channels (Haring
5 2001). The river has complex in-channel structure and an intact riparian corridor
6 with little encroaching development. From Easton Dam to the confluence with the
7 Cle Elum River, the channel exhibits similar characteristics, but with limited
8 residential development within the floodplain. From the confluence with the Cle
9 Elum River to the Teanaway River, the river is generally a large main channel, with
10 some side channels. Downstream to Taneum Creek, the river is relatively confined
11 as it flows through the Ellensburg Canyon (Haring 2001).

12 Interstate 90, a railroad corridor, and agricultural activities have degraded
13 floodplain functions, particularly along the downstream portion of the upper
14 Yakima River. These features and land use activities have resulted in bank
15 modifications and channelization leading to a narrowed, single-channel river with
16 numerous isolated side channels. This portion of the Yakima River experiences
17 frequent bank sloughing and contains limited or no riparian cover (Haring 2001).
18 Low levels of residential development occur along the banks of the river, with a few
19 exceptions.

20 Unnamed Lake 5 is located downstream of South Cle Elum on the left bank of the
21 river, between the river and I-90. The lake is approximately 0.3 mile long and
22 0.1 mile wide and is currently used by anglers. Unnamed Lake 5 was created from
23 an old gravel pit; the Yakima River's floodplain is one of the most heavily mined
24 floodplains in Washington State (Haring 2001). A hydromodification structure
25 separates the lake from the river, although there is likely overbank flow during
26 major storm events. A constructed berm divides the lake into two halves, but a
27 break in the berm allows flow to pass between these two sections. Yakima River
28 flows enter the upstream section of Unnamed Lake 5 through a small opening in the
29 structure, flow between the two halves, and then enter a channel separated from the
30 river by a structure, reentering the river approximately 0.5 mile downstream.

31 *3.3.1.1 City of Cle Elum*

32 A short stretch of the Yakima River (Yakima River Reach 7) flows through the south-
33 central city limits of Cle Elum. The river is listed as a shoreline of statewide
34 significance in this reach. The upstream extent begins at the Fourth Street Bridge
35 crossing and extends downstream approximately 0.5 mile. The river is confined by
36 I-90, located on the left bank, within this stretch. In addition to the river, multiple
37 ponds are located within the south-central and southeastern portions of the city,
38 separated from the Yakima River by I-90 and a railroad right-of-way. Most of these

1 ponds are old gravel pits and several are maintained as part of a city water
2 treatment facility.

3 The entire inventory area is mapped in the FEMA 100-year floodplain (FEMA 1996)
4 and the reach within the city limits has potential for channel migration (Ecology
5 2011).

6 *3.3.1.2 Town of South Cle Elum*

7 The Yakima River (Yakima River Reach 7) also flows through the northwestern
8 boundary of the Town of South Cle Elum. The river is listed as a shoreline of
9 statewide significance in this reach. This stretch of river only extends approximately
10 0.1 mile through the city. A railroad line borders the left bank of the river in this
11 area.

12 The entire inventory area is mapped in the FEMA 100-year floodplain (FEMA 1996)
13 and the reach within the city limits has potential for channel migration (Ecology
14 2011).

15 **3.3.2 Habitats and Species**

16 *3.3.2.1 Fish Use*

17 The mainstem upper Yakima River supports spawning and rearing of spring
18 Chinook, summer steelhead, and Dolly Varden/bull trout. Other fish species
19 documented in the river include coho salmon, rainbow trout, westslope cutthroat,
20 and mountain whitefish. Introduced fish species include largemouth bass and
21 eastern brook trout (StreamNet 2010).

22 Before construction of dams on the Yakima River in the early 1900s, Middle
23 Columbia River steelhead (federally listed as threatened) had access to most of the
24 upper Yakima River watershed. The Lake Easton Dam has a fish ladder that
25 generally allows passage in the winter and spring when steelhead would be
26 migrating into the Easton to Keechelus Reach. While spawning and rearing habitat is
27 still present between the Keechelus and Easton Dams, the numbers of steelhead
28 returning to the upper Yakima River are small (Haring 2001; WSDOT 2005, 2008).

29 Bull trout in the upper Yakima River have been affected by hybridization and
30 competition with brook trout, loss of prey base, altered river flow regimes, passage
31 barriers, and poor water quality. Bull trout were federally listed as threatened in
32 1999. Although bull trout are present in the Yakima River, they are likely to occur in
33 very low densities (Reclamation and Ecology 2011a; WSDOT 2005).

1 Many factors have caused the decline of upper Yakima basin fish populations,
2 including the following (Reclamation and Ecology 2011a):

- 3 • In the 1900s, crib dams on the four natural glacial lakes (Cle Elum, Kachess,
4 Keechelus, and Bumping) contributed to the extirpation of sockeye.
- 5 • Construction of five storage dams eliminated access to productive spawning
6 and rearing habitat for sockeye, spring Chinook, coho, and steelhead salmon.
- 7 • Irrigation operations have altered streamflows, resulting in flows at certain
8 times of the year that are too high in some reaches and too low in others to
9 provide good fish habitat. This problem is worse during drought years.
- 10 • Land development (road construction, diking, gravel mining, and agriculture)
11 has degraded riparian habitat and increased sediment in streams and rivers.
- 12 • Irrigation diversions have reduced flows and created fish passage barriers in
13 tributary streams.
- 14 • The Columbia River dams and historic commercial fishing in the Columbia
15 River and Pacific Ocean have also indirectly affected Yakima basin fisheries.

16 High summer flows in the upper Yakima River affect juvenile salmonid rearing
17 habitat. The annual later summer “flip-flop” operation disrupts instream habitat and
18 impacts aquatic insect populations (prey base for fish). Winter flows in the upper
19 Yakima River are low, potentially impacting survival of overwintering juvenile
20 salmonids (Reclamation and Ecology 2011a).

21 While high stream temperatures can be detrimental to fish (see Water Quality
22 section below), release of cold water from the bottom of the Yakima Project
23 reservoirs can also interfere with fish ecology in the Yakima River basin
24 (Reclamation and Ecology 2011a).

25 Despite these challenges, anadromous fisheries in the Yakima River have recently
26 improved as a result of better management, habitat and facility improvements,
27 hatchery supplementation, and reintroduction efforts. Reintroduction of coho
28 salmon in the Yakima basin began in the mid-1980s. Summer Chinook
29 reintroduction is currently being undertaken (Reclamation and Ecology 2011a).

30 Efforts to restore coho salmon within the Yakima River basin rely largely upon
31 releases of hatchery-produced fish. Natural reproduction of hatchery-reared coho
32 salmon is now occurring in the Yakima River. The upper Yakima wild Chinook
33 salmon population is supplemented with hatchery stock reared at the Cle Elum
34 Supplementation and Research Facility (CESRF) and released from three

1 acclimation sites (Reclamation 2011, Reclamation and Ecology 2011a). The CESRF
2 has been operating since 1997 and is managed by WDFW and the Yakama Nation.

3 Additional major efforts to improve fish habitat and populations in the Yakima basin
4 include the following (Reclamation and Ecology 2011a):

- 5 • The Yakima/Klickitat Fisheries Project is managed by WDFW and the
6 Yakama Nation. Its goal is salmon reintroduction through supplementation
7 along with habitat protection and restoration. Species currently being
8 enhanced include spring, summer and fall Chinook salmon, coho salmon,
9 sockeye salmon, and steelhead trout.
- 10 • The Yakima River Side Channels Project is managed by WDFW and the
11 Yakama Nation through the Yakima/Klickitat Fisheries Project. It focuses on
12 restoring habitat in the Easton, Ellensburg, Selah, and Union Gap reaches on
13 the Yakima River and the Glead reach in the lower Naches. Active habitat
14 restoration actions include reconnecting structurally diverse alcoves and
15 side channels, introducing large woody debris, fencing, and revegetating
16 riparian areas
- 17 • The Yakima Tributary Access and Habitat Program has numerous
18 participants including the Kittitas Conservation District. The Program seeks
19 to restore fish passage to Yakima River tributaries that historically supported
20 salmon and to improve habitat through measures such as fish screening and
21 fish passage improvements, riparian plantings, fencing, and irrigation system
22 improvements.
- 23 • Reclamation is leading a cooperative investigation to study the feasibility of
24 providing fish passage at the five large storage dams of the Yakima Project
25 (Bumping Lake, Kachess, Keechelus, Cle Elum, and Tieton). Fish passage
26 efforts at each dam are discussed in the relevant sections of this report.

27 Pacific lamprey is another native fish species that has recently become a focus of
28 restoration efforts. The Columbia River basin historically supported abundant
29 Pacific lamprey populations, but the population has steeply declined and is virtually
30 non-existent in the upper Yakima watershed. Major factors in the species' decline
31 include fish passage barriers, poor water quality, floodplain degradation, and highly
32 altered stream hydrology (CRITFC 2011; Luzier et al. 2011).

33 City of Cle Elum

34 See Section 3.3.2.1.

35 Town of South Cle Elum

1 See Section 3.3.2.1.

2 *3.3.2.2 Water Quality*

3 The mainstem Yakima River is on Ecology's 303(d) list for high temperatures and
4 low dissolved oxygen in the reaches just upstream of the Cle Elum River confluence
5 and near Lake Easton.

6 The Department of Ecology has undertaken the Yakima River Watershed Toxics
7 Study to evaluate levels of toxic contaminants in streams, rivers, reservoirs, and
8 lakes from the Yakima River's headwaters near Snoqualmie Pass to its confluence
9 with the Columbia River. Levels of toxic compounds in Yakima River fish were
10 recognized as a concern in the 1990s. During 2006 - 2008, Ecology collected
11 hundreds of samples of fish and water to evaluate current levels of toxic compounds
12 such as DDT, PCBs, and several others, many of which were historically used in
13 agriculture or utilities but have been banned in recent years. These compounds
14 attach to soil particles which are then washed downstream by precipitation or
15 irrigation. Although the compounds have not been applied in recent years, they can
16 persist in the environment. Ecology's study found that fish in the upper Yakima
17 River are currently meeting or close to meeting human health criteria for all toxic
18 substances tested except PCBs. The level of toxics generally increases in
19 downstream areas. The months of greatest concern for human-caused turbidity,
20 suspended sediment loading, and pesticide transport are during the irrigation
21 season, April through October. Sediments and pesticides can also be mobilized
22 during storms or rain-on-snow events (Johnson et al. 2010; Ecology 2009; Joy
23 2002).

24 **City of Cle Elum**

25 See Section 3.3.2.2

26 **City of Cle Elum**

27 See Section 3.3.2.2

28 *3.3.2.3 Riparian Habitat Conditions (Land Cover)*

29 Upstream of Lake Easton, the Yakima River runs through commercial forest land.
30 Near the confluence of Big Creek, agricultural and rural residential uses become
31 more common in the riparian zone. Development is most intensive in the Cle Elum
32 and South Cle Elum areas. I-90 is a major feature within and parallel to much of the
33 shoreline inventory area of the upper Yakima River mainstem. Big sagebrush-
34 dominated shrubland becomes more prevalent in and along the river's riparian zone
35 downstream of Swauk Creek.

1 City of Cle Elum

2 The Yakima River shoreline inventory area within Cle Elum is largely developed.
3 I-90 runs along the river in this reach. Vegetated in this area is patchy and
4 fragmented by roadways, structures, and excavated ponds.

5 Town of South Cle Elum

6 Much of the Yakima River floodplain south of I-90 in South Cle Elum has been
7 developed for residential uses. A band of woody riparian vegetation 250 to 550 feet
8 wide separates the river shoreline from developed areas.

9 *3.3.2.4 Wetlands*

10 Freshwater forested and shrub wetlands are located within the Yakima River
11 floodplain. Large wetland areas are mapped in floodplain in the vicinity of Lake
12 Easton and Lake Keechelus. Several excavated ponds (a remnant of past gravel
13 mining) are located in the floodplain near Cle Elum, including Unnamed Lake 5.

14 City of Cle Elum

15 Several wetlands are mapped in the Yakima River shoreline inventory area within
16 Cle Elum. However, most of these are artificially created ponds.

17 Town of South Cle Elum

18 Palustrine forested wetlands are mapped along the Yakima River in South Cle Elum.

19 *3.3.2.1 Wildlife Habitats and Species*

20 The area near Cle Elum on the north side of the Yakima River is mapped as an elk
21 winter concentration area. Mule deer winter range is mapped along the river east of
22 Cle Elum. A bald eagle nest is mapped along the river between Cle Elum and the
23 Teanaway River confluence. A sharp-tailed snake area is mapped at South Cle Elum
24 (federal species of concern, state candidate species).

25 Approximately one-third of the upper Yakima River shoreline inventory area is
26 mapped as shrub-steppe habitat (USGS 1993). Shrub-steppe habitat is dominated by
27 perennial bunchgrasses and shrubs such as sagebrush (WDFW 2008). Kittitas
28 County has several types of shrub-steppe communities with different combinations
29 of plant species, as described in Section 2.3.2 in Chapter 2. Shrub-steppe habitat
30 supports numerous unique plant and wildlife species (Azerrad et al. 2011). While it
31 was historically a common type of vegetation community in eastern Washington,

1 shrub-steppe habitat has been largely converted to agriculture and is considered a
2 priority habitat by WDFW (see Section 2.6.3.1).

3 As part of improvements to Interstate 90 between Hyak and Lake Easton, WSDOT is
4 constructing "connectivity emphasis areas" or CEAs at several locations. The
5 purpose of the CEAs is to restore or enhance connections between habitats on both
6 sides of I-90 to benefit fish, wildlife, and hydrologic functions. CEAs are planned
7 near the upper Yakima River at several locations: Bonnie Creek, Swamp Creek, Toll
8 Creek, Cedar Creek, Telephone Creek, Hudson Creek, Easton Hill, and Kachess River
9 (WSDOT 2011).

10 City of Cle Elum

11 Cle Elum is partially located within an elk winter concentration area and is near a
12 mapped sharp-tailed snake area. A bald eagle nest is mapped southeast of the city.

13 Town of South Cle Elum

14 A mapped sharp-tailed snake area overlaps part of South Cle Elum.

15 3.3.3 Land Use

16 From the Taneum Creek confluence upstream to the Swauk Creek confluence, the
17 Yakima River is bordered by agricultural land to the east and undeveloped forest
18 and range-zoned land to the west. From the Swauk Creek confluence to the
19 Teanaway River confluence, the Yakima River flows through primarily undeveloped
20 forest and range-zoned land and is bordered to the east by SR 10.

21 Upstream of the Teanaway confluence, the Yakima River flows through a
22 combination of undeveloped forest land (zoned primarily for rural residential
23 development) and low- to moderate-density residential development. Further
24 upstream, land use intensifies where the river is bordered by I-90 and flows through
25 Cle Elum and South Cle Elum.

26 Between the City of Cle Elum and Lake Easton, the river is bordered primarily by
27 moderate-density residential development and undeveloped forest land that is
28 zoned for forest and range. Within this river segment, areas of high-density
29 residential development are located at Pebble Beach Drive, the Wapiti Drive vicinity,
30 and the Sun Island Drive vicinity. In addition, I-90 borders and crosses the river in
31 several locations in this segment.

32 Just upstream of Lake Easton, the river is bordered primarily by undeveloped forest
33 land, zoned for rural residential development and forest and range. The river is also

1 crossed by two electric transmission line corridors. The remaining upstream
2 portion of the river flows through National Forest land with a few scattered,
3 privately-owned commercial forest-zoned parcels.

4 *3.3.3.1 City of Cle Elum*

5 East of Fourth Street and south of the BNSF railroad tracks, the Yakima River is
6 separated from the City of Cle Elum by I-90, but a portion of the river's floodplain
7 lies within city limits. Land use within this area is primarily industrial, and the Cle
8 Elum Wastewater Treatment Plant is located to the east. The FEMA floodway does
9 not extend into this area. Within the floodway, the City's UGA extends south of I-90
10 to the Yakima River, and encompasses Unnamed Lake 5. Lands within this UGA area
11 are generally undeveloped and zoned for forest and range, with the exception of an
12 industrial-zoned area east of the I-90/SR 10 interchange.

13 South of the Yakima River and east of South Cle Elum Way, land use along the river
14 is primarily high-density residential, and Fireman's Park borders the river bank.

15 *3.3.3.2 Town of South Cle Elum*

16 The Yakima River borders the north end of the Town of South Cle Elum. Land use
17 along the river in this area is primarily high-density residential, which is set back
18 approximately 300 feet from the river bank.

19 **3.3.4 Public Access**

20 The upper Yakima River can be accessed at the following locations:

- 21 • The John Wayne Heritage Trail, which borders the upper Yakima for much of
22 its length;
- 23 • Hanson Ponds, located southeast of the City of Cle Elum;
- 24 • Cle Elum Memorial Park and Fireman's Park;
- 25 • South Cle Elum Firemen Park;
- 26 • Undeveloped Washington State Parks land, located approximately 1 mile
27 west of the City of Cle Elum;
- 28 • Easton Ponds;
- 29 • Lake Easton State Park;

- 1 • Crystal Springs Campground (National Forest); and
2 • A network of hiking, snowmobiling, and cross-country ski trails on National
3 Forest land.

4 *3.3.4.1 City of Cle Elum*

5 The river can be accessed at Cle Elum Memorial Park and Fireman's Park, and
6 Hanson Ponds can be accessed from Dalle Road.

7 *3.3.4.2 Town of South Cle Elum*

8 The river can be accessed at Firemen Park.

9 3.3.5 Reach Sheets

10

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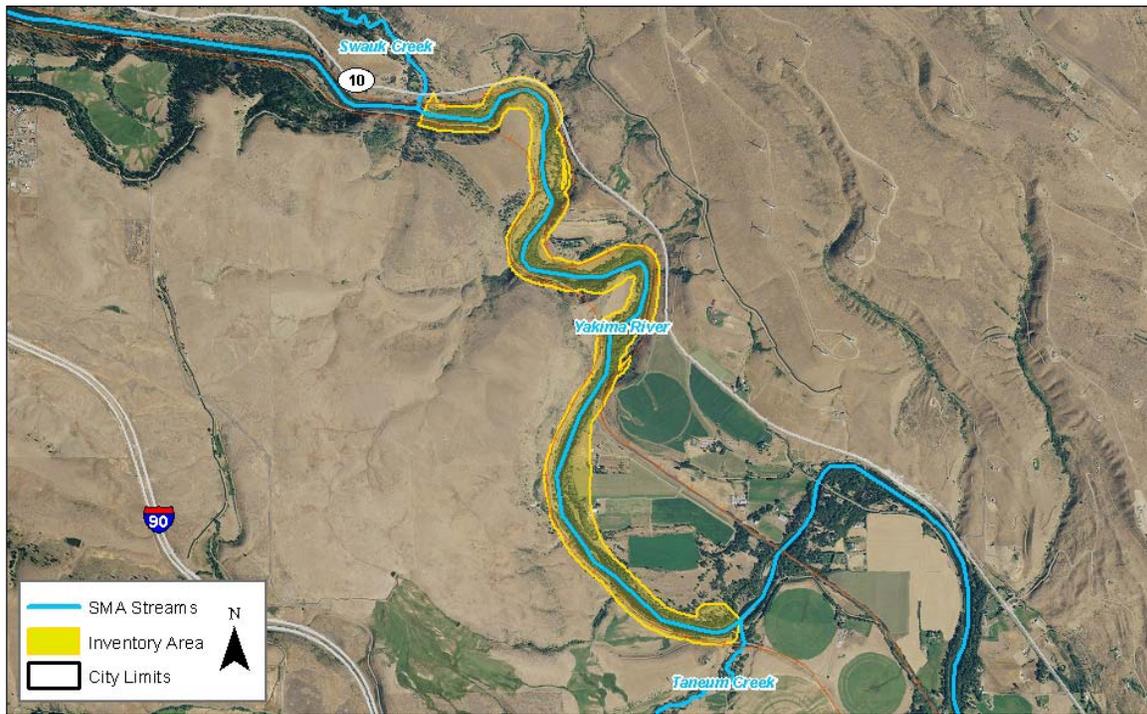
YAKIMA RIVER-REACH 5

SHORELINE LENGTH:

4.0 Miles

REACH INVENTORY AREA:

326.8 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

This single channel reach is confined due to steep canyon walls and by the John Wayne Trail on its right bank, and a railroad and Highway 10 along much of its left bank. The reach contains few side channels or gravel bars.

LAND COVER (MAP FOLIO #3)

The majority of the reach is covered by shrubland (36%), riparian vegetation (30%), and conifer-dominated forest (17%), with some agricultural lands (8%), developed lands (5%), and open water (3%) cover types.

HAZARD AREAS (MAP FOLIO #2)

The majority of the reach (70%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The downstream half of the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for spring Chinook and summer steelhead. The presence of coho salmon, Dolly Varden/bull trout, largemouth bass, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for dissolved oxygen, fecal coliform, and pH.

Patches of wetland habitat is mapped throughout the reach (8% reach total). Priority mule deer winter concentration range is also mapped within the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The reach is constrained along most of its length by Highway 10 and the John Wayne Heritage Trail.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail is located along the majority of the western boundary of the reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is rural (100%). Land ownership is 78% private and 22% public (State and Bureau of Reclamation).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

In general, the eastern portion of the reach is zoned for agriculture (25%) while the western and northern portions are zoned for forest & range (47%) and other (28%) [John Wayne trail].

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are 2 recorded historic sites within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach provides spawning habitat for priority fish species (including spring Chinook salmon), but water quality impairments and significant hydromodifications limit fish habitat quality.

TERRESTRIAL HABITAT QUALITY

Medium: Some riparian forest and shrub areas remain along the channel (particularly along its fringes), but connections to adjacent habitats have been disturbed by transportation corridors.

VEGETATION FUNCTIONS

Medium: Vegetation in much of the reach has been altered by development (primarily Highway 10 and the John Wayne Heritage Trail), but some riparian forest and shrub areas remain along the channel.

HYDROLOGIC FUNCTIONS

Low: The reach has limited connection to a functional floodplain because of its steep canyon walls, and the presence of significant hydromodifications associated with Highway 10 and the John Wayne Heritage Trail.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration hazards.
- Support efforts such as the Yakima River Side Channels Project and Yakima Tributary Access and Habitat Program.
- Work with landowners and the Kittitas Conservation District to encourage best management practices that reduce erosion of soil and legacy pesticides into surface waters.
- Educate shoreline property owners about measures to protect and restore riparian areas.

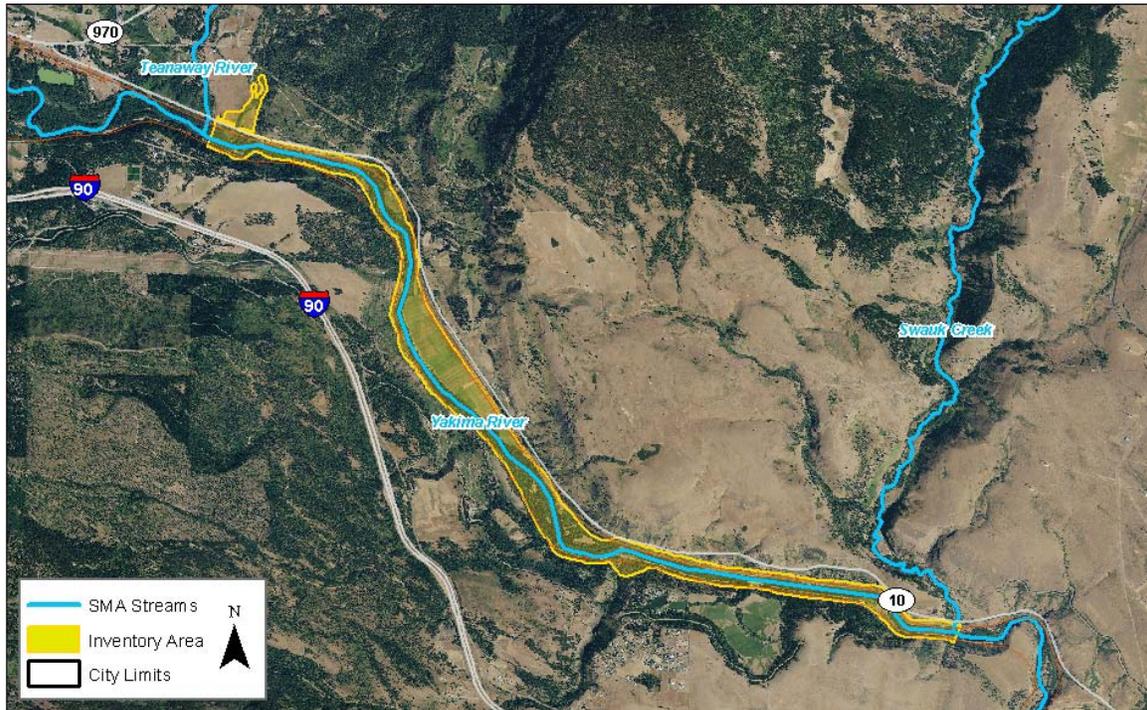
YAKIMA RIVER-REACH 6

SHORELINE LENGTH:

6.3 Miles

REACH INVENTORY AREA:

614.9 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach flows in a single channel with low topographic relief on both banks and is confined by the John Wayne trail on the right bank and a railroad and Highway 10 on the left bank. Few side channels and gravel bars are located within the reach.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily conifer-dominated forest (66%), and open water (12%), with patches of riparian vegetation (9%), shrubland (5%), agricultural lands (4%), developed lands (3%), other (1%), and harvested forest (1%).

HAZARD AREAS (MAP FOLIO #2)

A large portion of the reach (71%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The upstream half of the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and juvenile rearing habitat for spring Chinook and summer steelhead. The presence of coho salmon, Dolly Varden/bull trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Wetland habitat is mapped throughout the river reach (3% of the reach). Priority mule deer winter concentration range and wood duck nesting habitat are also mapped within the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The reach is constrained along most of its length by Highway 10 and the John Wayne Trail.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail is located along the majority of the western/southern boundary of the reach. The river can also be accessed via Lake Easton State Park.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is rural (100%). Land ownership is 87% private and 13% public (State).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for forest & range (67%), with rural residential (11%) at the upstream end and other (21%) [primarily John Wayne trail] extending along the reach.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A total of 8 recorded precontact and historic sites are located within the reach. Recorded sites include 3 precontact sites, 4 historic sites, and 1 site that feature both precontact and historic components.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), but high temperatures and significant hydromodifications limit fish habitat quality.

TERRESTRIAL HABITAT QUALITY

Medium: Some riparian forest and shrub areas remain along the channel (particularly along its fringes), but connections to adjacent habitats have been disturbed by transportation corridors.

VEGETATION FUNCTIONS

Medium: Vegetation in much of the reach has been altered by development (primarily Highway 10 and the John Wayne Heritage Trail), but some riparian forest and shrub areas remain along the channel.

HYDROLOGIC FUNCTIONS

Low: The reach has limited connection to a functional floodplain because of the presence of significant hydromodifications associated with Highway 10 and the John Wayne Heritage Trail.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration hazards.
- Several important cultural and archaeological sites are located within the reach.
- Support efforts such as the Yakima River Side Channels Project and Yakima Tributary Access and Habitat Program.
- Work with landowners and the Kittitas Conservation District to encourage best management practices that reduce erosion of soil and legacy pesticides into surface waters.
- Educate shoreline property owners about measures to protect and restore riparian areas.

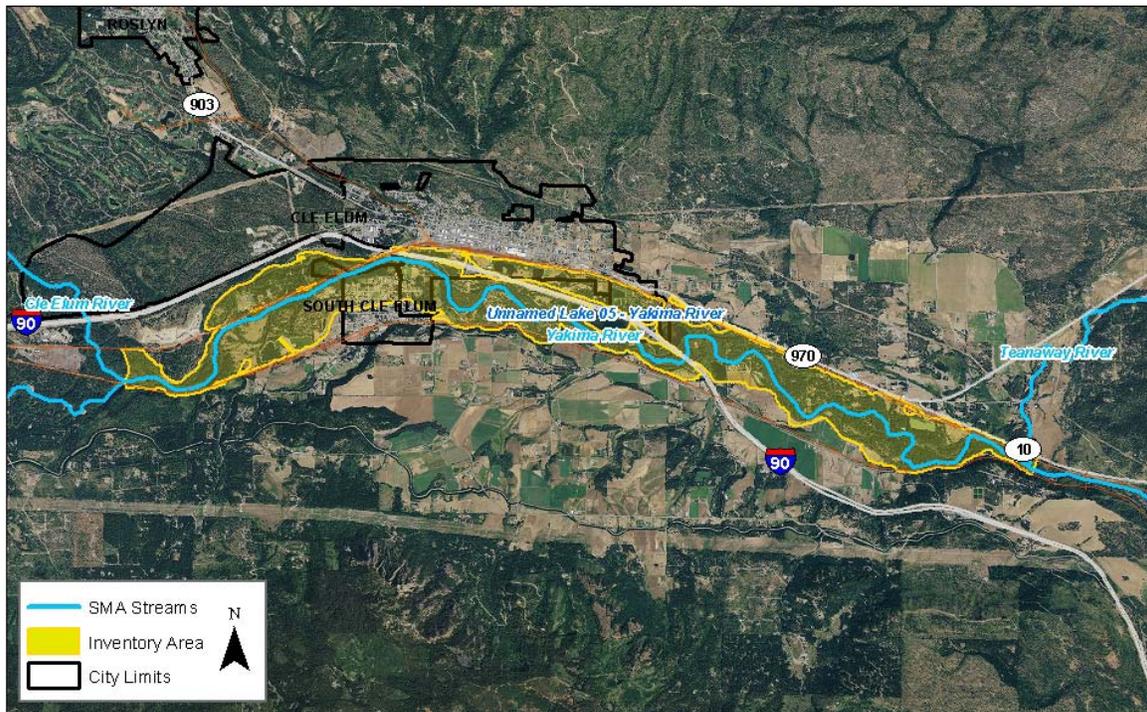
YAKIMA RIVER-REACH 7

SHORELINE LENGTH:

10.4 Miles

REACH INVENTORY AREA:

2,310.9 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach transitions between single and multiple channels several times and is located in a low topographic relief valley. The channel is confined in several areas by the John Wayne trail, I-90, and Highway 10. Several gravel pits are located on the left bank of the river.

LAND COVER (MAP FOLIO #3)

This reach contains significant riparian vegetation (37%), conifer-dominated forest (26%), and agricultural lands (22%). A number of other land cover types are also present, including: unvegetated (8%), developed lands (6%), other (5%), shrubland (3%), and open water (3%).

HAZARD AREAS (MAP FOLIO #2)

A significant area of the reach (96%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and juvenile rearing habitat for spring Chinook and summer steelhead. The presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also documented.

WATER QUALITY

TMDLs have been implemented for 4,4'-DDE, DDT, temperature, and turbidity.

Wetland habitat is mapped along the river and at several locations adjacent to the river (18% of the reach). Priority sharp-tailed snake area is associated with a wetland complex on the left bank of the river; priority wood duck nesting habitat is mapped at the downstream end of the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The reach is constrained along most of its length by Highway 10, I-90, the John Wayne trail, and other hydromodifications areas.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail is located along portions of the southern boundary of the reach. Access is also available via Hanson Ponds, and Cle Elum Memorial Park, and Firemans Park at the 4th Street Bridge crossing.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily rural (75%), with urban (7%), parks & open space (6%), and other (6%) land uses mapped near Cle Elum/S Cle Elum. Land ownership is 93% private and 7% public (State and WDFW).

CONTAMINATED SITES

No identified contaminated sites are located within this reach. One hazardous waste generator is mapped near the center of the reach.

ZONING (MAP #5)

Lands within the reach are zoned for forest & range (45%), rural residential (22%), industrial (11%), urban/suburban residential (4%), agriculture (2%), commercial (1%), parks & open space (1%), and other (14%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are 2 recorded precontact sites, and 4 recorded historic sites located in the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), but water quality impairments and significant hydromodifications limit fish habitat quality.

TERRESTRIAL HABITAT QUALITY

Medium: Some significant wetland areas and riparian forest and shrub areas remain along the channel but connections to adjacent habitats have been disturbed by transportation corridors and other development.

VEGETATION FUNCTIONS

Medium: Vegetation in much of the reach has been altered by development (primarily Highway 10, I-90, the John Wayne Heritage Trail, and residential development), but patches of significant riparian forest and shrub areas remain along the channel.

HYDROLOGIC FUNCTIONS

Medium: There are significant hydromodifications associated with Highway 10, the John Wayne Heritage Trail, and other development within the reach. However, the river still has a connection to its floodplain in some areas, particularly in the more sinuous areas along the channel.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Based upon existing land use patterns in the area, resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forest/range lands to residential subdivisions). New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Support efforts such as the Yakima River Side Channels Project and Yakima Tributary Access and Habitat Program.
- Work with landowners and the Kittitas Conservation District to encourage best management practices that reduce erosion of soil and legacy pesticides into surface waters.
- Educate shoreline property owners about measures to protect and restore riparian areas.

UNNAMED LAKE 5

SHORELINE LENGTH:

1.0 Mile

WATERBODY AREA: 18.3 Acres

REACH INVENTORY AREA: 36.2 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

The waterbody is located adjacent to I-90 and is separated from the Yakima River by a berm. Yakima River flow travels through the waterbody. This feature is an artifact of gravel mining in the river's floodplain.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is mostly open water (38%), shrubland (25%), developed lands (16%), and unvegetated (11%), with some agricultural lands (7%), conifer-dominated forest (2%), and riparian vegetation (1%).

HAZARD AREAS (MAP FOLIO #2)

The majority of the reach (83%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

No priority fish habitat is mapped within the reach by WDFW.

Wetland habitat is mapped at the north end of the reach (8% of the reach). No priority habitats or species are identified in this reach by WDFW.

WATER QUALITY

The reach is not listed on the State's Water Quality Assessment list of 303 (d) waters.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The lake, which was created by gravel mining activities, is directly adjacent to I-90 to the north.

PUBLIC ACCESS (MAP FOLIO #4)

Access to the waterbody is provided by Hanson Ponds Road, which transitions to a gravel trail.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use is rural to the south of the lake (25%), parks & open space to the east and west (47%), and other [I-90] to the north (27%). Land ownership is 100% private.

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for forest & range (44%) and other (56%) [I-90, to the north].

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Low: The lake is a manmade artifact of gravel mining, with no mapped priority fish use.

TERRESTRIAL HABITAT QUALITY

Low: The lake has limited riparian vegetation cover, and most of the shoreline perimeter is modified by roads (including I-90).

VEGETATION FUNCTIONS

Low: The lake has limited riparian vegetation cover.

HYDROLOGIC FUNCTIONS

Low: The lake is a manmade artifact of gravel mining, and surrounded by hydromodifications.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Explore restoration of former gravel pits to create more natural floodplain and riverine habitat.

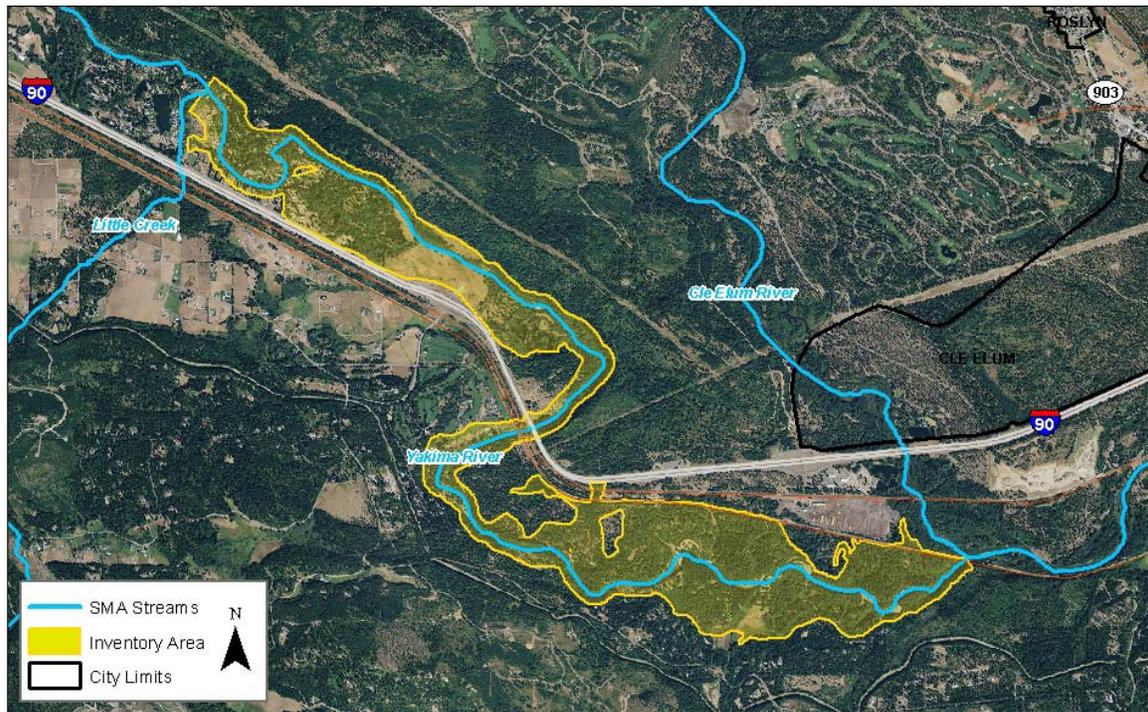
YAKIMA RIVER-REACH 8

SHORELINE LENGTH:

7.4 Miles

REACH INVENTORY AREA:

1,159.4 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The upstream portion of the reach is confined to a single channel by residential development and steep canyon walls, while the downstream portion flows through low topographic relief and contains multiple gravel bars, oxbows, and side channels.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is dominated by conifer-dominated forest (45%), riparian vegetation (34%), and agricultural lands (12%), with patches of other (4%), developed lands (3%), harvested lands (1%), and unvegetated (1%).

HAZARD AREAS (MAP FOLIO #2)

Roughly 91% of the reach is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for spring Chinook and summer steelhead and juvenile rearing habitat for spring Chinook. The presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for dissolved oxygen and temperature. A TMDL has been implemented for dieldrin in this reach.

Wetland habitat is mapped along much of the river reach and a large wetland complex is located at the downstream end of the reach (20% of the reach). A priority elk winter concentration area is mapped at the upstream and downstream portions of the reach and wood duck nesting habitat is also mapped in the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Portions of the reach (approximately one-tenth) are constrained by hydromodifications, presumably to protect adjacent residences and I-90 at its bridge crossing.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail crosses the river at several locations; access is also provided by undeveloped Washington State Parks land.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily rural (99%), with some resort land (1%) near the middle of the reach. Land ownership is 84% private and 16% public (State).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for rural residential (51%) west of the river and forest & range (40%) east of the river, with patches of master planned resort (1%) and other (8%) [I-90].

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are 3 recorded sites within the reach, 2 precontact sites and 1 historic property. The historic site consists of a historic structure circa 1908 and is considered eligible for listing on the National Register.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

High: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), has generally low levels of hydromodifications, and exhibits a generally high level of channel complexity.

TERRESTRIAL HABITAT QUALITY

Medium: The majority of the reach consists of dense forest and shrub habitat, but connections to adjacent habitats have been disturbed by transportation corridors and other development.

VEGETATION FUNCTIONS

High: Some areas of alteration exist, but the majority of the reach consists of dense riparian forest and shrub habitat.

HYDROLOGIC FUNCTIONS

Medium: Portions of the river's floodplain are constrained by I-90 within the reach, but the river still has a connection to its floodplain in some areas, particularly in the more sinuous areas along the channel.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Restoration opportunities identified within the reach include:
 - Potential acquisition of 23.49-acre parcel with mature riparian forest in a naturally functioning floodplain that supports high priority habitat along 0.4 mile of streambank. Project would protect habitat a gateway reach where approximately 50 percent of the Yakima Basin spring Chinook migrate into the Upper Yakima River system (YBFWRB, 2011).
- Several important cultural and archaeological sites are located within the reach.
- Address flooding issues experienced by Elk Meadows and Elk Meadows Park (Tetra Tech, 2012).
- Support efforts such as the Yakima River Side Channels Project and Yakima Tributary Access and Habitat Program.
- Work with landowners and the Kittitas Conservation District to encourage best management practices that reduce erosion of soil and legacy pesticides into surface waters.
- Educate shoreline property owners about measures to protect and restore riparian areas.

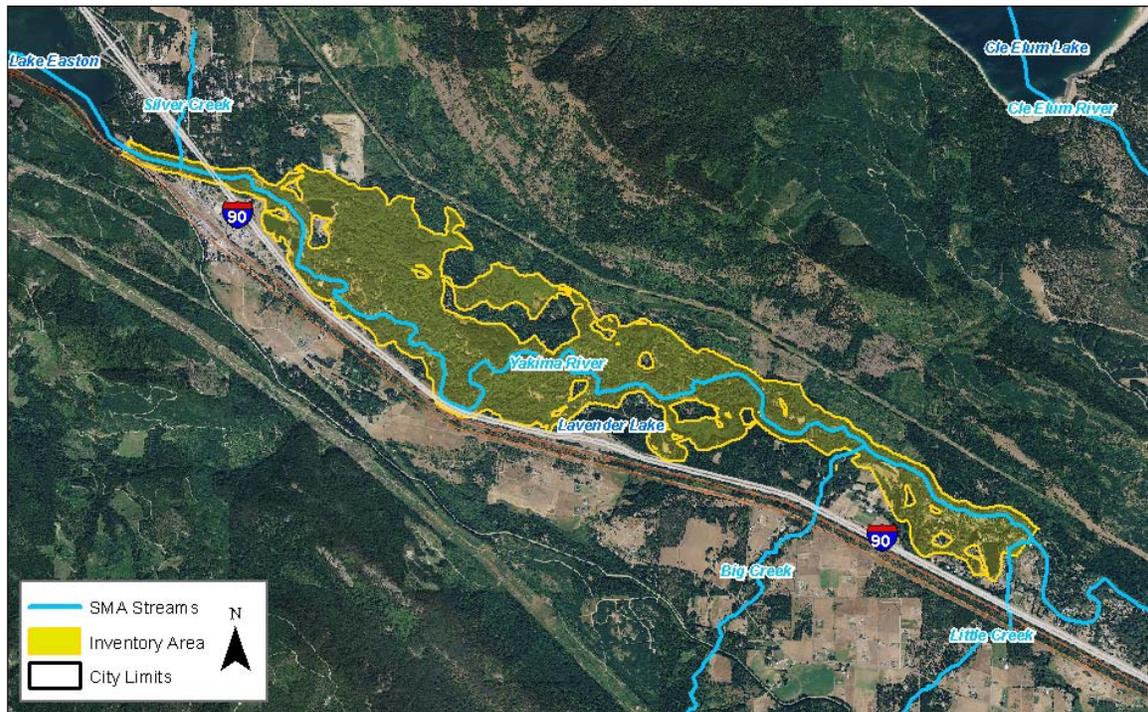
YAKIMA RIVER-REACH 9

SHORELINE LENGTH:

7.9 Miles

REACH INVENTORY AREA:

1,430.1 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

This reach is largely unconfined (except for the upstream portion, which is confined by I-90 on the right bank), flows through low topographic relief via multiple channels, and contains numerous gravel bars and side channels.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is mainly riparian vegetation (64%) and conifer-dominated forest (28%) with limited developed lands (2%), other (2%), harvested forest (2%), open water (1%), and agricultural lands (1%) cover.

HAZARD AREAS (MAP FOLIO #2)

A large portion of the reach (82%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The majority of the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for spring Chinook and summer steelhead and juvenile rearing habitat for spring Chinook. The presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for dissolved oxygen and pH. The reach meets water quality criteria for fecal coliform.

Extensive wetland habitat is mapped along the river and at numerous locations on both banks (45% of the reach). The majority of the reach is mapped as containing priority elk winter concentration area.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Hydromodifications, some of which are associated with I-90 and residential development, are located along approximately one-third of the reach.

PUBLIC ACCESS (MAP FOLIO #4)

Lake Easton State Park provides access at the upstream extent of the reach. A boat launch is located at Kinghorn Slough Access on the south side of the river, near the downstream extent of the reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily rural (81%) with forestry to the northeast (17%), and commercial (1%) and urban (1%) lands along the upstream end of the reach. Land ownership is 81% private and 19% public (State and Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for rural residential (36%) at the downstream end and forest & range (41%) and commercial forestry (15%) at the upstream end, with other (8%) [I-90] running the length of the reach.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There is 1 recorded precontact site within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

High: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), has generally low levels of hydromodifications, and exhibits a generally high level of channel complexity.

TERRESTRIAL HABITAT QUALITY

Medium: The majority of the reach consists of dense forest and shrub habitat, but connections to adjacent habitats have been disturbed by transportation corridors and other development.

VEGETATION FUNCTIONS

High: Some areas of alteration exist, but the majority of the reach consists of dense riparian forest and shrub habitat.

HYDROLOGIC FUNCTIONS

Medium: Portions of the river's floodplain are constrained by I-90 within the reach, but the river still has a connection to its floodplain in some areas, particularly in the more sinuous areas along the channel.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Restoration opportunities identified within the reach include:
 - Potential acquisition and protection of 163.57 acres of high quality floodplain, riparian, and stream habitat. (YBFWRB, 2011).
- Elk Meadows, Elk Meadows Park, Pine Glen, and Sun Island have flooding issues (Tetra Tech, 2012).
- Support efforts such as the Yakima River Side Channels Project and Yakima Tributary Access and Habitat Program.
- Work with landowners and the Kittitas Conservation District to encourage best management practices that reduce erosion of soil and legacy pesticides into surface waters.
- Educate shoreline property owners about measures to protect and restore riparian areas.

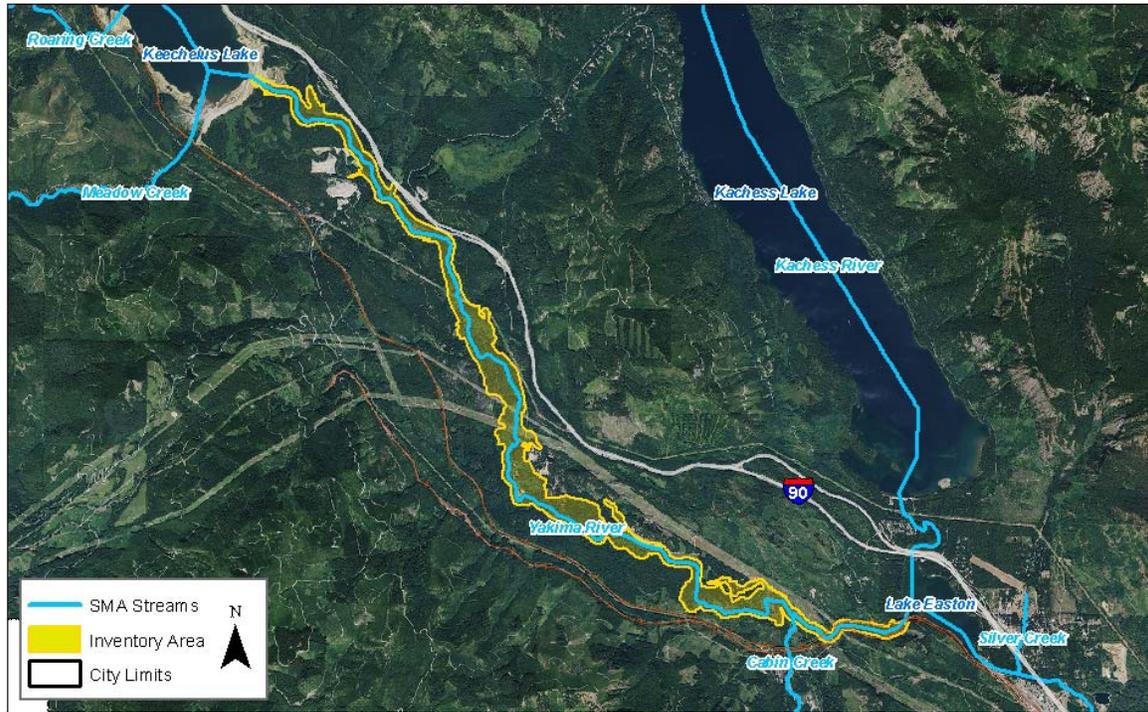
YAKIMA RIVER-REACH 10

SHORELINE LENGTH:

10.6 Miles

REACH INVENTORY AREA:

1,098.0 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach is largely unconfined (exception for the upstream portion is, which is confined by I-90 on the left bank and the downstream end is confined by a railroad on the right bank), flows through low topographic relief via multiple channels (in certain stretches), and contains numerous gravel bars and side channels.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily riparian vegetation (56%) and conifer-dominated forest (37%), with limited harvested forest (4%), other (2%), and open water (1%).

HAZARD AREAS (MAP FOLIO #2)

Much of the reach (78%) is located within the FEMA 100-year floodplain and very few landslide hazard areas (<1%) are mapped at the upstream and downstream ends of the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and juvenile rearing habitat for Dolly Varden/bull trout and spring Chinook. The presence of eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Wetland habitat is mapped along the river throughout the reach (33% of the reach) and at multiple locations on both banks of the reach. No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

A portion of the upstream end of the reach is constrained by I-90, and a portion of the downstream end is constrained by a railroad corridor.

PUBLIC ACCESS (MAP FOLIO #4)

Public access is provided by hiking and snowmobile trails that cross the river at several locations, Easton Ponds, and Crystal Springs Campground.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily forestry (87%) with some rural lands (13%) at the downstream end. Land ownership is 17% private and 83% public (State and Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (85%), with some forest & range (12%) and rural residential (3%) lands at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are 3 recorded historic sites within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

High: The reach provides spawning and juvenile rearing habitat for priority fish species (including Dolly Varden/spring Chinook salmon), has generally low levels of hydromodifications, and exhibits a generally high level of channel complexity.

TERRESTRIAL HABITAT QUALITY

High: The majority of the reach consists of dense forest and shrub habitat and connections to large areas of relatively undisturbed habitat are present throughout much of the reach.

VEGETATION FUNCTIONS

High: Some areas of alteration exist, but the majority of the reach consists of dense riparian forest and shrub habitat.

HYDROLOGIC FUNCTIONS

High: There are generally low levels of hydromodifications and floodplain alteration within the reach.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Protect the high-value, intact wetland and floodplain areas within the reach.
- Support efforts such as the Yakima River Side Channels Project and Yakima Tributary Access and Habitat Program.
- Work with landowners and the Kittitas Conservation District to encourage best management practices that reduce erosion of soil and legacy pesticides into surface waters.
- Educate shoreline property owners about measures to protect and restore riparian areas.

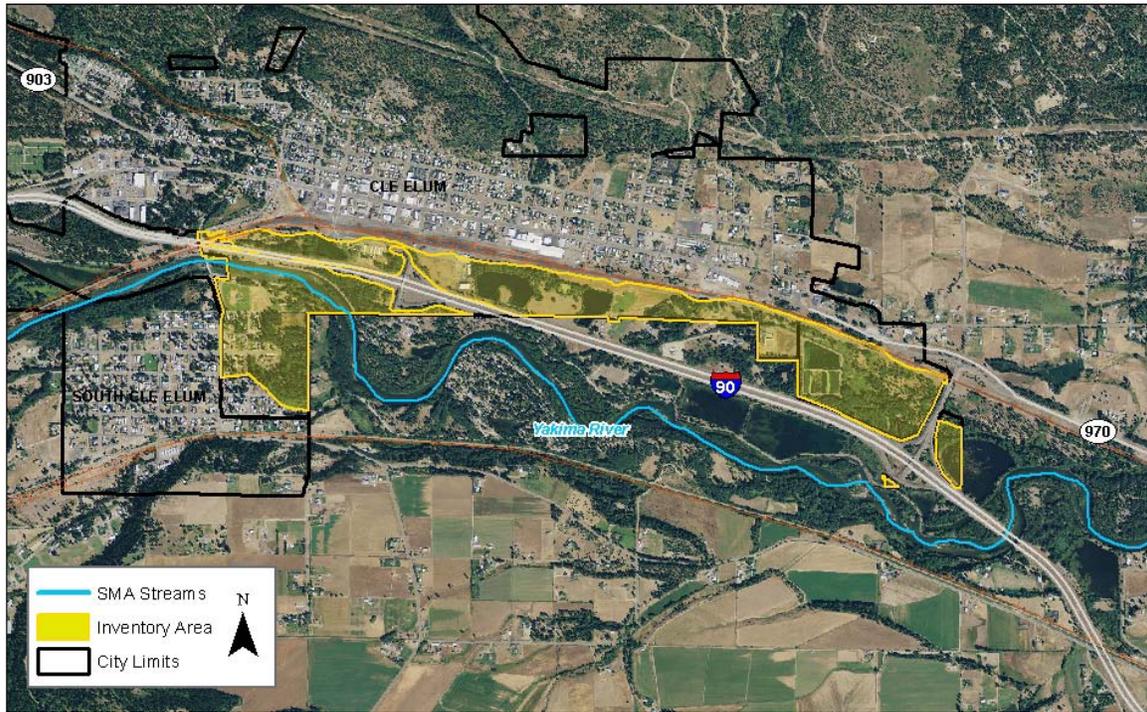
YAKIMA RIVER-CITY OF CLE ELUM REACH

SHORELINE LENGTH:

0.4 Miles

REACH INVENTORY AREA:

279.9 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

This single channel reach is confined by I-90 to the north and the 4th Street bridge at its upstream extent. The reach contains several gravel bars. Multiple ponds that were created from gravel mining the river's floodplain and water treatment ponds are located on the north side of I-90.

LAND COVER (MAP FOLIO #3)

The reach is primarily covered by agricultural lands (34%), developed lands (21%), and conifer-dominated forest (18%), with limited riparian vegetation (9%), unvegetated lands (7%), shrublands (4%), other (4%), and open water (3%).

HAZARD AREAS (MAP FOLIO #2)

The majority of the reach (98%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shoes that the reach provides spawning and juvenile rearing habitat for spring Chinook and summer steelhead. The presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also documented.

WATER QUALITY

TMDLs have been implemented for 4,4'-DDE, DDT, temperature, and turbidity.

Patches of wetland habitat are associated with ponds located within the reach (16% reach total). No priority species or habitats are mapped within the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Linear hydromodifications (associated with I-90) border the Yakima River.

PUBLIC ACCESS (MAP FOLIO #4)

Hanson Ponds can be accessed from Dalle Road. The Yakima River can be accessed at Cle Elum Memorial Park and Fireman's Park.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use within the reach is industrial (28%), urban (16%), parks and open space (15%) and other (41%) [transportation rights-of-way]. Land ownership is 61% private and 39% public (City, County, and WSDOT).

CONTAMINATED SITES

A hazardous waste generator is mapped in the southwestern portion of the reach, south of the Yakima River.

ZONING (MAP #5)

Lands within the reach are zoned primarily for industrial use (71%), with areas of urban/suburban residential (10%), parks and open space (5%) and other (13%) [transportation rights-of-way] zoning.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A portion of the Burlington Northern-Santa Fe (formerly Northern Pacific) rail line crosses Oakes Avenue in Cle Elum. The rail line was built in 1886 and is potentially eligible for listing on the National Register.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), but, water quality impairments and significant hydromodifications limit fish habitat quality.

TERRESTRIAL HABITAT QUALITY

Low: Vegetation in a majority of the reach has been removed by development, there connections to adjacent habitat areas are disturbed.

VEGETATION FUNCTIONS

Low: Vegetation in a majority of the reach has been altered by development (primarily I-90).

HYDROLOGIC FUNCTIONS

Low: There are significant floodplain alterations within the reach; primarily hydromodifications associated with I-90 .

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Protect the remaining forested riparian areas within the reach.
- Support efforts such as the Yakima River Side Channels Project and Yakima Tributary Access and Habitat Program.
- Work with landowners and the Kittitas Conservation District to encourage best management practices that reduce erosion of soil and legacy pesticides into surface waters.
- Educate shoreline property owners about measures to protect and restore riparian areas.

YAKIMA RIVER-TOWN OF SOUTH CLE ELUM REACH

SHORELINE LENGTH:

0.1 Miles

REACH INVENTORY AREA:

116.1 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

This single channel reach is confined by a railroad to the north.

LAND COVER (MAP FOLIO #3)

The majority of the reach is covered by agricultural lands (41%), developed lands (26%), and conifer-dominated forest (16%). Other cover types include: riparian vegetation (10%), unvegetated lands (7%), and other (1%).

HAZARD AREAS (MAP FOLIO #2)

The reach (99%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and juvenile rearing habitat for spring Chinook and summer steelhead. The presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also documented.

WATER QUALITY

TMDLs have been implemented for 4,4'-DDE, DDT, temperature, and turbidity.

Wetland habitat is associated with the river within the reach (13% reach total). Priority sharp-tailed snake area is also mapped within the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Linear hydromodifications border the Yakima River at the northeast end of the reach.

PUBLIC ACCESS (MAP FOLIO #4)

The river can be accessed at Firemen Park.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use within the reach is rural to the north (18%) and urban to the south (82%). Land ownership is 77% private and 23% public (City, County, and BPA).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for primarily for urban/suburban residential (47%) and commercial (11%) uses to the south, with areas of forest & range (18%) and other (23%) [transportation rights-of-way] zoning.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), but, water quality impairments and significant hydromodifications limit fish habitat quality.

TERRESTRIAL HABITAT QUALITY

Low: Some dense forest and shrub habitat remains on the south side of the river, but connections to adjacent habitat areas are disturbed.

VEGETATION FUNCTIONS

Medium: Vegetation along the north side of the reach has been removed by a railroad track, but dense forest and shrub habitat remains on the south side.

HYDROLOGIC FUNCTIONS

Low: There are significant floodplain alterations within the reach; primarily hydromodifications associated with I-90 .

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Protect the remaining forested riparian areas within the reach.

1 3.4 Cabin Creek and Log Creek

2 Cabin Creek is a right-bank tributary to the Yakima River, entering upstream of Lake
3 Easton at RM 205. The stream generally flows west to east. Log Creek is a right-bank
4 tributary to Cabin Creek and flows south to north.

5 3.4.1 Physical Characterization

6 Cabin and Log Creeks experience flashy flows, largely because of widespread
7 clearcuts in the upper watershed, coupled with periodic rain-on-snow events
8 (Haring 2001). A large landslide event occurred at RM 3.6 (Falls Hill) on Cabin Creek
9 and is the major sediment source to the lower stream. Flashy hydrology, coupled
10 with the landslide, has led to significant channel instability below RM 3.6. Several
11 other landslide hazard areas are mapped adjacent to the streams, upstream and
12 downstream of the Falls Hill location (WDNR 2010). Steep slopes are mapped along
13 most of the shoreline of the two streams (Kittitas County 2012). The FEMA 100-year
14 floodplain occupies much of the downstream two-thirds of the Cabin Creek
15 inventory area (FEMA 1996). Downstream of the confluence with Log Creek, Cabin
16 Creek is mapped as having potential for channel migration. In addition, the
17 downstream half of the Log Creek reach has potential for channel migration
18 (Ecology 2011). Cabin Creek has a large and unpredictable floodplain and flood
19 capacity (Tetra Tech, 2012).

20 The Cabin and Log Creek watershed is largely undeveloped, but timber harvest is a
21 common land use. A Forest Service road parallels much of Cabin Creek and crosses
22 the stream at multiple locations. Before entering the Yakima River, the streamflows
23 under a railroad bridge and the John Wayne Heritage Trail, in addition to a utility
24 corridor. A small residential development and old log yard, located on the left bank
25 near RM 0.75, restrict floodplain connectivity. A Forest Service road borders Log
26 Creek for much of its length and crosses the stream several times.

27 Like many of the other tributaries to the upper Yakima River, there are no irrigation
28 dams or diversions on Cabin and Log Creeks. However, at least two waterfalls
29 associated with the Falls Hill slide are barriers to upstream anadromous fish
30 passage. In addition, two man-made barriers were identified elsewhere within the
31 watershed (Haring 2001).

1 3.4.2 Habitats and Species

2 3.4.2.1 Fish Use

3 Cabin Creek supports spring Chinook juvenile rearing. Other fish species
4 documented include rainbow trout, westslope cutthroat, and eastern brook trout
5 (StreamNet 2010). Most of these species occur downstream of the impassable Falls
6 Hill landslide (RM 3.6); only cutthroat are present upstream of the landslide (Haring
7 2001). Several road culverts may also present fish passage barriers. Log Creek
8 supports westslope cutthroat.

9 Flows in Cabin Creek are flashy due to large clearcuts in the upper watershed. High
10 flows move large wood out of the stream channel. Pools and off-channel habitat are
11 lacking (Haring 2001).

12 3.4.2.2 Water Quality

13 Lower Cabin Creek and lower Log Creek are on Ecology's 303(d) list for warm water
14 temperatures.

15 Numerous landslides in the Cabin Creek watershed contribute excess sediment to
16 the stream. Logging roads are another source of sediment to both Cabin and Log
17 Creeks (Haring 2001).

18 3.4.2.3 Riparian Habitat Conditions (Land Cover)

19 Cabin and Log Creeks flow through commercial forestland in various stages of
20 regeneration. The riparian zone along the lower part of Cabin Creek is generally
21 intact, but riparian vegetation is in poor condition from RM 1 upstream due to
22 severe floods and logging. Most of the upper drainage was logged before riparian
23 buffer strips were required, and so the riparian vegetation is still early successional
24 (Haring 2001). There are several stream crossings as discussed in Section 3.4.1.

25 3.4.2.4 Wetlands

26 Freshwater emergent, shrub, and forested wetlands are mapped along lower Cabin
27 Creek. No wetlands are mapped in the Log Creek shoreline inventory area.

28 3.4.2.1 Wildlife Habitats and Species

29 Northern spotted owls (federally listed threatened species) have been mapped in
30 the vicinity of Cabin and Log Creeks. Elk concentration and calving areas are also
31 mapped in this area.

1 3.4.3 Land Use

2 Most of the land bordering Cabin and Log Creeks is private commercial forest lands,
3 with some National Forest lands at the upstream ends of the streams. Some rural
4 residential development is located along the lower mile of Cabin Creek. South of the
5 Easton Re-Load SnoPark, an approximately 1-mile stretch of stream frontage on
6 Cabin Creek is permanently conserved and managed by the Cascade Land
7 Conservancy.

8 3.4.4 Public Access

9 Lower Cabin Creek can be accessed from the John Wayne Heritage Trail and the
10 Easton Re-Load Snopark. The creek is bordered by a snowmobile trail for almost its
11 entire extent.

12 3.4.5 Reach Sheets

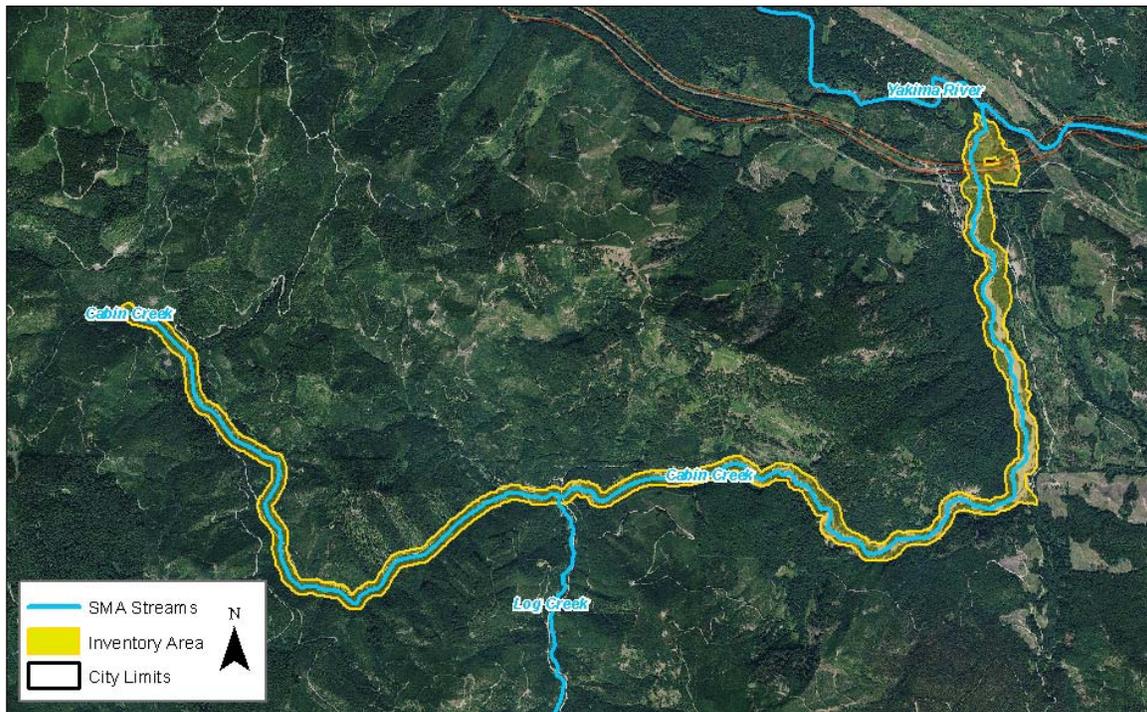
CABIN CREEK

SHORELINE LENGTH:

9.1 Miles

REACH INVENTORY AREA:

520.0 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The upstream portion of the reach is located within a narrow channel that exhibits limited migration; however, the downstream portion of the reach flows through a broad channel that allows for frequent channel migration. A Forest Service road limits channel movement in the middle portion of the reach.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is dominated by conifer-dominated forest (49%), riparian vegetation (28%), and harvested forest (20%), with limited developed lands (2%) shrublands (1%), and other (1%).

HAZARD AREAS (MAP FOLIO #2)

Roughly one-third of the reach (33%) is located within the FEMA 100-year floodplain and several landslide hazard areas (9%) are mapped along the reach. Downstream of the confluence with Log Creek, the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides juvenile rearing habitat for spring Chinook. The presence of eastern brook trout, rainbow trout, and westslope cutthroat is also mapped within the reach.

WATER QUALITY

The reach is listed on the State’s Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Wetland habitat is mapped fairly continuously on both banks of the downstream portion of the reach (17% of the reach). No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

A Forest Service road parallels the reach and crosses the stream at multiple locations. The road culverts may be fish passage barriers.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail and Easton Re-Load Snopark allow access to the stream. A snowmobile trail parallels most of the reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily forestry (83%) with rural lands along the downstream end (17%). Land ownership is 51% private and 49% public (State and Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (82%), with some forest & range (9%) and rural residential (9%) areas at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A National Register historic district is located within the reach. The Cabin Creek Historic District is a collection of cabins and buildings built around 1916.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The stream provides provides habitat for priority fish species (including rearing habitat for Spring Chinook) and is largely unaltered, but the flashy hydrograph and channel instability in the lower reach limits fish habitat quality.

TERRESTRIAL HABITAT QUALITY

High: The reach is connected to a large area of contiguous forest habitat, and contains minimal existing development.

VEGETATION FUNCTIONS

High: The majority of the reach area consists of dense, mature forest cover.

HYDROLOGIC FUNCTIONS

Medium: Much of the stream channel is unaltered, but flashy flows (attributed to clearcuts in the upper watershed) have altered the hydrology of the creek.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions.
- The Cabin Creek Historic District is located within the reach.
- Several road culverts within the reach may be fish passage barriers.
- Decommission or repair logging roads to reduce erosion.
- Cabin Creek has a large and unpredictable floodplain in the lower reach.

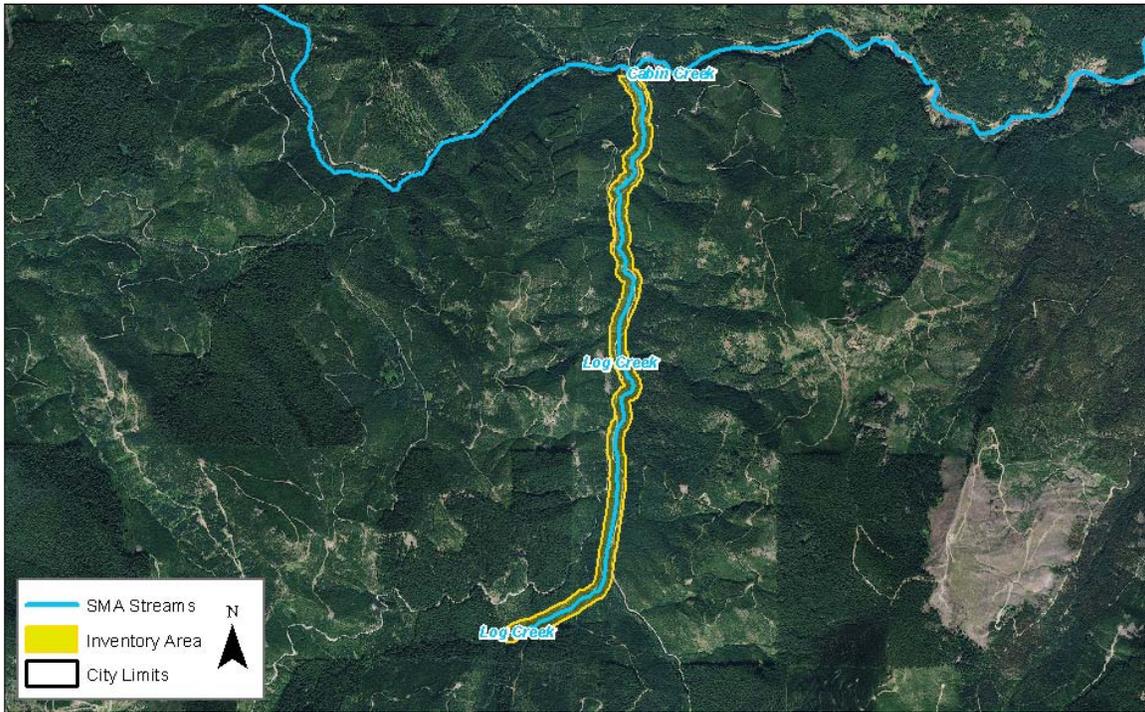
LOG CREEK

SHORELINE LENGTH:

3.1 Miles

REACH INVENTORY AREA:

152.7 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach is located within a narrow valley and is confined by a forest service road for much of its length, with the exception of the downstream portion where the valley becomes broader.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is mostly harvested forest (70%) and conifer-dominated forest (21%), with patches of riparian vegetation (8%) and other (1%).

HAZARD AREAS (MAP FOLIO #2)

The reach is not located within the FEMA 100-year floodplain. Multiple landslide hazard areas (8%) are mapped within the reach. The downstream half of the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows westslope cutthroat habitat within the reach. No priority habitats or species are identified in this reach by WDFW.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

A Forest Service road parallels much of the reach.

PUBLIC ACCESS (MAP FOLIO #4)

No public access is provided to the reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is forestry (100%). Land ownership is 89% private and 11% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (100%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The stream has a generally well-vegetated riparian corridor, but a Forest Service road has impacted many areas. Natural barriers on Cabin Creek block anadromous fish access.

TERRESTRIAL HABITAT QUALITY

High: The reach is connected to a large area of contiguous forest habitat, and contains minimal existing development (with the exception of a Forest Service road that parallels the stream).

VEGETATION FUNCTIONS

High: The majority of the reach area consists of dense, mature forest cover.

HYDROLOGIC FUNCTIONS

Low: A Forest Service road parallels the stream and flashy flows (attributed to clearcuts in the upper watershed) have altered the hydrology of the creek.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions.
- The Forest Service road the parallels the reach has separated the river from its floodplain in many locations.
- The Cabin Creek Historic District is located within the reach.
- Several road culverts within the reach may be fish passage barriers.

3

1 **3.5 Lower Kachess River and Lake Easton**

2 The Kachess River flows approximately 1.1 miles from the Kachess Lake Dam to
3 Lake Easton, draining to the north shore of Lake Easton. The river is mapped as a
4 shoreline of statewide significance from the confluence with Lake Easton, upstream
5 for approximately 0.5 mile.

6 **3.5.1 Physical Characterization**

7 Lake Easton is approximately 1.3 miles long and 0.6 mile wide. In addition to the
8 Kachess River, the Yakima River enters Lake Easton from the west. The Lake Easton
9 Dam is located at the southeastern portion of the lake and impounds up to 4,000
10 acre-feet of water, covering approximately 516 acres. The dam has a fish ladder that
11 facilitates anadromous access to upstream habitat; however, access may be
12 impaired during some years (low flow) and during certain parts of the year (fish
13 ladder operated from October-May) (Haring 2001). The lake is operated for
14 irrigation diversion to the Kittitas Main Canal, rather than storage, unlike the three
15 large reservoirs.

16 Several small landslide hazard areas are located along the left bank of the Kachess
17 River and in the southwestern portion of the lake (WDNR 2010). A few steep slopes
18 are mapped along the southern shoreline of Lake Easton and in the vicinity of the
19 dam (Kittitas County 2012). The FEMA 100-year floodplain occupies much of the
20 Kachess River inventory area, particularly the right bank of the reach, in addition to
21 the northeastern, eastern, and southeastern shorelines of Lake Easton (FEMA 1996).
22 The downstream half of the Kachess River is mapped as having potential for channel
23 migration (Ecology 2011).

24 Interstate 90, in addition to two other roads, crosses the southern portion of the
25 Kachess River/north end of Lake Easton. Fill material has been placed in the lake to
26 facilitate construction of these transportation corridors. A utility corridor is also
27 located at the base of the Kachess Dam, crossing over the river. A small residential
28 community is located on the right bank of the river between Kachess Lake Dam and
29 I-90. A railroad corridor is located along the southern shoreline of the lake and the
30 John Wayne Heritage Trail crosses the mouth of the Yakima River at Lake Easton.

1 3.5.2 Habitats and Species

2 3.5.2.1 Fish Use

3 The lower Kachess River and Lake Easton are used by spring Chinook, coho salmon,
4 Dolly Varden/bull trout, rainbow trout, westslope cutthroat, and mountain
5 whitefish. Introduced species include eastern brook trout (StreamNet 2010).

6 Lake Easton provides spawning habitat for spring Chinook and summer steelhead
7 (StreamNet 2010). The fish ladder at Easton Dam was reconstructed in 1987 to
8 improve anadromous salmonid access to the reach from Easton Dam to Keechelus
9 Dam. However, fish passage is still impaired in some years. Operation of the fish
10 ladder varies from year to year based on the water supply outlook. The decision
11 whether to keep the fish ladder open to allow passage of spring Chinook is based on
12 predicted total water availability each year (Haring 2001).

13 3.5.2.2 Water Quality

14 The Yakima River at Lake Easton is on Ecology's 303(d) list for low dissolved
15 oxygen and high water temperatures. WSDOT performed water quality monitoring
16 of streams in the upper Yakima River watershed in 2001 as part of the I-90
17 improvements project. Their sampling found exceedances of state water quality
18 standards in the Kachess River/Lake Easton (temperature, turbidity, dissolved
19 oxygen, heavy metals). Possible reasons for high temperatures include a lack of
20 riparian vegetation, disruption of groundwater flow by roads and drainage
21 structures, and excessive sediment deposition leading to shallow water. Sediments
22 may be eroded when stream channels are confined, such as by the I-90 bridges;
23 sand applied to I-90 for traction may also contribute excess sediment. Low dissolved
24 oxygen may result from elevated stream temperatures and decomposition of
25 organic matter. Heavy metals are a common pollutant in roadway runoff. (WSDOT
26 2005)

27 3.5.2.3 Riparian Habitat Conditions (Land Cover)

28 The riparian zone of Lake Easton is forested but constricted on three sides by major
29 roadways. The lower Kachess River (between Lake Easton and Lake Kachess) flows
30 through forested areas with limited rural residential development.

31 3.5.2.4 Wetlands

32 No wetlands are mapped along the Lake Easton shoreline. A small portion of the
33 lower Kachess River riparian area is mapped as wetland.

1 *3.5.2.1 Wildlife Habitats and Species*

2 An elk winter concentration area is mapped west of Lake Easton and the lower
3 Kachess River.

4 The I-90 corridor near Lake Easton has been identified as an important movement
5 corridor for wildlife as documented by camera traps and a high incidence of
6 roadkill. WSDOT has proposed constructing terrestrial wildlife crossings in this area
7 to improve connectivity for mammals, amphibians, reptiles, and mollusks (WSDOT
8 2005).

9 *3.5.3 Land Use*

10 The upstream half of the lower Kachess River is located on National Forest land
11 while the downstream half is bordered by a high-density residential development
12 and private forest land. Almost the entire shoreline of Lake Easton is located within
13 Lake Easton State Park.

14 *3.5.4 Public Access*

15 Lake Easton can be accessed from Lake Easton State Park and the John Wayne
16 Heritage Trail, and a boat launch is located on the northeast shore of the lake.
17 National Forest land bordering the lower Kachess River can be accessed from
18 Kachess Dam Road.

19 *3.5.5 Reach Sheets*

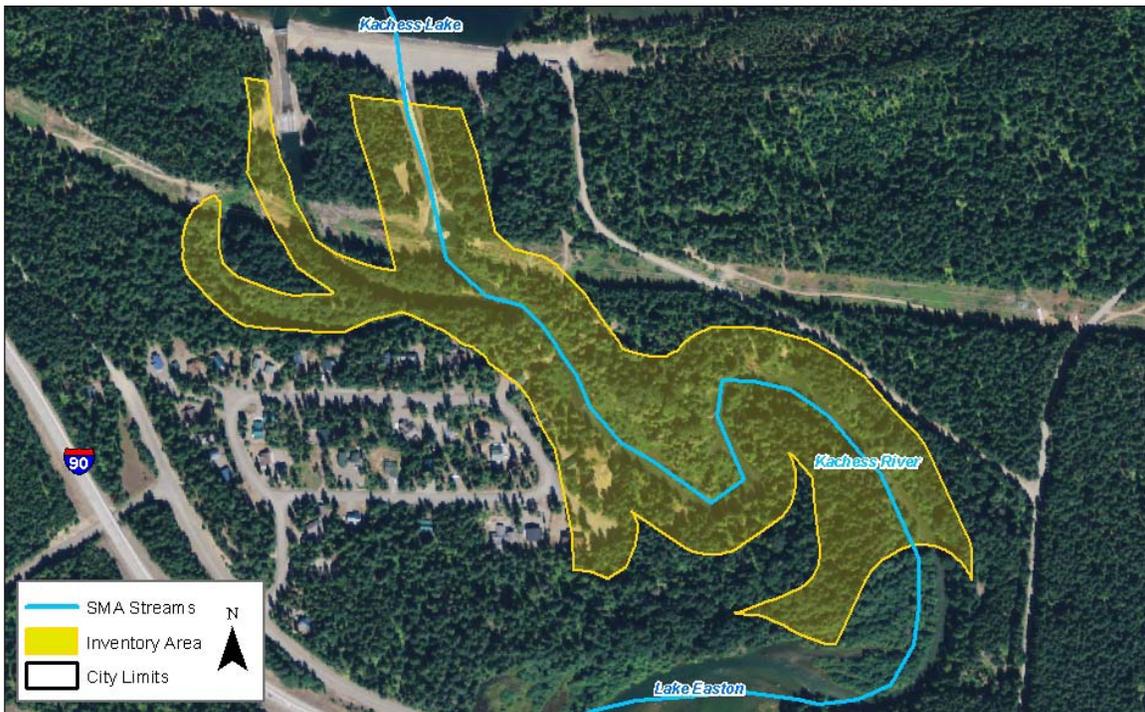
KACHESS RIVER-REACH 1

SHORELINE LENGTH:

0.7 Miles

REACH INVENTORY AREA:

43.3 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach only descends approximately 15 feet in elevation and is confined within a single channel that widens upstream of the confluence with Lake Easton, then constricts again at the I-90 crossing.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily conifer-dominated forest (67%) and riparian vegetation (33%).

HAZARD AREAS (MAP FOLIO #2)

Approximately 71% of the reach is located within the FEMA 100-year floodplain and a very limited number of landslide hazard areas (<1%) are mapped on the left bank. The downstream half of the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows the presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, spring Chinook, and westslope cutthroat within the reach.

WATER QUALITY

Dissolved oxygen data are not sufficient for listing the reach, but raise concern about water quality, per the State's Water Quality Assessment.

A couple patches of wetland habitat are mapped along the river in the reach (6% of the reach). No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

No shoreline modifications are identified within the reach.

PUBLIC ACCESS (MAP FOLIO #4)

National Forest land that borders the lower Kachess River can be accessed from Kachess Dam Road.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily forestry (80%) with urban lands along the southwest end of the reach (20%). Land ownership is 27% private and 73% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

The reach is zoned for commercial forestry (38%) at the upstream end and forest & range (40%), rural residential (21%), and other (1%) at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach has a well-vegetated riparian corridor and mapped priority fish presence, but no spawning or rearing habitat is mapped.

TERRESTRIAL HABITAT QUALITY

Medium: The reach is well-vegetated and has some limited connections to larger areas of undisturbed habitat. However, habitat at the upstream and downstream ends of the reach has been altered.

VEGETATION FUNCTIONS

Medium: The majority of the reach contains dense forest and shrub habitat, but the upstream and downstream ends have been altered (by Kachess Dam and I-90, respectively).

HYDROLOGIC FUNCTIONS

Medium: The floodplain of the river is generally unaltered, but upstream flows are controlled by Kachess Dam.

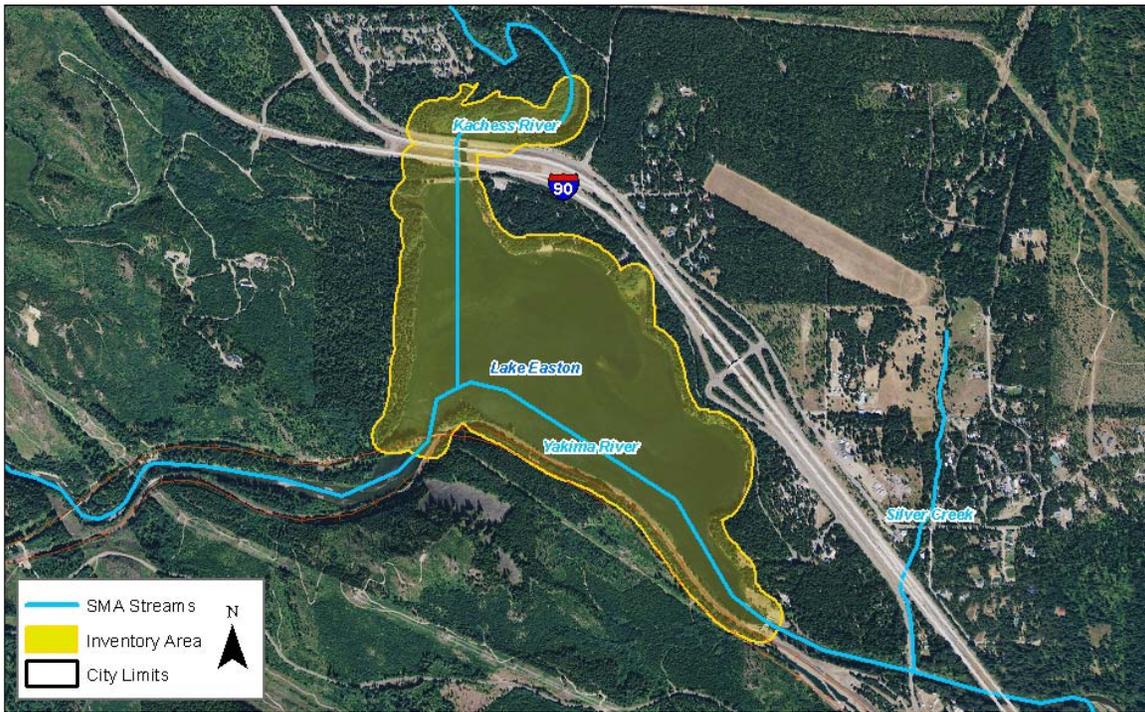
KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Protect the high-value, forested floodplain areas within the reach.

LAKE EASTON

SHORELINE LENGTH:
8.0 Miles

WATERBODY AREA: 208.1 Acres
REACH INVENTORY AREA: 316.1 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

The lake is located at the confluence of the Yakima River and Kachess River. The 66-foot-high dam, located at the southeast end of the lake, impounds the lake at 2,181 feet.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is mostly open water (64%), conifer-dominated forest (21%), and riparian vegetation (12%), with patches of developed lands (3%).

HAZARD AREAS (MAP FOLIO #2)

Approximately 33% of the reach is located within the FEMA 100-year floodplain and a few landslide hazard areas (1%) are mapped on the northern, western, and southern shorelines.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for spring Chinook and summer steelhead. The presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat are mapped within the reach.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for dissolved oxygen, pH, and temperature. The reach meets water quality criteria for fecal coliform.

A small area of wetland habitat is mapped along the shoreline of the lake (2% of the reach). No priority habitats or species are identified in this reach by WDFW.

The Lake Easton shoreline supports one rare plant species mapped by the Washington Natural Heritage Program.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The lake level is controlled by a dam, which contains a fish ladder. I-90 crosses the lake in the Kachess River outlet, and the southern shore of the lake is constrained by railroad tracks.

PUBLIC ACCESS (MAP FOLIO #4)

The lake can be accessed from Lake Easton State Park, the John Wayne Heritage Trail, a boat launch located on the northeast shore of the lake, and a snowmobile trail that crosses the north end of the lake.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use bordering the lake is primarily forestry (54%), rural (21%), and parks & open space (21%) lands, with some urban land (1%) at the southeast corner of the lake. Land ownership is 98% private and 2% public (State).

CONTAMINATED SITES

A State cleanup site (gas station) is located in the northern portion of the reach, adjacent to I-90.

ZONING (MAP #5)

Lands within the reach are zoned for rural residential (35%), forest & range (35%), and other (30%) [I-90 and John Wayne trail].

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are a total of 3 recorded precontact sites, 1 recorded historic site, and 1 site that features both precontact and historic features located within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Low: The lake is operated as an irrigation diversion reservoir, and has several water quality impairments.

TERRESTRIAL HABITAT QUALITY

Medium: The lake shore is well-vegetated and is connected to a significant area of contiguous forest habitat to the west, but other connections are disturbed by I-90 and the John Wayne Heritage Trail.

VEGETATION FUNCTIONS

Medium: The majority of the lake shoreline consists of dense forest and shrub cover, but some areas have been altered (I-90, Lake Easton Dam, and recreational uses).

HYDROLOGIC FUNCTIONS

Medium: The lake provides some floodwater storage potential, but it is managed as an irrigation diversion reservoir.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- The dam has a fish passage facility, but the facility is not operated year-round and access is impaired during low flow years,

3

1 3.6 Kachess Lake

2 Kachess Lake is located in the northwestern portion of Kittitas County, and is
3 designated as a “lake of statewide significance.” The lake, located between
4 Keechelus Lake and Cle Elum Lake, is one of the reservoirs operated to supply
5 irrigation water as part of the Yakima Project.

6 3.6.1 Physical Characterization

7 The lake is oriented north-south and is fed primarily by three tributaries that drain
8 to the northern half of the lake: Mineral Creek, Box Canyon Creek, and Gale Creek.
9 Kachess Lake is approximately 10 miles long and 1 mile wide, covering 4,540 acres
10 when at capacity, making the lake the largest major irrigation storage reservoir in
11 the Yakima River watershed.

12 The active storage of the lake is approximately 239,000 acre-feet when at capacity.
13 The dam, standing at 115 feet, was originally constructed in 1912 and then
14 improved in 1935 (Haring 2001). A 2,877-foot constructed discharge channel
15 carries water to the intake structure of the dam’s outlet works. The channel was
16 excavated from the natural lake, allowing for the natural lake to be used for storage
17 (BOR 2009).

18 A few potential landslide areas are mapped on the eastern shoreline (WDNR 2010).
19 The northwest and eastern shorelines are mapped with steep slopes (Kittitas
20 County 2012). The FEMA 100-year floodplain is mapped within almost the entirety
21 of the western shoreline inventory area. The southern shoreline is also mapped as
22 being in the floodplain, but to a lesser extent (FEMA 1996).

23 Multiple roads are mapped on the western and eastern shorelines, primarily along
24 the southern two-thirds of the lake. Limited residential development is located on
25 the western shoreline and most of the watershed is forested, but has been impacted
26 by logging practices. Multiple overwater structures are mapped along the lake’s
27 shoreline, with a concentration of structures located near the central portion of the
28 western shore (WDNR 2009).

1 3.6.2 Habitats and Species

2 3.6.2.1 Fish Use

3 Kachess Lake supports Dolly Varden/bull trout rearing and spawning. Other fish
4 that use the lake include kokanee salmon, rainbow trout, westslope cutthroat, and
5 pygmy whitefish (StreamNet 2010).

6 The Integrated Water Resource Management Plan for the Yakima River basin
7 proposes installing upstream and downstream fish passage facilities at Kachess
8 Dam, subject to further evaluation of alternatives to determine the most feasible
9 approach for providing passage (Reclamation and Ecology 2011a).

10 The Integrated Plan for the Yakima River basin also includes the Lake Kachess
11 Inactive Storage project, which would be located just east of Interstate 90 near
12 Easton. The project would tap into Lake Kachess and allow the lake to be drawn
13 down approximately 80 feet lower than the current outlet. This would provide the
14 ability to withdraw another 200,000 acre-feet of water from the lake, when needed,
15 for downstream uses during drought conditions. Water would be conveyed through
16 a pump station and outlet just downstream from Kachess Dam or a tunnel outlet to
17 the Yakima River approximately 4.8 miles southeast of Kachess Dam. This project
18 will include fish passage improvements at Box Canyon Creek to improve access for
19 bull trout (Reclamation and Ecology 2011a).

20 The "K to K" pipeline is another project proposed under the Integrated Plan. Water
21 would be conveyed from Lake Keechelus to Lake Kachess to reduce flows and
22 improve habitat conditions during high flow releases below Lake Keechelus and
23 provide more water storage in Lake Kachess for downstream needs. The pipeline
24 may also help Lake Kachess refill after using inactive storage (Reclamation and
25 Ecology 2011a).

26 3.6.2.2 Water Quality

27 Lake Kachess is not included on Ecology's 2008 list of waterbodies with impaired
28 water quality. There is scant published water quality information for this lake.

29 3.6.2.3 Riparian Habitat Conditions (Land Cover)

30 Lake Kachess is surrounded by coniferous forest that is managed for timber harvest.
31 Riparian vegetation is in various stages of succession. Roads and limited residential
32 development encroach into portions of the riparian zone as described in Section
33 3.6.1.

1 3.6.2.4 *Wetlands*

2 Lake Kachess is a reservoir with steep shorelines that are unlikely to support
3 wetlands. No wetlands are mapped along the lake shore.

4 3.6.2.1 *Wildlife Habitats and Species*

5 Most of the area immediately east of Lake Kachess is mapped as critical habitat for
6 northern spotted owl (federally listed threatened species). This area is also mapped
7 as elk and mountain goat wintering range.

8 3.6.3 Land Use

9 Kachess Lake is bordered by a “checkerboard” of public (National Forest) and
10 private parcels. Most of the private parcels are zoned for commercial forestry, with
11 the exception of two residential developments (one high-density and one low-
12 density) located on the west shore of the lake.

13 3.6.4 Public Access

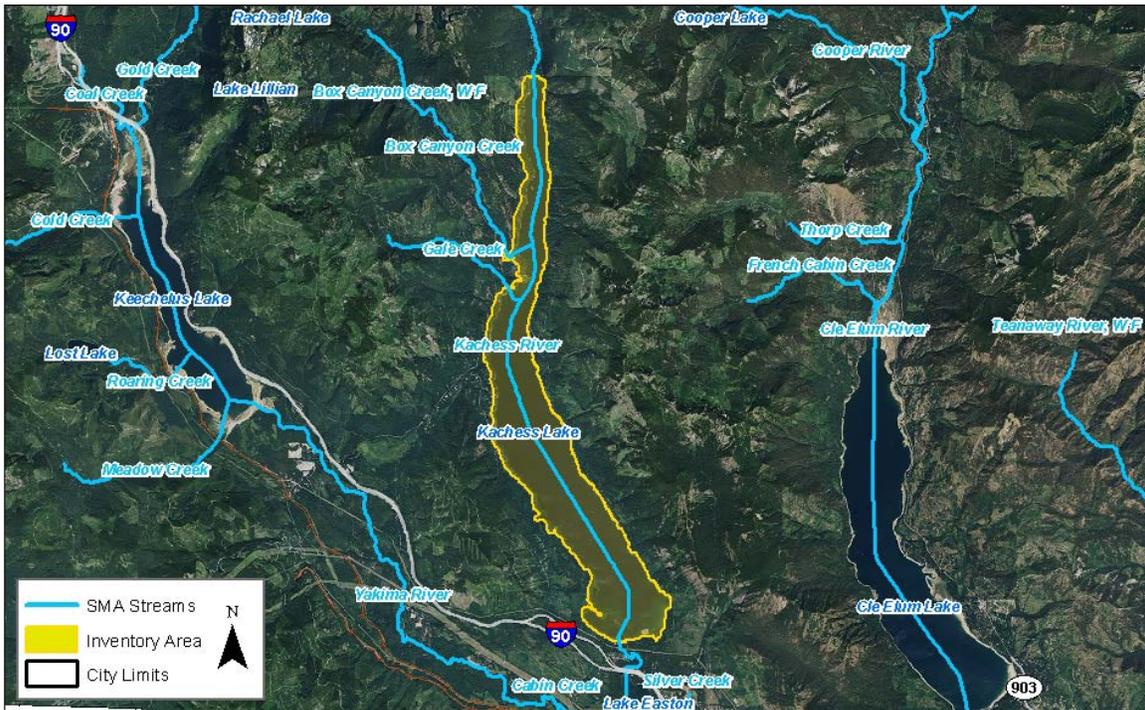
14 Hiking and snowmobile trails border much of the Kachess Lake shoreline. A boat
15 launch and National Forest campground are located on the west shore of the lake,
16 off of Kachess Lake Road.

17 3.6.5 Reach Sheet

KACHESS LAKE

SHORELINE LENGTH:
77.1 Miles

WATERBODY AREA: 4,367.8 Acres
REACH INVENTORY AREA: 5,182.6 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

The lake is located in a valley, oriented northwest to southeast. The 115-foot-high dam, located at the south end of the lake, regulates pool elevations between 2,262 feet and 2,193 feet.

LAND COVER (MAP FOLIO #3)

This reach is principally composed of open water (76%) and conifer-dominated forest (11%). Unvegetated (6%), riparian vegetation (4%), other (2%), and harvested forest (1%) are also present.

HAZARD AREAS (MAP FOLIO #2)

A large extent of the reach (61%) is located within the FEMA 100-year floodplain; several landslide hazard areas (3%) are mapped on the eastern shoreline of the lake.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and rearing habitat for Dolly Varden/bull trout. The presence of burbot, eastern brook trout, kokanee salmon, rainbow trout, westslope cutthroat, and mountain whitefish is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Limited wetland habitat is mapped along the shoreline of the lake (3% of the reach). Priority cliff/bluffs are located at the northeast portion of the lake, elk winter concentration area is mapped east of the lake, and mountain goat winter range is located at the south end of the lake. Bald eagle also is mapped in the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The lake level is controlled by a dam (which is a fish passage barrier). There are approximately 10 docks mapped on the lakeshore, primarily along the western shore.

PUBLIC ACCESS (MAP FOLIO #4)

Hiking and snowmobile trails border the northwest and southeast shorelines of the lake. A boat launch and National Forest campground are located on the northwest shoreline of the lake, off of Kachess Lake Road.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use around the lake is primarily forestry (83%) with some patches of rural (7%) and parks & open space (9%) lands also present. Land ownership is 13% private and 87% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (84%), with some areas of forest & range (5%), rural residential (1%), and other [I-90] (9%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A total of 15 recorded precontact and historic sites are located within the reach. Precontact sites feature campsites, lithic material, and possible fish weirs while historic sites include depression era properties, refuse scatters, and campsites related to dam construction.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The lake provides habitat for several priority fish species (including spawning habitat for Dolly Varden/bull trout and Kokanee salmon), but is primarily managed as an irrigation reservoir and has a listed water quality impairment (high temperatures).

TERRESTRIAL HABITAT QUALITY

High: The shorelands consist primarily of dense forest cover, and the lake has significant, unaltered connections to large areas of relatively unaltered habitat.

VEGETATION FUNCTIONS

High: Nearly the entire lakeshore consists of dense, mature forest habitat

HYDROLOGIC FUNCTIONS

Medium: The lake provides significant floodwater storage, but it is managed as an irrigation reservoir.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Based upon existing land use patterns in the area, resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forest lands to residential subdivisions). New development should be set back an adequate distance to protect riparian functions along the lakeshore.
- Kachess Dam is a complete barrier to fish passage. Participate in programs to install fish passage facilities at Kachess Dam.
- Many important cultural and archaeological sites are located within the reach.
- Encourage new/existing docks to be joint-use structures designed to be fish-friendly (e.g., grating to allow light penetration, use of non-toxic materials).

3

1 3.7 Kachess Lake Tributaries

2 Three main tributaries (mean annual flow greater than 20 cfs) flow into the north
3 half of Kachess Lake. Mineral Creek, which becomes the Kachess River 1.2 miles
4 before entering the lake, drains to the north end of Kachess Lake. Box Canyon Creek
5 and Gale Creek empty to the northwest portion of the lake, respectively.

6 3.7.1 Physical Characterization

7 Several landslide hazards are mapped along Gale Creek (WDNR 2010) and steep
8 slopes are mapped adjacent to each of these tributaries (Kittitas County 2012). In
9 addition, several Forest Service roads cross each of the tributaries one to multiple
10 times. The FEMA 100-year floodplain is mapped in most of Kachess River Reach 2
11 inventory area, primarily on the right bank. The mouth of Box Canyon Creek is also
12 mapped in the floodplain (FEMA 1996).

13 3.7.2 Habitats and Species

14 3.7.2.1 Fish Use

15 Table 3-2 summarizes fish use in tributaries to Lake Kachess. The lack of upstream
16 fish passage facilities at Kachess Dam has prevented anadromous salmonids from
17 accessing approximately 14 miles of highly productive historic habitat (Haring
18 2001).

19 A barrier falls located on Box Canyon Creek at RM 1.6 precludes upstream migration
20 of resident fish (Haring 2001). Additionally, as Kachess Lake is drawn down in the
21 summer/fall, the undefined channel at the mouth of Box Canyon Creek may become
22 too shallow for passage by some fish species (e.g., bull trout, resident salmonids).
23 The Bureau of Reclamation attempted to mitigate this by constructing a single
24 channel through the inundation zone. A similar passage problem occurs at the
25 mouth of the Kachess River. In addition, a culvert on Gale Creek was identified as a
26 fish passage barrier (Haring 2001).

27

**Table 3-2. Fish Use in Kachess Lake Tributaries
(Source: StreamNet 2010)**

Species	Gale Creek	Box Canyon Creek	WF Box Canyon Creek	Upper Kachess River	Mineral Creek
Dolly Varden/Bull Trout		S		S, R	S, R, P/M
Rainbow Trout	P/M	P/M		P/M	P/M
Westslope Cutthroat	P/M	P/M	P/M	P/M	P/M
Eastern Brook Trout		P/M		P/M	P/M
Kokanee Salmon		P/M		P/M	P/M
Coho salmon				P/M	

P/M = presence/migration; R = juvenile rearing; S = spawning

3.7.2.2 Water Quality

Lower Gale Creek is on Ecology's 303(d) list for high stream temperatures.

3.7.2.3 Riparian Habitat Conditions (Land Cover)

The Kachess Lake tributaries flow through coniferous forest that is managed for commercial timber harvest. The upper reaches of Mineral Creek are within alpine shrubland. I-90 crosses the upper Kachess River, confining the river's floodplain (WSDOT 2005).

3.7.2.4 Wetlands

Freshwater scrub-shrub and forested wetlands are mapped along much of the upper Kachess River. Mapped wetlands are scattered along the other upper tributary streams.

3.7.2.1 Wildlife Habitats and Species

The upper tributaries to Lake Kachess are located within mapped critical habitat for northern spotted owl (federally listed threatened species) and near mapped mountain goat range.

1 **3.7.3 Land Use**

2 The tributary lakes and stream reaches to Kachess Lake are primarily located on
3 National Forest lands.

4 **3.7.4 Public Access**

5 The tributary lakes and stream reaches to Kachess Lake are accessible via hiking
6 and snowmobile trails.

7

DRAFT

1 3.8 Silver Creek

2 Silver Creek flows from north to south and is a left-bank tributary to the Yakima
3 River, entering the river at approximately RM 202.2.

4 3.8.1 Physical Characterization

5 The upstream portion of the stream is generally an unconfined, narrow, single
6 channel. Downstream, residential developments and road crossings, including I-90,
7 confine the channel. A streambed control feature is mapped near the mouth of the
8 stream, at the Railroad Street Bridge crossing of the Yakima River, which acts as a
9 partial fish passage barrier (WDFW 2010). The downstream half of the reach is
10 mapped as having potential for channel migration (Ecology 2011).

11 3.8.2 Habitats and Species

12 3.8.2.1 Fish Use

13 Silver Creek supports westslope cutthroat (StreamNet 2010). Fish passage barriers
14 are mapped at roadway crossings on the lower part of the stream.

15 3.8.2.2 Water Quality

16 Silver Creek is not included on Ecology's 303(d) list of waterbodies with water
17 quality impairments.

18 3.8.2.3 Riparian Habitat Conditions (Land Cover)

19 Silver Creek flows through rural residential areas. The upper portion of the stream
20 has a narrow band of riparian trees which grows wider heading downstream. Roads
21 constrict riparian vegetation along the lowest part of the stream.

22 3.8.2.4 Wetlands

23 No wetlands are mapped within the Silver Creek shoreline inventory area.

24 3.8.2.1 Wildlife Habitats and Species

25 Most of Silver Creek is located in a mapped elk wintering area.

1 3.8.3 Land Use

2 The downstream end of Silver Creek, south of its I-90 crossing, is bordered by
3 railroad tracks. Upstream of I-90, the creek is bordered by high- and low-density
4 residential developments.

5 3.8.4 Public Access

6 The lands bordering Silver Creek are private. View access is available from public
7 road crossings.

8 3.8.5 Reach Sheet

DRAFT

SILVER CREEK

SHORELINE LENGTH:

0.8 Mile

REACH INVENTORY AREA:

37.8 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach has low topographic relief, and the upstream portion is generally an unconfined, narrow, single channel. Downstream, residential developments and road crossings, including I-90, confine the channel.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is dominated by conifer-dominated forest (42%), harvested forest (26%), and developed lands (22%), with limited other (5%) and riparian vegetation (5%).

HAZARD AREAS (MAP FOLIO #2)

20% of the reach is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows the presence of westslope cutthroat in the creek. No wetland habitat is mapped in the reach. A significant amount of priority elk winter concentration area is mapped within the reach.

WATER QUALITY

The reach is not listed on the State's Water Quality Assessment list of 303 (d) waters.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

A portion of the reach is constrained at the I-90 crossing. Fish barrier culverts are located at I-90 and Parks Rd.

PUBLIC ACCESS (MAP FOLIO #4)

There is no public access to this reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily rural (80%), with some urban (17%) and commercial (3%) lands near the center of the reach. Land ownership is 95% private and 5% public (State Parks).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for rural residential (67%), with commercial (12%) and other (21%) [I-90] at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Low: Fish habitat within the reach is limited by adjacent development and fish passage barriers.

TERRESTRIAL HABITAT QUALITY

Low: The reach is surrounded by roads (including I-90) and residential development.

VEGETATION FUNCTIONS

Medium: Some dense forest cover remains along the stream, but significant portions have been removed by adjacent development and I-90.

HYDROLOGIC FUNCTIONS

Low: The reach contains significant hydromodifications and floodplain alteration.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Two fish-barrier culverts are located within the reach (I-90 and Sparks Road).
- There is no public access to the reach.
- Restore fish passage at Railroad Street Bridge crossing and roadways.
- Educate shoreline property owners about measures to protect and restore riparian areas.

3

1 3.9 Lavender Lake

2 Lavender Lake is located on the right bank of the Yakima River, north of I-90,
3 between Silver Creek (upstream) and Big Creek (downstream), at RM 198.

4 3.9.1 Physical Characterization

5 Lavender Lake is approximately 0.3 mile long and 0.1 mile wide and contains
6 several acres of surface water. The lake is primarily used by anglers fishing for
7 stocked rainbow trout. The west and north sides of the lake contain residential
8 development, the east side of the lake is forested, and the south side is adjacent to
9 the interstate. There is no permanent surface water connection between the lake
10 and the Yakima River; however, the FEMA 100-year floodplain is mapped in a
11 portion of the inventory area (FEMA 1996).

12 3.9.2 Habitats and Species

13 3.9.2.1 Fish Use

14 Lavender Lake is stocked with rainbow trout.

15 3.9.2.2 Water Quality

16 Lavender Lake is listed on the State's Water Quality Assessment list of 303 (d)
17 waters for invasive exotic species.

18 3.9.2.3 Riparian Habitat Conditions (Land Cover)

19 Approximately half of the lake shoreline is forested, while the remainder consists of
20 rural residential uses and roadways.

21 3.9.2.4 Wetlands

22 No wetlands are mapped along the Lavender Lake shoreline.

23 3.9.2.1 Wildlife Habitats and Species

24 Lavender Lake is located at the edge of a mapped elk wintering area.

1 **3.9.3 Land Use**

2 Lavender Lake is bordered by moderate-density residential development to the
3 west and north, I-90 to the south, and undeveloped forest land (zoned R3) to the
4 east.

5 **3.9.4 Public Access**

6 Public access to the southern shoreline of Lavender Lake is provided at Cresto Road.

7 **3.9.5 Reach Sheet**

DRAFT

LAVENDER LAKE

SHORELINE LENGTH:
1.0 Mile

WATERBODY AREA: 18.5 Acres
REACH INVENTORY AREA: 39.0 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

The shoreline of the lake, which is oriented west to east, contains limited development and is located between residential development and the Yakima River to the north and I-90 to the south. The lake does not drain to the Yakima River and likely was created by gravel mining.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily open water (43%), conifer-dominated forest (33%), riparian vegetation (13%), and developed lands (10%).

HAZARD AREAS (MAP FOLIO #2)

About one-quarter of the reach (27%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

The lake is stocked with rainbow trout. Wetland habitat is mapped on the northern shoreline of the lake (16% of the reach) and a priority elk winter concentration area is also mapped within the reach.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) waters for invasive exotic species.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The lake, which was created by gravel mining activities, is directly adjacent to I-90 to the south.

PUBLIC ACCESS (MAP FOLIO #4)

Public access to the southern shoreline of Lavender Lake is provided at Cresto Road.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use surrounding the lake is rural (100%). Land ownership is 100% private.

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for rural residential (44%) to the north and other (56%) [I-90] to the south.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Low: The lake is a manmade artifact of gravel mining, with no surface water connection to the Yakima River. There is no priority fish use.

TERRESTRIAL HABITAT QUALITY

Medium: The reach is directly adjacent to I-90, but contains some dense forest cover and connects to an area of relatively unaltered habitat to the east.

VEGETATION FUNCTIONS

Medium: Approximately half of the reach area contains dense forest cover, but significant areas have been altered by I-90 and adjacent residential development.

HYDROLOGIC FUNCTIONS

Low: The lake is a manmade artifact of gravel mining.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Develop a plan to control invasive aquatic vegetation.
- Educate shoreline property owners about measures to protect and restore riparian areas.

3

1 3.10 Big Creek

2 Big Creek is a right-bank tributary to the Yakima River, located between Lavender
3 Lake upstream and Little Creek downstream. Big Creek generally flows from
4 southwest to northeast and drains to the Yakima River at RM 195.8.

5 3.10.1 Physical Characterization

6 Several landslide hazard areas are mapped in the upper reach of the stream (WDNR
7 2010). Steep slopes are mapped along most of the stream's shoreline, upstream of
8 about RM 1.5 (Kittitas County 2012). The FEMA 100-year floodplain is mapped
9 within much of the downstream one-third of the inventory area (FEMA 1996). Big
10 Creek has an unpredictable floodplain and flood capacity (Tetra Tech, 2012).

11 Big Creek passes under and over multiple man-made features located in the lower
12 portion of the stream, including Interstate 90 and several other roads, the John
13 Wayne Heritage Trail, a railroad, an irrigation canal, and power line corridors.

14 The watershed was clearcut in the late 1800s and developed for agriculture. Water
15 diversions on Big Creek were installed by the late 1880s. Currently, a dam is located
16 at RM 2.1 along with unscreened agricultural water diversions. Downstream of this
17 point, the stream sometimes lacks instream flow, particularly during the dry season
18 because natural runoff in the stream is fully appropriated for irrigation (Haring
19 2001).

20 3.10.2 Habitats and Species

21 3.10.2.1 Fish Use

22 Big Creek supports spawning spring Chinook and summer steelhead. Numerous
23 spring Chinook juveniles rear in the lower reaches (Haring 2001). Other fish species
24 documented in Big Creek include eastern brook trout, rainbow trout, and westslope
25 cutthroat (StreamNet 2010).

26 WDFW maps fish passage barriers at the I-90 crossing on lower Big Creek. An
27 impassable dam and unscreened irrigation diversion at RM 2.1 prevent fish access
28 to potential high-quality spawning habitat upstream. The lack of instream flow from
29 the dam to the mouth of the stream is another barrier (Haring 2001).

30 The Integrated Water Resource Management Plan for the Yakima River basin
31 proposes modifications to laterals of the Kittitas Reclamation District (KRD) Main

1 and South Branch canals to reduce seepage losses and allow greater flexibility in
2 KRD supply management. The water saved or transferred would be used to enhance
3 instream flows in tributaries to the Yakima River, including Big Creek (Reclamation
4 and Ecology 2011a).

5 3.10.2.2 *Water Quality*

6 The lower portion of Big Creek, just below the boundary of Wenatchee National
7 Forest, is listed by Ecology for high water temperatures. This portion of the stream
8 crosses a cleared utility corridor where the lack of shade may contribute to higher
9 stream temperatures.

10 Excess sediment may also affect water quality in lower Big Creek, resulting from a
11 lack of riparian vegetation and large wood (Haring 2001).

12 3.10.2.3 *Riparian Habitat Conditions (Land* 13 *Cover)*

14 Coniferous forest occupies over half of the Big Creek riparian corridor, particularly
15 in the upper reaches. Around one-quarter of the reach is used for timber harvest.
16 Rural residential and agricultural uses dominate the lower part of the stream, where
17 riparian vegetation is narrower and trees are scattered. Large wood was actively
18 removed from the channel in the past, and there is currently little wood from the
19 powerline crossing to the stream mouth (Haring 2001).

20 3.10.2.4 *Wetlands*

21 Scattered wetlands mapped along Big Creek compose less than 5 percent of the
22 shoreline inventory area.

23 3.10.2.1 *Wildlife Habitats and Species*

24 Priority wildlife species mapped in the Big Creek watershed include northern
25 spotted owl (federally listed threatened species), elk, and mountain goat.

26 3.10.3 Land Use

27 The downstream end of Big Creek, between its confluence with the Yakima River
28 and I-90, is undeveloped forest land zoned for rural residential development.
29 Between I-90 and the KRD Big Creek Siphon, land use is primarily low-density
30 residential, with one moderate-density residential subdivision bordering the creek
31 in the northwest. From the siphon to approximately 1 mile upstream, undeveloped
32 forested land borders the creek which is zoned as forest and range. An electric

1 transmission line corridor also crosses the creek in this segment. The remainder of
2 the creek flows through a “checkerboard” of National Forest and private forest land.

3 3.10.4 Public Access

4 A dogsled trail crosses Big Creek at the Big Creek Siphon, and a snowmobile trail
5 crosses the stream within the electric transmission line corridor. Starting on
6 National Forest land, the Big Creek trail borders much of the upper stream.

7 3.10.5 Reach Sheet

DRAFT

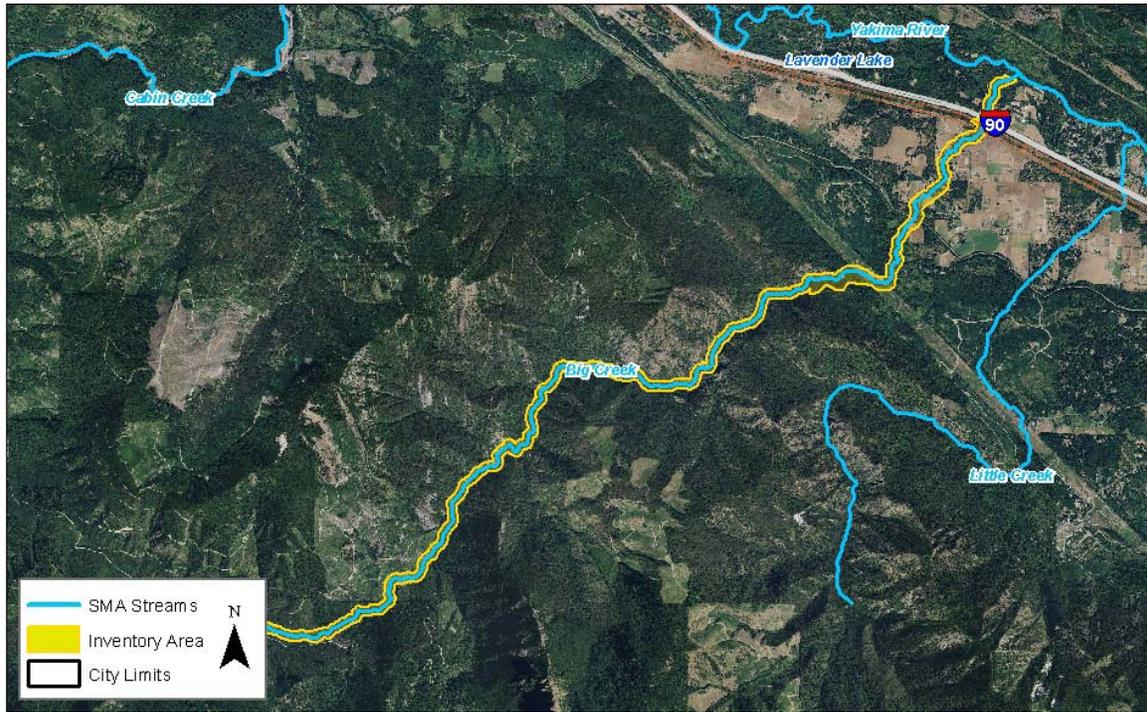
BIG CREEK

SHORELINE LENGTH:

10.4 Miles

REACH INVENTORY AREA:

531.4 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The upstream portion of the reach primarily flows as a single channel through a narrow valley flanked by steep slopes. Downstream, the streamflows through flat terrain in a channel that exhibits limited migration.

LAND COVER (MAP FOLIO #3)

This reach is mostly covered by conifer-dominated forest (59%), harvested forest (18%), and riparian vegetation (17%), with small amounts of agricultural lands (3%), other (2%), and developed lands (1%).

HAZARD AREAS (MAP FOLIO #2)

A portion of the reach (21%) is located within the FEMA 100-year floodplain and a several landslide hazard areas (3%) are mapped at the upstream end of the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for spring Chinook and summer steelhead. The presence of rainbow trout, eastern brook trout, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Limited wetland habitat is mapped along the river in several patches (2% of the reach) and priority elk winter concentration area is also mapped within the reach. The Big Creek shoreline inventory area is mapped as habitat for rare plant species by the Washington Natural Heritage Program.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Shoreline modifications includes I-90 and railroad crossings and an impassable dam and irrigation diversion at RM 2.1 blocks upstream fish passage. Other, unmapped diversion structures may be present, as well.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail crosses the downstream portion of the stream. A dogsled trail crosses Big Creek at the Big Creek Siphon, and a snowmobile trail crosses the stream within the electric transmission line corridor. Big Creek trail borders the middle portion of the stream and the North Ridge Trail parallels a segment of the stream downstream from here.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily forestry (68%) with rural lands (32%) along the downstream end. Land ownership is 58% private and 42% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (68%), with forest & range (15%), agriculture (10%), rural residential (4%), and other (3%) [I-90] areas at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The creek provides habitat for a variety of priority fish species (including spawning habitat for spring Chinook), but low summer flows and fish passage barriers are a limiting factor for fish use.

TERRESTRIAL HABITAT QUALITY

Medium: The reach contains significant areas of dense forest cover and connections to large areas of relatively undisturbed habitat (primarily upstream), but habitat is altered in some areas by I-90, residential development, and timber harvest.

VEGETATION FUNCTIONS

Medium: Much of the reach area consists of dense, mature forest cover, but some riparian areas have been disturbed by forest harvest (upstream) and agriculture, residential development, and I-90 (downstream).

HYDROLOGIC FUNCTIONS

Medium: The upstream portions of the reach are relatively intact, but floodplain development and irrigation diversions have significantly altered the hydrology of the lower creek.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions), particularly at the downstream end of the reach. New development should be set back an adequate distance to protect stream functions and protect structures from flooding.
- The dam/irrigation diversion at RM 2.1 is a barrier to fish passage.
- The creek experiences low summer flows because of irrigation diversion.
- Work with landowners to screen all irrigation diversions.
- Participate in efforts to balance irrigation needs with fish passage flows.
- The downstream portion of the reach has an unpredictable floodplain and flood capacity.

3

1 **3.11 Little Creek**

2 Little Creek is a right-bank tributary to the Yakima River that enters at RM 194.6.

3 **3.11.1 Physical Characterization**

4 Multiple transportation corridors (I-90 and other roads, railroad, and the John
5 Wayne Heritage Trail) and utility corridors (drainage canal and power line) cross
6 the lower reach of Little Creek. The stream also traverses agricultural land and is
7 flanked by sparse to moderate-density residential development.

8 The watershed was extensively logged and converted to agriculture in the late
9 1880s. Water diversions were established on the stream by 1881 (Haring 2001). At
10 least one water diversion structure at approximately RM 1.2 completely dewater
11 the channel during certain times of the year, downstream to about the confluence
12 with the Yakima River.

13 The Little Creek channel may have been rerouted in the vicinity of the Yakima River
14 floodplain to facilitate residential development (Haring 2001). The stream would
15 have originally flowed through an area of wetlands and springs associated with the
16 hyporheic zone of the Yakima River, but much of this area has been altered by
17 development.

18 The FEMA 100-year floodplain is mapped within much of the downstream half of
19 the inventory area (FEMA 1996). The floodplain in this area has an unpredictable
20 floodplain and flood capacity (Tetra Tech, 2012).

21 **3.11.2 Habitats and Species**

22 **3.11.2.1 Fish Use**

23 Little Creek supports spring Chinook and steelhead rearing and potentially
24 steelhead spawning in the lower reaches (Haring 2001). Other fish species mapped
25 in the stream include rainbow trout and westslope cutthroat (StreamNet 2010).

26 A water diversion at approximately RM 1.2 dewater the channel downstream to
27 near the Yakima River confluence, precluding anadromous salmonid passage to
28 suitable habitat upstream (Haring 2001).

29 The Integrated Water Resource Management Plan for the Yakima River basin
30 proposes modifications to laterals of the Kittitas Reclamation District (KRD) Main

1 and South Branch canals to reduce seepage losses and allow greater flexibility in
2 KRD supply management. The water saved or transferred would be used to enhance
3 instream flows in tributaries to the Yakima River, including Little Creek
4 (Reclamation and Ecology 2011a).

5 3.11.2.2 *Water Quality*

6 The lower part of Little Creek is on Ecology's 303(d) list for high water
7 temperatures. The lack of riparian vegetation and shade along this part of the
8 stream may contribute to temperature issues.

9 Water quality in Little Creek may be affected by excess sediments, particularly
10 during floods that transport streambed substrates (Haring 2001).

11 3.11.2.3 *Riparian Habitat Conditions (Land* 12 *Cover)*

13 The upper three-quarters of Little Creek is located in managed forest land. The
14 lower portion flows through rural residential/agricultural areas with scattered
15 trees in the riparian zone.

16 Vegetation management along the power line crossing of Little Creek (near the
17 center of the reach) limits tree cover (shade) and potential future large wood for the
18 stream. Large wood is lacking in other parts of Little Creek as well because of past
19 fires, channelization, and deliberate removal (Haring 2001).

20 3.11.2.4 *Wetlands*

21 A small portion of the Little Creek shoreline inventory area is mapped as wetland,
22 located near the power line corridor crossing.

23 3.11.2.1 *Wildlife Habitats and Species*

24 No priority habitats or species are mapped near Little Creek.

25 3.11.3 *Land Use*

26 The downstream end of Little Creek, between its confluence with the Yakima River
27 and I-90, is bordered by high-density residential development. Between I-90 and the
28 KRD Little Creek Siphon, land use bordering the creek is primarily low-density
29 residential and agriculture. From the siphon to the National Forest boundary
30 (approximately 1.3 miles), undeveloped forested land borders the creek, with the
31 exception of an electric transmission corridor that crosses the stream. Zoning within

1 this segment is forest and range and agriculture (3-acre lots). The remainder of the
2 creek flows through National Forest land.

3 3.11.4 Public Access

4 A dogsled trail crosses Little Creek at the Little Creek Siphon, and a snowmobile trail
5 crosses the creek near the electric transmission line corridor.

6 3.11.5 Reach Sheet

DRAFT

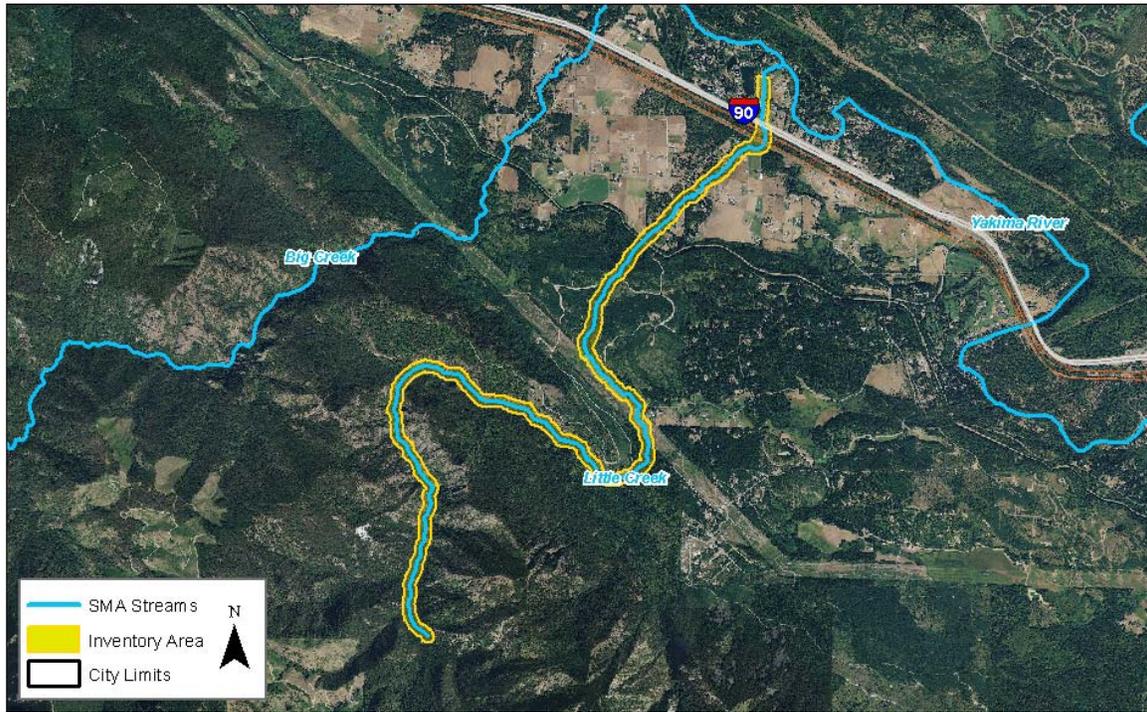
LITTLE CREEK

SHORELINE LENGTH:

7.1 Miles

REACH INVENTORY AREA:

351.9 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The upstream portion of the reach primarily flows as a single channel through a narrow valley with steep slopes. The downstream portion of the streamflows through flat terrain, but the channel is more confined and has been rerouted in the vicinity of the Yakima River floodplain.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is dominated by conifer-dominated forest (61%), riparian vegetation (17%), and harvested forest (13%), with some agricultural lands (5%), developed lands (2%), and other (2%).

HAZARD AREAS (MAP FOLIO #2)

Approximately 36% of the reach is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and rearing habitat for spring Chinook. The presence of, rainbow trout, summer steelhead, and westslope cutthroat is also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 for temperature.

Wetland habitat is mapped in the middle portion of the reach (4% of the reach). No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Identified shoreline modifications within the reach include I-90, railroad crossings, and a water diversion structure at RM 1.2. Other, unmapped diversion structures may be present, as well.

PUBLIC ACCESS (MAP FOLIO #4)

The John Wayne Heritage Trail crosses the downstream portion of the stream. A dogsled trail crosses Little Creek at the Little Creek Siphon, and a snowmobile trail crosses the stream near the electric transmission line corridor.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is forestry (54%) upstream and rural (46%) downstream. Land ownership is 46% private and 54% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (54%) along the upstream half and rural residential (17%), agriculture (14%), forest & range (10%), and other (5%) [I-90] along the downstream half.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There is 1 recorded historic site within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The creek provides habitat for a variety of priority fish species (including spawning habitat for spring Chinook), but low summer flows (and periodic channel dewatering) are a limiting factor for fish use.

TERRESTRIAL HABITAT QUALITY

Medium: The reach contains significant areas of dense forest cover and connections to large areas of relatively undisturbed habitat (primarily upstream), but habitat is altered in some areas by I-90, residential development, and timber harvest.

VEGETATION FUNCTIONS

Medium: Much of the reach area consists of dense, mature forest cover, but some riparian areas have been disturbed by forest harvest (upstream) and agriculture, residential development, and I-90 (downstream).

HYDROLOGIC FUNCTIONS

Medium: The upstream portions of the reach are relatively intact, but floodplain development and irrigation diversions have significantly altered the hydrology of the lower creek.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions), particularly at the downstream end of the reach. New development should be set back an adequate distance to protect stream functions and protect structures from flooding.
- A water diversion structure at RM 1.2 dewateres the channel downstream to near the Yakima River confluence, blocking fish passage.
- Participate in efforts to balance irrigation needs with fish passage flows.
- Educate shoreline property owners about measures to protect and restore riparian areas.
- The downstream portion of the reach has significant flood hazard potential.

3

1 3.12 Lower Cle Elum River

2 The lower Cle Elum River flows approximately 8 miles from the Cle Elum Lake Dam
3 to the Yakima River. The Cle Elum River is a left-bank tributary to the Yakima River,
4 emptying at RM 185.6. The lower Cle Elum River is considered a shoreline of
5 statewide significance.

6 3.12.1 Physical Characterization

7 Downstream of the dam, the river is confined within a single channel for
8 approximately 1 mile. Downstream of this point, the river is typically characterized
9 by a large channel with multiple large side-channel complexes that become engaged
10 with the main channel when flows exceed 500 cfs (Haring 2001).

11 Several landslides and steep slopes have been mapped along the lower river (WDNR
12 2010; Kittitas County 2012). The FEMA 100-year floodplain is mapped in most of
13 the inventory area, with some of the upstream portions of the inventory area, below
14 the dam, outside of the floodplain (FEMA 1996). The majority of the reach is
15 mapped as having potential for channel migration (Ecology 2011).

16 Residential development and golf courses, associated with the Suncadia
17 development, are located on the left and right banks of the river at about RM 2 to
18 RM 6.5. Upstream of the development, one bridge crosses the river; downstream of
19 this development, the river flows under a powerline corridor, four roadways
20 including I-90, and a railroad bridge. In addition to residential development, the
21 lower watershed has been extensively logged. The lower Cle Elum River confluence
22 with the Yakima River is located at the John Wayne Heritage Trail crossing of the
23 Yakima River.

24 3.12.1.1 City of Cle Elum

25 A short stretch of the Cle Elum River (Cle Elum River Reach 1) flows through the
26 western city limits of Cle Elum. The upstream extent begins at the Bullfrog Road and
27 continues downstream until the I-90 bridge; a distance of approximately 0.8 mile.
28 The river is listed as a shoreline of statewide significance in this reach. The stretch
29 of river is largely undeveloped and contains a large left-bank bend with multiple
30 channels. A small lake is located on the left bank of the river with several residential
31 structures on its northern shoreline. The FEMA 100-year floodplain is mapped in
32 most of the inventory area, with some of the upstream portions of the inventory
33 area (FEMA 1996) and the entire reach is mapped as having potential for channel
34 migration (Ecology 2011).

1 3.12.2 Habitats and Species

2 3.12.2.1 Fish Use

3 The lower Cle Elum River below Cle Elum Dam supports spring Chinook and
4 summer steelhead spawning. The lower Cle Elum River is considered a high-density
5 Chinook salmon spawning area; in most years, half of the spring Chinook salmon
6 redds in the upper Yakima River watershed are found immediately upstream and
7 downstream of the confluence of the Cle Elum and Yakima Rivers (Haring 2001).
8 Currently, no steelhead occur upstream of Cle Elum Dam. Small numbers of
9 steelhead may spawn in the Cle Elum River downstream from the dam.
10 (Reclamation and Ecology 2011b).

11 Other species documented in the lower Cle Elum River include rainbow trout,
12 westslope cutthroat, burbot, eastern brook trout, and mountain whitefish
13 (StreamNet 2010).

14 Cle Elum Dam was constructed without fish passage facilities, blocking anadromous
15 fish use from approximately 35 miles of highly productive historic habitat (Haring
16 2001). During the late 1800s and early 1900s, stream channels in the Cle Elum
17 watershed were cleared in order to allow large rafts of logs to be floated downriver
18 to lumber mills. This caused substantial damage to salmonid habitat (Haring 2001).

19 The natural hydrology of the Cle Elum River has been significantly altered by water
20 storage for flood control and irrigation water delivery. High flows during the
21 irrigation season provide fish access to side channels that provide summer rearing
22 habitat. However, lowering of flows during flip-flop operations results in dewatering
23 of the side channels, eliminating them as winter rearing habitat (Haring 2001).

24 City of Cle Elum

25 See Section 2.12.2.1.

26 3.12.2.2 Water Quality

27 Dispersed recreational activity along the Cle Elum River and Cle Elum Lake may
28 increase the delivery of fine sediments (Haring 2001).

29 The Cle Elum River has water temperatures that are higher than the standard
30 acceptable levels for fish immediately above and downstream of the reservoir.
31 Downstream from the dam, higher water temperatures may be a result of dam
32 impoundment and surrounding forest practices (Reclamation and Ecology 2011b).

1 **City of Cle Elum**

2 See Section 3.12.2.2.

3 **3.12.2.3 Riparian Habitat Conditions (Land**
4 **Cover)**

5 The lower Cle Elum River flows through forested areas, some of which have been
6 extensively logged. Several road crossings and utility corridors cross the river. See
7 discussion above under Section 3.12.1.

8 **City of Cle Elum**

9 Most of the Cle Elum riparian zone within city limits is forested. There is limited
10 residential development in the shoreline inventory area.

11 **3.12.2.4 Wetlands**

12 Approximately one-third of the lower Cle Elum River shoreline inventory area is
13 mapped as wetland, primarily forested-shrub wetland habitat.

14 **City of Cle Elum**

15 A large forested wetland associated with the Cle Elum River is mapped within the
16 city's shoreline inventory area.

17 **3.12.2.1 Wildlife Habitats and Species**

18 The lower Cle Elum River flows through a mapped elk winter concentration area.

19 **City of Cle Elum**

20 Within the city, the Yakima River flows through a mapped elk winter concentration
21 area.

22 **3.12.3 Land Use**

23 Between I-90 and its confluence with the Yakima River, the Cle Elum River is
24 bordered by undeveloped forest land that is zoned as forest and range. Upstream of
25 the I-90 crossing, within the City of Cle Elum, the land bordering the river is mostly
26 undeveloped forest land (zoned for planned mixed use) with a few single-family
27 residential lots.

1 Upstream of Cle Elum city limits to the National Forest boundary, the river is
2 bordered by undeveloped forest land zoned for master planned resort (Suncadia).
3 From the Cle Elum Dam to approximately 1 mile downstream, the river flows
4 through National Forest lands.

5 3.12.3.1 *City of Cle Elum*

6 The Cle Elum River flows through the west end of the City of Cle Elum. The river is
7 generally bordered by undeveloped forest land, which is zoned for planned mixed
8 use. A moderate-density residential development borders the river to the southeast.

9 3.12.4 Public Access

10 The lower Cle Elum River can be accessed from the Suncadia Conservancy, which
11 borders the river from Bullfrog Road to the National Forest boundary.

12 3.12.4.1 *City of Cle Elum*

13 There is no public access to this reach.

14 3.12.5 Reach Sheet

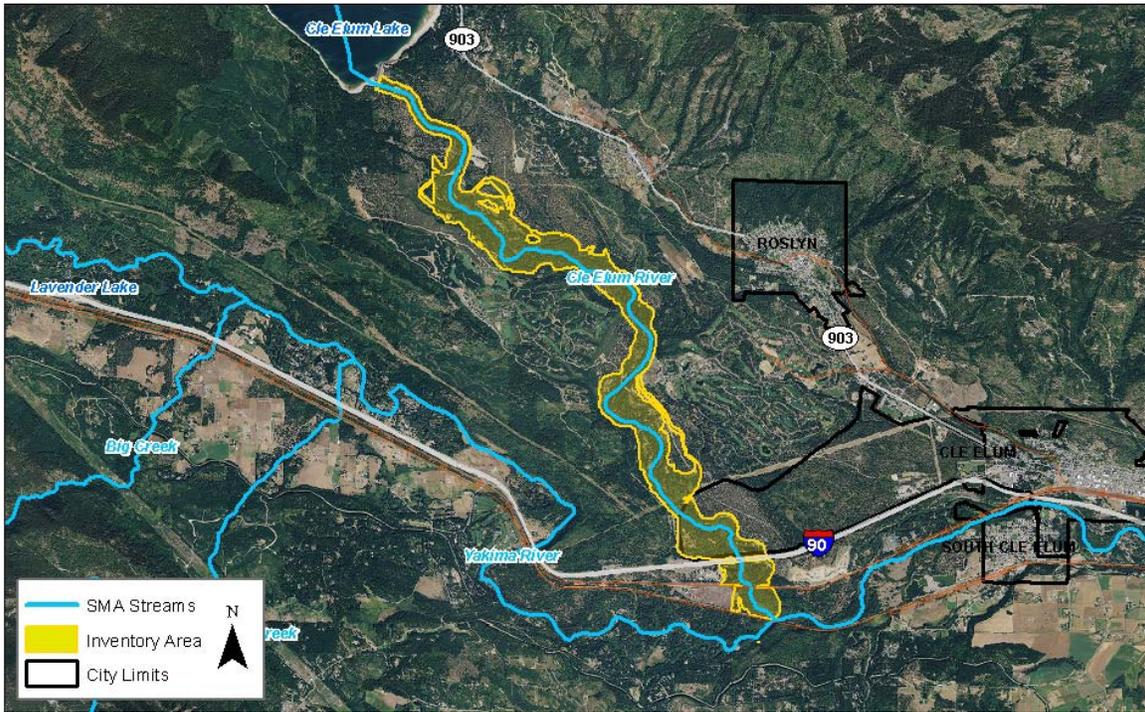
CLE ELUM RIVER-REACH 1

SHORELINE LENGTH:

7.8 Miles

REACH INVENTORY AREA:

1,202 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach descends approximately 250 feet, contains multiple channels, numerous side channels and gravel bars, particularly upstream of the Suncadia development. The downstream portion of the reach passes under several bridges, including I-90, which constrain channel movement.

LAND COVER (MAP FOLIO #3)

This reach is primarily conifer-dominated forest (38%) and riparian vegetation (38%), with some unvegetated (6%), agricultural lands (6%), harvested forest (5%), other (3%), open water (2%), and developed lands (1%).

HAZARD AREAS (MAP FOLIO #2)

The majority of the reach (89%) is located within the FEMA 100-year floodplain and a few landslide hazard areas (2%) are mapped on both banks of the reach. The majority of the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for spring Chinook and summer steelhead. The presence of burbot, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Wetland habitat is mapped along the river throughout the reach (37% of the reach). A significant amount of priority elk winter concentration area is located in the reach; wood duck nesting habitat is also mapped in the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

There are several crossing (bridges) over the reach, including I-90, a railroad, and 3 other roadways.

PUBLIC ACCESS (MAP FOLIO #4)

The lower Cle Elum River can be accessed from the Suncadia Conservancy, which borders the river from Bullfrog Road to the National Forest boundary.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily resort (70%) with rural lands at the upstream and downstream ends of the reach (30%). Land ownership is 93% private and 7% public (Forest Service).

CONTAMINATED SITES

A State cleanup site (pesticide dump) is located at the downstream end of the reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for master planned resort (70%), with forest & range (14%) along the upstream end and mixed use (11%), rural residential (1%), urban/suburban residential (1%) and other (3%) [I-90] at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A total of 41 recorded precontact and historic sites are located within the reach. Recorded precontact sites include lithic scatters and burials while historic sites include bridges, refuse dumps, and waterlines.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

High: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), has generally low levels of hydromodifications, and exhibits a generally high level of channel complexity.

TERRESTRIAL HABITAT QUALITY

High: The majority of the reach consists of dense forest and shrub habitat and connections to large areas of relatively undisturbed habitat are present throughout much of the reach.

VEGETATION FUNCTIONS

High: Some areas of alteration exist, but the majority of the reach consists of dense riparian forest and shrub habitat.

HYDROLOGIC FUNCTIONS

High: There are generally low levels of hydromodifications and floodplain alteration within the reach.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forest and range to residential subdivisions). New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Protect the high-value wetland and forested floodplain areas.
- The lower Cle Elum River is a high-density Chinook salmon spawning area.
- Many important cultural and archaeological sites are located within the reach.
- Support efforts to balance irrigation needs with fish passage flows.
- Manage recreational activity to reduce impacts on vegetation and subsequent erosion.
- Educate shoreline property owners about measures to protect and restore riparian areas.

CLE ELUM RIVER-CITY OF CLE ELUM REACH

SHORELINE LENGTH:

0.7 Miles

REACH INVENTORY AREA:

148.7 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The upstream extent of the reach is confined by a road crossing; the downstream extent by an I-90 crossing. This single channel reach transitions to multiple channels downstream and then back to a single channel at the I-90 crossing.

LAND COVER (MAP FOLIO #3)

The majority of the reach is covered by riparian vegetation (51%) and conifer-dominated forest (22%). Other cover types include: agricultural lands (8%), harvested forest (6%), other (6%), unvegetated lands (5%), and developed lands (2%).

HAZARD AREAS (MAP FOLIO #2)

The majority of the reach (98%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for spring Chinook and summer steelhead. The presence of burbot, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Wetland habitat is closely associated with the river, primarily the upstream portion of the left bank and entire right bank (36% reach total). Priority elk winter concentration area is also mapped within the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

There are no shoreline modifications mapped within the reach.

PUBLIC ACCESS (MAP FOLIO #4)

There is no public access to this reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use within the reach is rural (100%). Land ownership is 100% private.

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for mixed use (91%), urban/suburban residential (5%), and other (4%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are 3 recorded precontact sites, and 1 recorded historic site located within the reach. The recorded precontact sites mostly feature lithic scatters with 1 site also containing burials.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

High: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), has generally low levels of hydromodifications, and exhibits a generally high level of channel complexity.

TERRESTRIAL HABITAT QUALITY

High: The majority of the reach consists of dense forest and shrub habitat and connections to large areas of relatively undisturbed habitat are present throughout much of the reach.

VEGETATION FUNCTIONS

High: Some areas of alteration exist (associated with residential development), but the majority of the reach consists of dense riparian forest and shrub habitat.

HYDROLOGIC FUNCTIONS

High: There are generally low levels of hydromodifications and floodplain alteration within the reach.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration hazards.
- Protect the high-value wetland and forested floodplain areas.
- The lower Cle Elum River is a high-density Chinook salmon spawning area.
- Support efforts to balance irrigation needs with fish passage flows.
- Manage recreational activity to reduce impacts on vegetation and subsequent erosion.
- Educate shoreline property owners about measures to protect and restore riparian areas.

3

1 3.13 Cle Elum Lake

2 Cle Elum Lake is the eastern-most of the three reservoirs which supply irrigation
3 water as part of the Yakima Project. The lake is designated as a “lake of statewide
4 significance.”

5 3.13.1 Physical Characterization

6 Cle Elum Lake is oriented north-south. It has an active storage capacity of
7 approximately 436,000 acre-feet with a surface area of 4,800 acres when full. The
8 maximum depth is approximately 258 feet. Lake levels fluctuate roughly 60 feet
9 between the winter/spring and summer (Haring 2001). Major tributaries to the lake
10 include the Cle Elum River and its tributaries and French Cabin Creek, all of which
11 drain to the north end of the lake.

12 Several landslide hazard areas have been mapped within narrow canyons along the
13 southwestern shoreline of the lake (WDNR 2010). Steep slopes are mapped near the
14 northeastern shoreline and at many locations along the southwestern shoreline
15 (Kittitas County 2012). The FEMA 100-year floodplain extends around the
16 circumference of the lake, but is not mapped throughout the inventory area (FEMA
17 1996).

18 State Route 903 roughly parallels much of the eastern lake shoreline. The roadway
19 provides access to sparse to moderate-density residential development along the
20 eastern and southeastern shorelines. Virtually no development is located along the
21 north, west, or southwest shorelines of the lake. A limited number of Forest Service
22 roads are mapped near the northwest portion of the lake.

23 Cle Elum Lake originally formed in the U-shaped glacial valley of the Cle Elum River
24 with a capacity of approximately 100,000 acre-feet. In 1933, an earth and gravel-fill
25 dam was constructed at the outlet of the lake to increase storage capacity for
26 irrigation (Haring 2001). The Cle Elum Lake Dam is located at the south end of the
27 lake. Below the 165-foot dam, the lake drains to the south via the Cle Elum River
28 until its confluence with the Yakima River (BOR 2009).

29 3.13.2 Habitats and Species

30 3.13.2.1 Fish Use

31 The construction of a crib dam at Cle Elum Reservoir contributed to the local
32 extinction of sockeye from the basin in the early 1900s. Later the U.S. Bureau of

1 Reclamation (Reclamation) constructed Cle Elum Dam. The dam expanded a natural
2 lake that historically supported populations of sockeye, coho, and spring Chinook
3 salmon, steelhead, Pacific lamprey, bull trout, and other resident fish. Lack of
4 passage at the dam blocked access to the lake and upstream habitat for anadromous
5 salmonids and contributed to the extirpation of sockeye salmon runs in the Yakima
6 River basin. The absence of passage has also isolated local populations of bull trout
7 and may have prevented the recolonization of populations. Biologists believe
8 approximately 29 miles of tributary habitat upstream of Cle Elum Lake are
9 potentially accessible if passage at the dam were provided (Reclamation 2011,
10 Haring 2001).

11 No anadromous fish are present in the reservoir or the Cle Elum River upstream of
12 the dam, with the exception of some sockeye and coho that have been introduced in
13 recent years. Native resident fish in the lake include burbot, Dolly Varden/bull trout,
14 kokanee salmon (spawning), westslope cutthroat, mountain and pygmy whitefish,
15 rainbow trout, dace, suckers, sculpins, and a few other species. Introduced resident
16 species in the lake include brown trout, eastern brook trout, and lake trout
17 (StreamNet 2010, Reclamation and Ecology 2011b).

18 Cle Elum Reservoir is operated to meet irrigation demands, flood control, and
19 instream flows for fish. Operational releases at Cle Elum Dam are affected by the
20 presence of spring Chinook salmon redds in the Cle Elum River downstream from
21 the dam (Reclamation and Ecology 2011b).

22 In 2001, Reclamation entered into an agreement with the Washington Department
23 of Fish and Wildlife to assess the feasibility of providing passage for anadromous
24 salmonids at five water storage projects in the Yakima River basin. The goal is to
25 eventually restore anadromous salmonid runs to suitable habitats upstream from
26 the dams and restore the connectivity of bull trout populations. State and tribal
27 fisheries managers are developing a plan for the eventual phased reintroduction of
28 sockeye salmon, coho salmon, Chinook salmon, and steelhead above the dams. The
29 Yakama Nation and WDFW developed a reintroduction plan for anadromous fish
30 species above the Yakima Project storage dams. The fish reintroduction plan helped
31 guide the development of alternatives for fish reintroduction at Cle Elum Dam
32 (Reclamation 2007, 2011).

33 Between 2003 and 2005, biologists studied conditions in Cle Elum Lake to better
34 understand the potential for reintroducing sockeye salmon. They found that Cle
35 Elum Lake is relatively unproductive, with low nutrient levels, chlorophyll a
36 concentrations, phytoplankton biovolume, zooplankton densities, and total organic
37 carbon concentrations. The very low densities of zooplankton may limit the capacity
38 of the lake to support fish. However, the carcasses of returning adult salmon are

1 expected to return marine-derived nutrients to the system (Reclamation 2007,
2 2011).

3 Interim juvenile fish passage facilities were completed at Cle Elum Lake in 2005 to
4 test the ability of juvenile fish to locate the passage facility and exit the reservoir
5 (Reclamation 2007). Data gathered from the temporary passage facilities confirm
6 that fish can navigate a downstream passage facility at the dam (Reclamation 2011).

7 The Integrated Water Resource Management Plan for the Yakima River basin
8 proposes permanent fish passage facilities at the Cle Elum Dam including both
9 downstream passage facilities for juvenile fish and upstream adult fish passage
10 facilities. The Integrated Plan also proposes raising the maximum water level of Cle
11 Elum Lake to increase the volume of available storage in the lake (Reclamation and
12 Ecology 2011a).

13 *3.13.2.2 Water Quality*

14 Cle Elum Lake is listed by Ecology for high water temperatures at the upper and
15 lower ends of the lake near the river inlet/outlet. The trophic status of the lake was
16 classified as eutropic according to a 1993 assessment by Ecology (Rector 1996)
17 indicating high mineral and organic nutrients and low dissolved oxygen content.

18 Dispersed recreational activity along the Cle Elum River and Cle Elum Lake may
19 increase the delivery of fine sediments (Haring 2001).

20 *3.13.2.3 Riparian Habitat Conditions (Land* 21 *Cover)*

22 The riparian zone of Cle Elum Reservoir consists of forested areas with limited and
23 scattered residential development.

24 *3.13.2.4 Wetlands*

25 A small part of the lake's shoreline inventory area is mapped as freshwater
26 emergent wetland.

27 *3.13.2.1 Wildlife Habitats and Species*

28 The area surrounding Cle Elum Lake is mapped as northern spotted owl critical
29 habitat (federally listed threatened species), elk winter concentration area and
30 mountain goat habitat. A bald eagle nest is mapped on the lake shoreline.

1 The forest and riparian habitat areas surrounding Cle Elum Reservoir are relatively
2 undisturbed and provide high-quality habitat for a variety of native wildlife species.
3 Many wildlife species in the Cle Elum River basin have a food web relationship with
4 salmon as primary or secondary consumers (for example, black bear, bald eagle,
5 river otter, common merganser, osprey) (Reclamation and Ecology 2011b).

6 Grizzly bear observations have been recorded in the vicinity of Cle Elum Reservoir
7 (WDFW, 2009a; WSDOT 2005). The grizzly bear is a federal threatened and state
8 endangered species. Grizzly bears are wide-ranging and omnivorous, and they make
9 heavy use of salmon as a food source. Suitable habitat existed in the Cle Elum
10 Reservoir area historically, but fairly high road densities, development, and
11 increased human use have decreased the quality of the habitat. Small numbers of
12 grizzlies may also be found in other areas of the Cle Elum River basin (Reclamation
13 and Ecology 2011b).

14 Reproducing pairs of northern spotted owls have been observed in the Cle Elum
15 Reservoir area. This species was federally listed as threatened in 1990 and is state-
16 listed as endangered. It is known to be declining in the Cle Elum and Wenatchee
17 areas. Spotted owls generally rely on older forested habitats. Critical habitat for
18 northern spotted owl is designated near Cle Elum Reservoir and Cle Elum River. The
19 U.S. Forest Service approach to managing habitat for this species is shifting away
20 from site-specific reserves toward a landscape approach that recognizes the role of
21 fires in east side, dry forest ecosystems (Reclamation and Ecology 2011b; USFS
22 restoration strategy 2010).

23 3.13.3 Land Use

24 Over three-quarters of the Lake Cle Elum shoreline inventory area is located on
25 National Forest lands. The remaining inventory area consists of moderate-density
26 residential subdivisions and vacant land that is zoned for rural residential
27 development.

28 3.13.4 Public Access

29 Several National Forest recreation areas border Lake Cle Elum, including Speelyi
30 Beach, Wish Poosh Campground (contains a boat launch), and Cle Elum River
31 Campground. In addition, the northeastern shore of Lake Cle Elum is bordered by a
32 snowmobile trail.

33 3.13.5 Reach Sheet

LAKE CLE ELUM

SHORELINE LENGTH:
43.9 Miles

WATERBODY AREA: 4,509.9 Acres
REACH INVENTORY AREA: 5,095.1 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

The lake is located in a valley, oriented northwest to southeast. The 165-foot-high dam, located at the south end of the lake, regulates pool elevations between 2,240 feet and 2,210 feet.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is mainly open water (56%) and unvegetated (30%). Other (6%), conifer-dominated forest (5%), and riparian vegetation (2%) are also present.

HAZARD AREAS (MAP FOLIO #2)

A significant portion of the reach (75%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for Kokanee salmon. The presence of burbot, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat are also mapped.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Approximately 14% of the reach is mapped as wetland habitat. Priority elk winter concentration area is located east and south of the lake and unique habitat features (e.g., cliffs, outcroppings, talus slopes) are located in the southern portion of the reach, suitable for mountain goat.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The lake level is controlled by a dam (barrier to fish passage).

PUBLIC ACCESS (MAP FOLIO #4)

Several National Forest recreation areas border Lake Cle Elum, including Speelyi Beach, Wish Poosh Campground (contains a boat launch), and Cle Elum River Campground. In addition, the northeastern shore of Lake Cle Elum is bordered by a snowmobile trail.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the lake is primarily rural along the eastern and southern shores (55%) and forestry along the western and northern shores (38%), with patches of parks & open space (8%). Land ownership is 23% private and 77% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for rural residential (43%) along the east and south lake shores commercial forestry (37%) along the west and north shores, with some areas of forest & range (9%) and other (11%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A total of 27 recorded precontact and historic sites are located in the reach. Recorded sites include 17 precontact sites, 5 historic sites, and 5 sites that feature both precontact and historic features.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The lake provides habitat for several priority fish species, but is primarily managed as an irrigation reservoir and has a listed water quality impairment (high temperatures).

TERRESTRIAL HABITAT QUALITY

High: The shorelands consist primarily of dense forest cover, and the lake has significant, unaltered connections to large areas of relatively unaltered habitat.

VEGETATION FUNCTIONS

High: Nearly the entire lakeshore consists of dense, mature forest habitat

HYDROLOGIC FUNCTIONS

Medium: The lake provides significant floodwater storage, but it is managed as an irrigation reservoir.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- In the recent past, large tracts of resource lands within the reach have been converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance from the lakeshore to protect riparian functions.
- The Cle Elum Lake Dam is a complete barrier to fish passage, but a fish passage facility is proposed.
- Many important cultural and archaeological sites are located within the reach.
- Protect existing forested areas and high-quality wildlife habitat.
- Educate shoreline property owners about measures to protect and restore riparian areas.
- Manage recreational activity to reduce impacts on vegetation and subsequent erosion.

3

1 3.14 Lake Cle Elum Tributaries

2 Tributaries to Lake Cle Elum with mean annual flows greater than 20 cfs include
3 French Cabin Creek, Thorp Creek, Upper Cle Elum River, Scatter Creek, Fortune
4 Creek, Cooper River, Delate Creek, Lemah Creek, Waptus River, Goat Creek, Trail
5 Creek, Spinola Creek, Spade Creek, Chief Creek, and Shovel Creek. Lakes in the upper
6 Cle Elum watershed larger than 20 acres include Tuck Lake, Robin Lake, Tucquala
7 Lake, Cooper Lake, Spectacle Lake, Glacier Lake, Chikamin Lake, Pete Lake, Lake
8 Michael, Deep Lake, Circle Lake, Waptus Lake, Spade Lake, Venus Lake, Lake
9 Ivanhoe, Shovel Lake, and Lake Rowena.

10 With the exception of the upper Cle Elum River, Cooper River, and Cooper Lake, all
11 of the waterbodies listed above are located entirely on National Forest land. The
12 following streams are designated as “shorelines of statewide significance”: Cooper
13 River upstream to Cooper Lake, the Waptus River upstream to Waptus Lake, and the
14 Cle Elum River two miles upstream of the confluence with Fortune Creek.

15 3.14.1 Physical Characterization

16 The headwaters of the Cle Elum River are located at the northern extent of Kittitas
17 County, in the Alpine Lakes Wilderness of the Cascade Mountain Range. The
18 majority of the Cle Elum River watershed is located above Cle Elum Lake Dam. The
19 watershed occupies approximately 208 square miles and contains 14 streams and
20 rivers with mean annual flows greater than 20 cfs. Most of the rivers in the
21 watershed drain to one of three major rivers: Waptus, Cooper, and Cle Elum Rivers.
22 The Waptus and Cooper Rivers are tributaries to the Cle Elum River, which empties
23 to the north end of Cle Elum Lake. The other shoreline regulated stream, which
24 drains directly to Cle Elum Lake, is French Cabin Creek. An estimated 554 miles of
25 Type 1 through Type 5 streams flow through the watershed.

26 A potential landslide area is mapped near the headwaters of the Cle Elum River
27 (WDNR 2010). The Waptus, Cooper, and Cle Elum Rivers originate and flow through
28 the Cascade Mountain Range and have steep slopes associated with some of their
29 shorelines. However, in many areas, the rivers flow through narrow, relatively flat
30 valleys, with steep slopes located at some distance from their shorelines (Kittitas
31 County 2012). The FEMA 100-year floodplain is mapped in most of the downstream
32 inventory area of Cle Elum River Reach 4 and is also mapped as having potential for
33 channel migration (Ecology 2011 and FEMA 1996).

34 The upper watershed is primarily composed of National Forest lands, in addition to
35 industrial forest and private development. Approximately half of the watershed

1 contains mature forest habitat. From the early 1880s to the 1930s, significant coal
2 and hard rock mining occurred in the upper watershed, which likely impacted the
3 quality of fish habitat (Haring 2001).

4 Cooper Lake is located in a broad valley, oriented northwest to southeast, and is
5 approximately 1.0 mile long and 0.2 mile wide. The Cooper River enters the lake at
6 the northwest shoreline and exits at the southeast shoreline. A large stream
7 delta/wetland complex is located at the mouth of the stream along the northwest
8 shoreline. Steeps slopes are located near portions of the lake's northern and
9 southern shorelines (Kittitas County 2012). The northern shoreline inventory area
10 is mapped in the FEMA 100-year floodplain (FEMA 1996).

11 The Cooper River is a right-bank tributary to the Cle Elum River. The river is listed
12 as a shoreline of statewide significance in this reach. The river is generally confined
13 within a single channel in a narrow ravine. A bridge, associated with a residential
14 development at the southeast end of the lake, crosses the reach near its upstream
15 extent. Steeps slopes are located along the upstream and middle portions of the
16 river reach (Kittitas County 2012). A small portion of the upstream inventory area
17 of the river, on the left bank, and some of the downstream segments of the river are
18 mapped in the FEMA 100-year floodplain (FEMA 1996).

19 3.14.2 Habitats and Species

20 3.14.2.1 Fish Use

21 The upper Cle Elum watershed supports kokanee and bull trout, as well as other
22 resident salmonid and non-salmonid species. Kokanee and bull trout in this area
23 spend their life in Cle Elum Reservoir, except for spawning and egg incubation to
24 emergence (Haring 2001). No anadromous fish are present in the reservoir or the
25 Cle Elum River upstream of the dam, with the exception of some sockeye and coho
26 that have been introduced in recent years (Reclamation and Ecology 2011b).

27 Table 3-3 summarizes fish use in the upper Cle Elum watershed. Fish use has not
28 been recorded by StreamNet (2010) for many of the small lakes in the upper
29 watershed, likely as a result of fish passage barriers such as waterfalls in these steep
30 upper reaches.

31

1

Table 3-3. Fish Use in Lake Cle Elum Tributaries (Source: StreamNet 2010)

Species	French Cabin Creek	Thorp Creek	Upper Cle Elum River	Robin Lake	Tucquala Lake	Fortune Creek	Cooper River	Cooper Lake	Lemah Creek	Pete Lake	Waptus River	Goat Creek	Lake Michael	Trail Creek	Spinola Creek	Deep Lake	Circle Lake	Waptus Lake	Spade Creek	Spade Lake	Venus Lake	Chief Creek	Shovel Creek	Lake Ivanhoe	Shovel Lake	Lake Rowena
Dolly Varden/Bull Trout			P/M		P/M	P/M	P/M	P/M										P/M								
Rainbow Trout	P/M		P/M		P/M	P/M	P/M	P/M			P/M			P/M				P/M					P/M	P/M		
Westslope Cutthroat		P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M		P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M	P/M
Eastern Brook Trout	P/M	P/M	P/M		P/M	P/M	P/M	P/M	P/M	P/M	P/M							P/M	P/M			P/M				
Kokanee Salmon			S				P/M	P/M																		
Burbot			P/M				P/M																			
Mountain whitefish			P/M				P/M	P/M																		

2 P/M = presence/migration; S = spawning

3

4

3.14.2.2 *Water Quality*

Dispersed recreational activity along the Cle Elum River and Cle Elum Lake may increase the delivery of fine sediments (Haring 2001).

The Cle Elum River has water temperatures that are higher than the standard acceptable levels for fish immediately above and downstream of the reservoir. Higher water temperatures in the upper reach of the Cle Elum River are likely a result of water flowing slowly through warm, shallow Tucquala Lake. Much of the upper Cle Elum watershed lies within the Alpine Lakes Wilderness Area and is therefore not affected by forest practices. Both Thorp Creek and the Cooper River, tributaries to the upper Cle Elum River, are also listed on the 303(d) list for temperature (Reclamation and Ecology 2011b).

3.14.2.3 *Riparian Habitat Conditions (Land Cover)*

Most of the upper Cle Elum River, upstream of Cle Elum Reservoir, is located in a steep, rocky canyon. The riverbed consists mainly of large boulders, cobbles, and gravels. Stream habitats are varied and include cascades, riffles, and pools suitable for spawning and rearing fish. Log jams and large woody debris are abundant in the river channel. The river valley widens and the gradient is low where the Cle Elum River flows through the wide and shallow Tucquala Lake. The mixed conifer forests and alpine meadows bordering the river are relatively undisturbed except for a gravel road and hiking trails (Reclamation and Ecology 2011b).

Human activities have altered riparian vegetation and reduced sources of large wood along several tributary streams in the upper watershed. Fortune Creek has been affected by timber harvest and motorized trail encroachment into the riparian area. The riparian zones of Thorp Creek and French Cabin Creek have been impacted by timber harvest, road encroachment, and dispersed recreation (Haring 2001).

Extensive areas of the lower Cooper River drainage have a high erosion risk. There is a checkerboard ownership between the National Forest and Plum Creek Timber Company (Haring 2001).

3.14.2.4 *Wetlands*

Scattered wetlands are mapped along streams and lakes in the upper Cle Elum watershed. Large wetland systems are mapped on the Waptus River, Delate Creek, Lemah Creek, and the Cooper River.

1 3.14.2.1 *Wildlife Habitats and Species*

2 The upper Cle Elum watershed is mapped as mountain goat habitat. Several
3 northern spotted owl occurrences are mapped in the upper watershed, and much of
4 the area is designated as critical habitat for this federally listed threatened species.

5 3.14.3 Land Use

6 The tributary lakes and streams to Lake Cle Elum are located on National Forest
7 lands, with the following exceptions:

- 8 • The Cle Elum River is bordered by private land between Cooper and Waptus
9 Rivers. Land use in this area is primarily commercial forest, but some high-
10 density residential subdivisions are located adjacent to Cooper and Cle Elum
11 Rivers.
- 12 • North of the Waptus River confluence, the Cle Elum River is bordered by
13 private commercial forest-zoned lands, portions of which have been
14 subdivided into moderate-density residential lots.
- 15 • A high-density residential subdivision borders the southeast corner of
16 Cooper Lake.

17 3.14.4 Public Access

18 The Lake Cle Elum tributary streams and lakes can be accessed from adjacent
19 National Forest recreation areas and a network of hiking, horse, and snowmobile
20 trails.

21 3.14.5 Reach Sheets

22

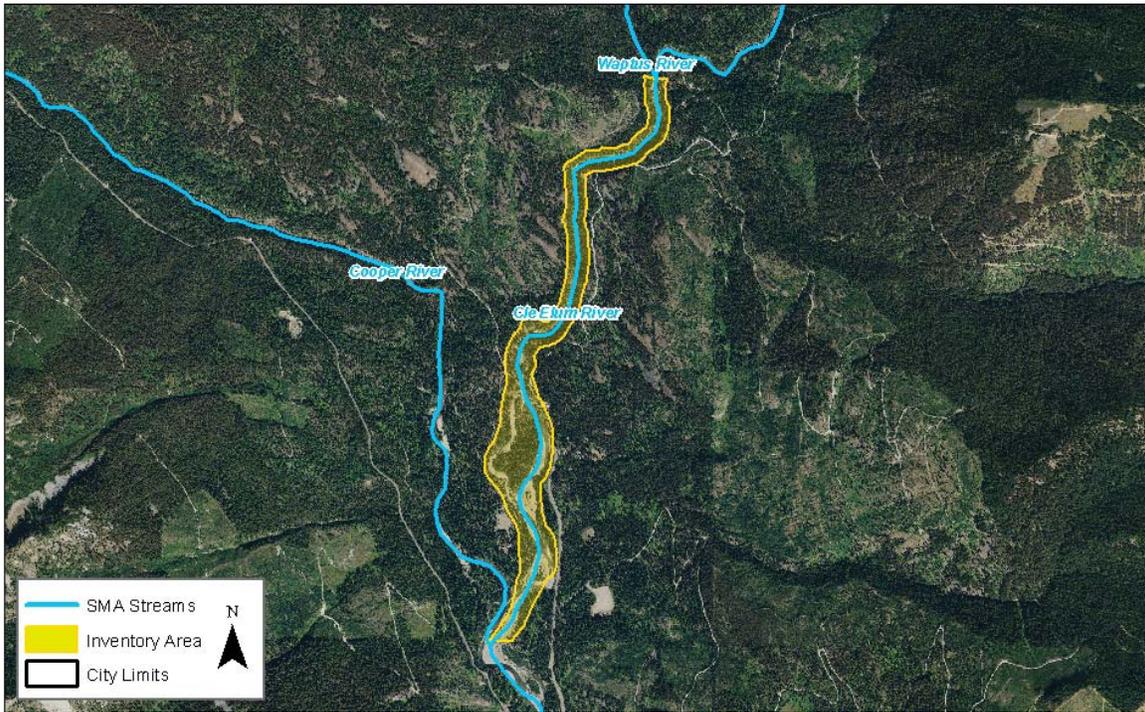
CLE ELUM RIVER-REACH 4

SHORELINE LENGTH:

2.5 Miles

REACH INVENTORY AREA:

157.4 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The upstream portion of the reach is confined to a single channel in a steep, narrow valley. Near the confluence with the Cooper River, the topography becomes less severe and the river splits into multiple channels with large gravel bars.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily conifer-dominated forest (81%), and riparian vegetation (11%), with patches of other (4%), developed lands (2%), and grassland (2%).

HAZARD AREAS (MAP FOLIO #2)

A little more than half (55%) of the reach is located within the FEMA 100-year floodplain and a limited amount of landslide hazard area (1%) is mapped at the upstream end of the reach. The downstream half of the reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW maps the presence of burbot, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat within the reach. Wetland habitat is mapped along much of the river reach (7% of the reach). No priority habitats or species are identified in this reach by WDFW.

WATER QUALITY

The reach meets water quality criteria for temperature, per the State's Water Quality Assessment.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

There are no shoreline modifications identified within the reach.

PUBLIC ACCESS (MAP FOLIO #4)

This reach can be accessed by cross country ski and snowmobile trails at several locations.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is forestry (100%). Land ownership is 45% private and 55% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (97%) and other (3%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There is 1 recorded precontact site, and 2 recorded historic sites within the reach. The Salmon la Sac Guard Station (built 1912) is listed on state and national historic registries.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The stream provides habitat for several priority fish species, but no spawning or rearing habitat is identified.

TERRESTRIAL HABITAT QUALITY

High: The reach is connected to a large area of contiguous forest habitat, and contains minimal existing development.

VEGETATION FUNCTIONS

High: The majority of the reach area consists of dense, mature forest cover.

HYDROLOGIC FUNCTIONS

High: The stream channel and its floodplain are generally unaltered.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Privately-owned forest lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions). New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Protect the high-value, forested floodplain areas within the reach.
- Support efforts to restore fish passage above Cle Elum Dam.
- Manage recreational activity to reduce impacts on vegetation and subsequent erosion.
- Educate shoreline property owners about measures to protect and restore riparian areas.

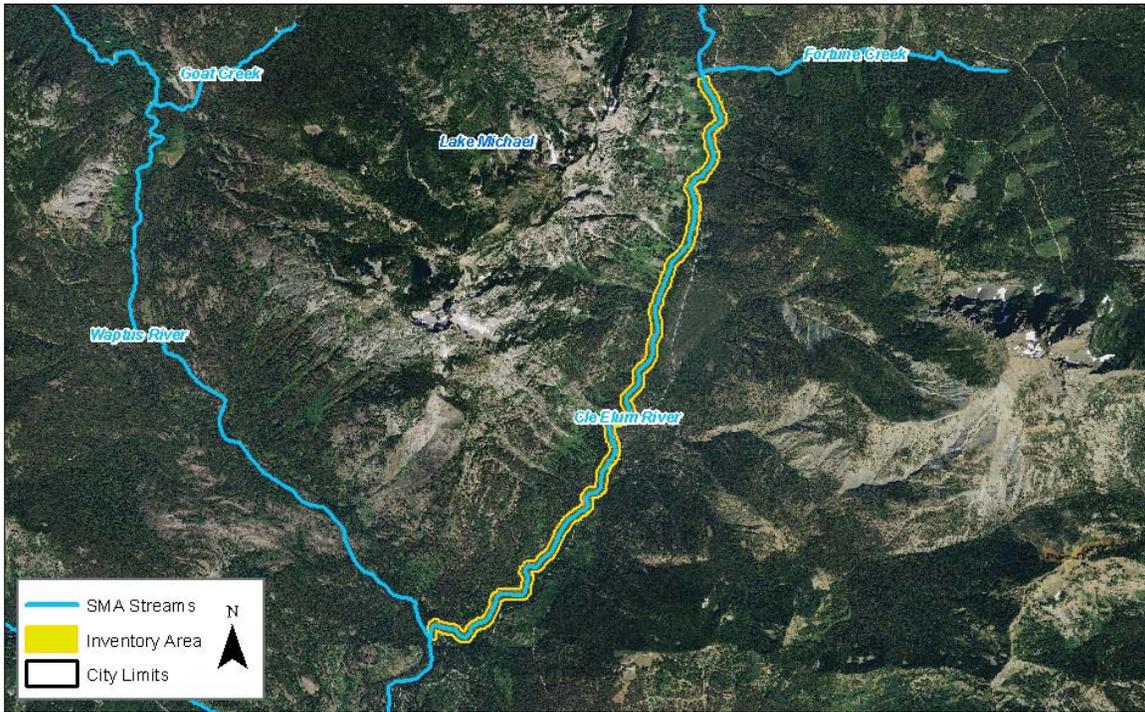
CLE ELUM RIVER-REACH 5

SHORELINE LENGTH:

5.4 Miles

REACH INVENTORY AREA:

257.3 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach is located within a narrow valley with moderate to steep topographic relief; the river is generally confined within a single channel with numerous gravel bars.

LAND COVER (MAP FOLIO #3)

This reach is mostly conifer-dominated forest (93%), and developed (4%), with limited riparian vegetation (2%).

HAZARD AREAS (MAP FOLIO #2)

The reach is not located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW maps the presence of Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat within the reach.

WATER QUALITY

The reach meets water quality criteria for temperature, per the State's Water Quality Assessment.

Very limited wetland habitat is mapped along the river (<1% of reach total), primarily along the downstream portion of the reach. No priority habitats or species are identified in this reach by WDFW.

The upper Cle Elum River shoreline inventory area supports one rare plant species mapped by the Washington Natural Heritage Program.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

A Forest Service road parallels most of the reach on the left bank.

PUBLIC ACCESS (MAP FOLIO #4)

The Davis Peak Trail crosses the downstream extent of the stream and a snowmobile provides access at multiple locations.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is forestry (100%). Land ownership is 14% private and 86% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (97%) and other (3%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are 4 recorded historic sites within the reach. Recorded historic sites feature material related to the mining boom of the early 20th century and include historic structures and a mine.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The stream provides habitat for several priority fish species, but no spawning or rearing habitat is identified.

TERRESTRIAL HABITAT QUALITY

High: The reach is connected to a large area of contiguous forest habitat, and contains minimal existing development, with the exception of a Forest Service Road.

VEGETATION FUNCTIONS

High: The majority of the reach area consists of dense, mature forest cover.

HYDROLOGIC FUNCTIONS

High: The stream channel and its floodplain are generally unaltered, with the exception of a Forest Service Road.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Privately-owned forest lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions). New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Protect the high-value, forested floodplain areas within the reach.
- Support efforts to restore fish passage above Cle Elum Dam.
- Manage recreational activity to reduce impacts on vegetation and subsequent erosion.
- Educate shoreline property owners about measures to protect and restore riparian areas.

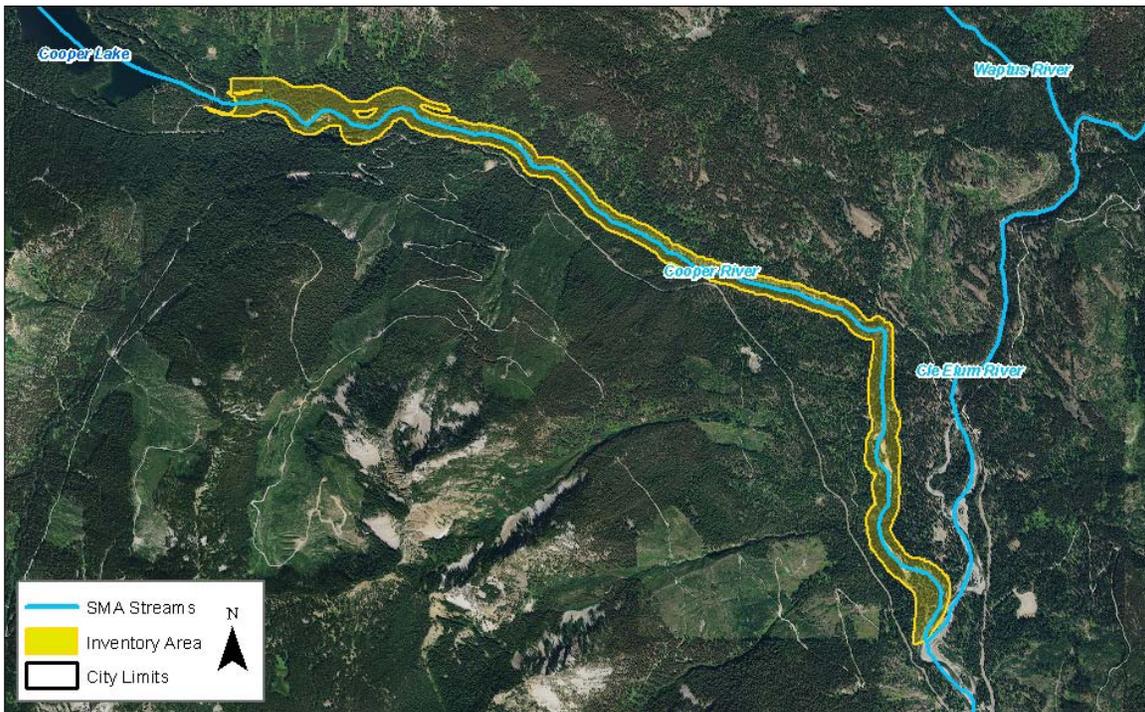
COOPER RIVER-REACH 1

SHORELINE LENGTH:

4.5 Miles

REACH INVENTORY AREA:

278.2 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach is located within a narrow ravine with steep to moderate (upstream to downstream) topographic relief. The river is generally confined within a single channel with few gravel bars.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is principally conifer-dominated forest (81%) and riparian vegetation (18%), with some harvested forest (1%) and other (1%).

HAZARD AREAS (MAP FOLIO #2)

Approximately one-third of the reach (73%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW maps the presence of burbot, kokanee salmon, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat within the reach.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

Wetland habitat is mapped at the upstream and downstream portions of the reach (16% of reach total). No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

No shoreline modifications are mapped within the reach.

PUBLIC ACCESS (MAP FOLIO #4)

The Cooper River Trail, a snowmobile trail, and cross country ski trails allow stream access.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is forestry (100%). Land ownership is 3% private and 97% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (99%) and other (1%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The stream provides habitat for several priority fish species, but no spawning or rearing habitat is identified.

TERRESTRIAL HABITAT QUALITY

High: The reach is connected to a large area of contiguous forest habitat, and contains minimal existing development.

VEGETATION FUNCTIONS

High: The majority of the reach area consists of dense, mature forest cover.

HYDROLOGIC FUNCTIONS

Medium: The stream channel is relatively unaltered, but the channel is located within a narrow ravine and has limited floodplain functions.

2

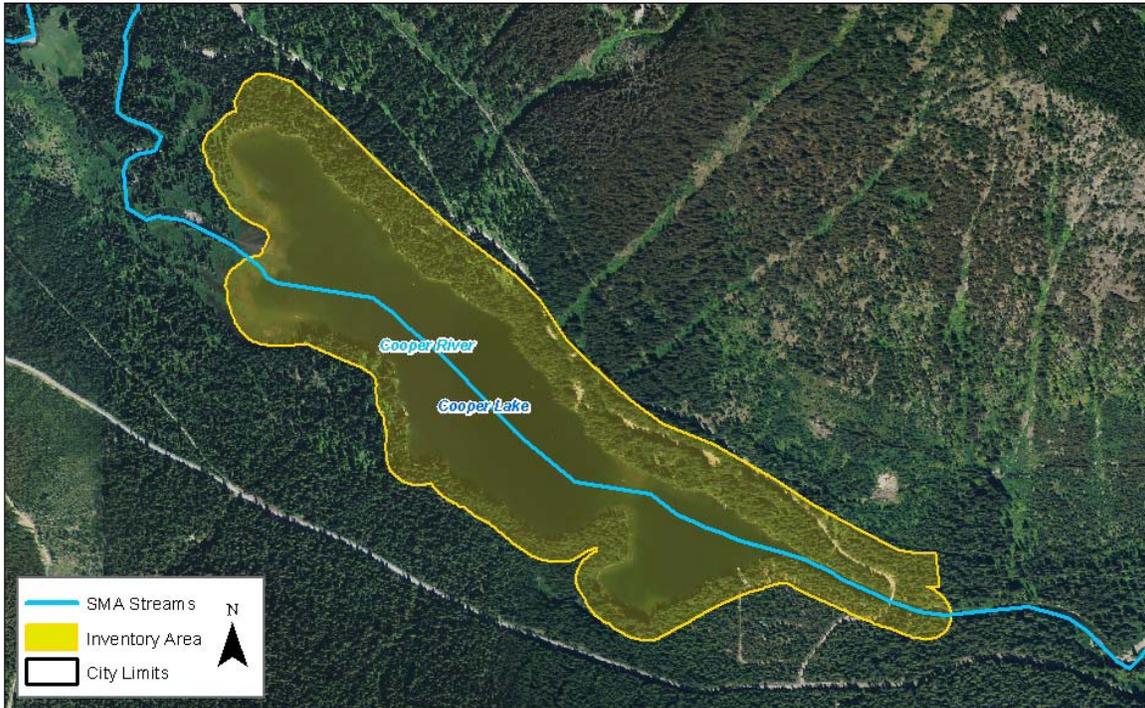
KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Privately-owned forest lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions). New development should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Protect the high-value, forested floodplain areas within the reach.
- Manage recreational activity to reduce impacts on vegetation and subsequent erosion.
- Educate shoreline property owners about measures to protect and restore riparian areas.

COOPER LAKE

SHORELINE LENGTH:
6.3 Miles

WATERBODY AREA: 121.1 Acres
REACH INVENTORY AREA: 242.0 Acres



PHYSICAL AND ECOLOGICAL FEATURES

PHYSICAL CONFIGURATION

The lake shoreline is mostly undeveloped and is oriented northwest to southeast. The lake inlet is located to the northwest; it drains to the southeast. A large stream delta/wetland complex is located on the western lake shoreline.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is largely open water (47%), conifer-dominated forest (43%), with some riparian vegetation (9%) and other (1%).

HAZARD AREAS (MAP FOLIO #2)

The majority of the reach (61%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW maps the presence of kokanee salmon, Dolly Varden/bull trout, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat within the reach.

WATER QUALITY

The reach is not listed on the State's Water Quality Assessment list of 303 (d) waters.

Wetland habitat is mapped primarily at the northwest shoreline of the lake (7% of reach total). No priority habitats or species are identified in this reach by WDFW.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

No shoreline modifications are mapped within the reach.

PUBLIC ACCESS (MAP FOLIO #4)

The Cooper River Trail provides public access to the northern shoreline of the lake, as does the OWHI Campground and associated boat launch.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is forestry (100%). Land ownership is 6% private and 94% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (69%) and other (31%) [right-of-way].

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The lake provides habitat for several priority fish species, but no spawning or rearing habitat is identified.

TERRESTRIAL HABITAT QUALITY

High: The reach is connected to a large area of contiguous forest habitat, contains a significant wetland complex, and is relatively unaltered.

VEGETATION FUNCTIONS

High: The majority of the reach area consists of dense, mature forest cover.

HYDROLOGIC FUNCTIONS

High: The lakeshore is relatively unaltered and the lake helps maintain Cooper River base flows.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Protect the high value wetland complex at the northwest end of the lake.
- Manage recreational activity to reduce impacts on vegetation and subsequent erosion.

3

1 3.15 Teanaway River and Tributaries

2 The Teanaway River is a left-bank tributary to the Yakima River at RM 176.1
3 (Haring 2001). Tributaries to the Teanaway River with mean annual flows greater
4 than 20 cfs are the North, Middle, and West Forks of the Teanaway, and Stafford
5 Creek. The mainstem Teanaway and its forks generally flow from the northwest to
6 south. The mainstem, downstream of the forks, is identified as a “shoreline of
7 statewide significance.”

8 3.15.1 Physical Characterization

9 The reach flows along the southern portion of a broad valley, with low topographic
10 relief. The river is generally confined within a single, wide channel. The channel is
11 confined at several locations by bridges, including the Highway 10 crossing, and by
12 Highway 970 in places.

13 Active landslide hazard areas are mapped at a several locations in the upper
14 watershed, adjacent to portions of the North and Middle Forks (WDNR 2010). In
15 addition, steep slopes are mapped in the upper reaches of all river forks, as the river
16 traverses through the eastern slopes of the Cascade Mountain Range (Kittitas
17 County 2012). The FEMA 100-year floodplain is mapped in much of the mainstem
18 and North Fork inventory areas, notably extending outside of this area where
19 Highway 970 travels east away from the mainstem. The downstream halves of the
20 West Fork and Middle Fork inventory areas also have mapped floodplain with their
21 boundaries, but to a lesser extent. Near the confluence with the North Fork reach,
22 Stafford Creek has mapped FEMA 100-year floodplain in its inventory area (FEMA
23 1996). The entire mainstem and North Fork reaches are mapped as having
24 potential for channel migration (Ecology 2011).

25 The mainstem, Middle Fork, and West Fork of the Teanaway experience low flows
26 and associated high water temperatures during the summer and fall, partially the
27 result of multiple stream diversions. Several diversions have been converted to
28 pump and pipeline irrigation systems, which have allowed more flow to remain in
29 the river (Haring 2001).

30 This stretch of the river has been largely disconnected from its floodplain since the
31 late 1800s. Human alterations have impacted river system processes: ponds and
32 wetlands have been drained and side channels filled; the river has been
33 straightened; and channels have been confined and consolidated. Beaver
34 populations have been reduced so there are fewer dams to retain and disperse
35 flows. Logging and splash damming in the upper watershed have increased the rate

1 of runoff and reduced channel complexity. Downstream of the confluence of the
2 three forks, the river has been moved to the edge of the valley, channelized, and
3 armored to facilitate agricultural activities (Haring 2001).

4 3.15.2 Habitats and Species

5 3.15.2.1 Fish Use

6 The Teanaway River system provides rearing and spawning habitat for bull trout,
7 summer steelhead, and spring Chinook. Other salmonids present in this river system
8 include coho salmon, rainbow trout, westslope trout, eastern brook trout, and
9 mountain whitefish (StreamNet 2010).

10 Approximately 51 miles of the Teanaway River and its tributaries are accessible to
11 steelhead trout. Steelhead have been observed spawning in the mainstem Teanaway
12 and in the lower West Fork (YSFWPB 2004).

13 It is unclear whether bull trout were ever abundant in Yakima River tributaries. The
14 North Fork Teanaway River supports a bull trout population, but it is believed to be
15 at risk of extinction due to limited habitat area and isolation from other populations
16 (Haring 2001, USFWS 2002; YSFWPB 2004). Current legal fisheries in the basin are
17 highly regulated to reduce negative impacts on steelhead and bull trout (Conley et
18 al. 2009).

19 The Teanaway River system historically produced large numbers of spring Chinook
20 salmon. Today small numbers of spring Chinook salmon spawn and rear in the
21 mainstem Teanaway River and the North Fork as far as Stafford Creek (RM 8.3). In
22 1997 the Cle Elum Supplementation and Research Facility (CESRF) began a program
23 to determine if introducing hatchery fish could increase the abundance of spring
24 Chinook. Smolts have been released at the Jack Creek facility on the North Fork
25 Teanaway River. Spawner returns and redds in the Teanaway River increased from
26 near zero to 110 redds in 2002 and 31 redds in 2003. However, there are concerns
27 that hatchery fish may compete with natural origin fish for space and food
28 resources. (Conley et al. 2009).

29 Spawning conditions suitable for spring Chinook salmon, steelhead, and coho
30 salmon are still present in much of the mainstem Teanaway River and the lower
31 portions of the forks. However, human changes to the river system have
32 substantially altered fish habitats. Beginning in the late 19th century, the rivers
33 were used to transport millions of board feet of timber downstream. The removal of
34 large woody debris from the channel led to streambed scouring, channel incision,
35 and lowering of the water table. As settlement continued, stream channels were
36 consolidated or confined to protect homes and fields; while this reduced flooding, it

1 also reduced the recharge of shallow aquifers by cold spring runoff and eliminated
2 off-channel habitat. The lack of large wood in the Teanaway River reduced the
3 number of pools and other important in-channel rearing habitats (Haring 2001,
4 Conley et al. 2009).

5 Streamflows in the Teanaway River system continue to be a challenge for fisheries.
6 Low flows can prevent salmon access to spawning areas, while excessive peak flows
7 can scour the streambed and reduce the survival of incubating eggs and
8 overwintering juveniles (Conley et al. 2009). The upper Teanaway River has not
9 been subject to extensive water diversions, but below RM 9.6 there is significant
10 diversion for irrigation, especially during the natural low-flow period of late July
11 through mid-September (Reclamation 2002). Low flows and associated increased
12 temperatures limit the availability of summer and early fall rearing habitat in
13 affected tributary and lower mainstem reaches and create passage barriers for
14 migrating and rearing steelhead (Conley et al. 2009). Irrigation systems have been
15 modified to conserve water, reduce diversions, and increase streamflow in the
16 Teanaway River. However, these gains may be partially offset by water used for
17 residential development and drilling of permit exempt wells (Reclamation and
18 Ecology 2011a).

19 Because the Teanaway watershed has a south-facing aspect, steep slopes, and is in
20 the rain-on-snow zone, it is prone to increases in peak flows resulting from forest
21 road networks and timber harvest. The Teanaway River is considered a high
22 priority for identifying and reducing impacts from forest practices (Conley et al.
23 2009, YSFWPB 2004).

24 3.15.2.2 Water Quality

25 Ecology's 2008 303(d) list does not identify water quality issues in the Teanaway
26 River or its tributaries. The Teanaway River watershed had past problems with high
27 water temperatures. Development of a total maximum daily load (TMDL) for
28 temperature in 2003 resulted in removal of the basin's streams from the 303(d) list
29 (Reclamation and Ecology 2011a).

30 The Teanaway River has elevated levels of sediment. This is due partly to natural
31 sources such as landslides and partly to high road densities, agriculture, and
32 recreational uses that remove vegetation and cause additional bank erosion. The
33 Teanaway is estimated to contribute a third of the total sediment load in the upper
34 Yakima River (Haring 2001, YSFWPB 2004).

3.15.2.3 *Riparian Habitat Conditions (Land Cover)*

The upper Teanaway River watershed is dominated by coniferous forest. Harvested forest, agriculture, and riparian vegetation are more common along the lower mainstem Teanaway. The growth of native riparian vegetation has been hampered by historic and ongoing human activities. For example, where roads have been located near stream channels the streambanks are reinforced with riprap, eliminating riparian vegetation. Historic use of streams to transport logs scoured the channels and lowered the groundwater table, making it more difficult for riparian species to grow (YSFWPB 2004).

3.15.2.4 *Wetlands*

The Teanaway River system historically had extensive riparian wetland habitats. In order to develop valley bottomland for agriculture, wet meadows were drained and side channels were filled. Removal of beavers, along with diking and channelization, further eliminated remaining wet meadows and wetlands (YSFWPB 2004).

A large wet meadow/wetland complex along the lower mainstem has been identified a priority for preservation. This complex has remnant off-channel backwaters and springs that provide important habitat for fish and wildlife (YSFWPB 2004, Haring 2001). Overall, mapped wetlands occupy less than a quarter of the shoreline inventory area along the Teanaway River and its forks. No wetlands are mapped along Stafford Creek.

3.15.2.1 *Wildlife Habitats and Species*

The upper Teanaway River watershed is mapped as critical habitat for northern spotted owl, a federally listed threatened species associated with structurally complex coniferous forest. Forests used by spotted owls in the lower and middle slopes of the eastern Cascade Range tend to be younger than forests used elsewhere in Washington. Owls in those areas nest in abandoned northern goshawk nests or clumps of branches infected by mistletoe (WDFW 2011c). The northern goshawk (a state candidate species and a federal species of concern) has been recorded throughout the upper Teanaway watershed, including in and near the shoreline inventory areas.

Despite conservation efforts, northern spotted owl populations continue to decline in Washington. Reasons for the decline include habitat loss and competition with barred owls. Habitat loss has resulted from forest conversion, timber harvest, fire, windthrow, insect outbreak and disease. In the Teanaway River basin area, an

1 ongoing spruce budworm outbreak has impacted large patches of spotted owl
2 habitat (WDFW, 2011c).

3 The Teanaway River watershed is also used by elk as a calving area. Elk calving
4 areas are considered a state priority habitat, along with elk migration corridors and
5 wintering areas (WDFW 2008).

6 Another notable wildlife species that has recently been documented in the
7 Teanaway River area is the gray wolf, a federally listed endangered species. The
8 federal listing covers the western half of Washington, including the Yakima basin.
9 Gray wolves were once common throughout the state but were eliminated during
10 ranching and farming during the late 1800s and early 1900s. The species is a wide-
11 ranging, top-level predator that affects the behavior of prey such as elk, in turn
12 influencing vegetation patterns. In July 2011 a gray wolf pack was confirmed in the
13 Teanaway region and appeared to be successfully breeding (WDFW, 2011a;
14 Reclamation and Ecology 2011a).

15 3.15.3 Land Use

16 The mainstem Teanaway River is bordered by agricultural lands (primarily irrigated
17 hayfields) and undeveloped forest land that is zoned for commercial forest and
18 forest and range. Some moderate- and low-density residential subdivisions are also
19 located along the downstream end of the river.

20 The lower approximately 7 miles of the West Fork Teanaway River is bordered
21 primarily by undeveloped commercial forest-zoned lands, while the upper West
22 Forks is located within National Forest lands. The lower approximately 3 miles of
23 the Middle Fork is bordered by undeveloped forest and range-zoned land to the
24 west, and low- to moderate-density residential development to the east. The
25 remainder of the Middle Fork flows through undeveloped, commercial forest-zoned
26 land and National Forest.

27 The lower approximately 2 miles of the North Fork Teanaway River is bordered by
28 moderate-density residential development. The remainder of the North Fork flows
29 through undeveloped commercial forest-zoned land and National Forest.

30 3.15.4 Public Access

31 There is no public access available to the mainstem Teanaway River or the
32 downstream portions of its forks; the surrounding lands are privately owned. In the
33 upper watershed, the Teanaway River forks are crossed by a snowmobile trail and
34 can also be accessed from numerous hiking/horse trails within the National Forest.

1 3.15.5 Reach Sheets

DRAFT

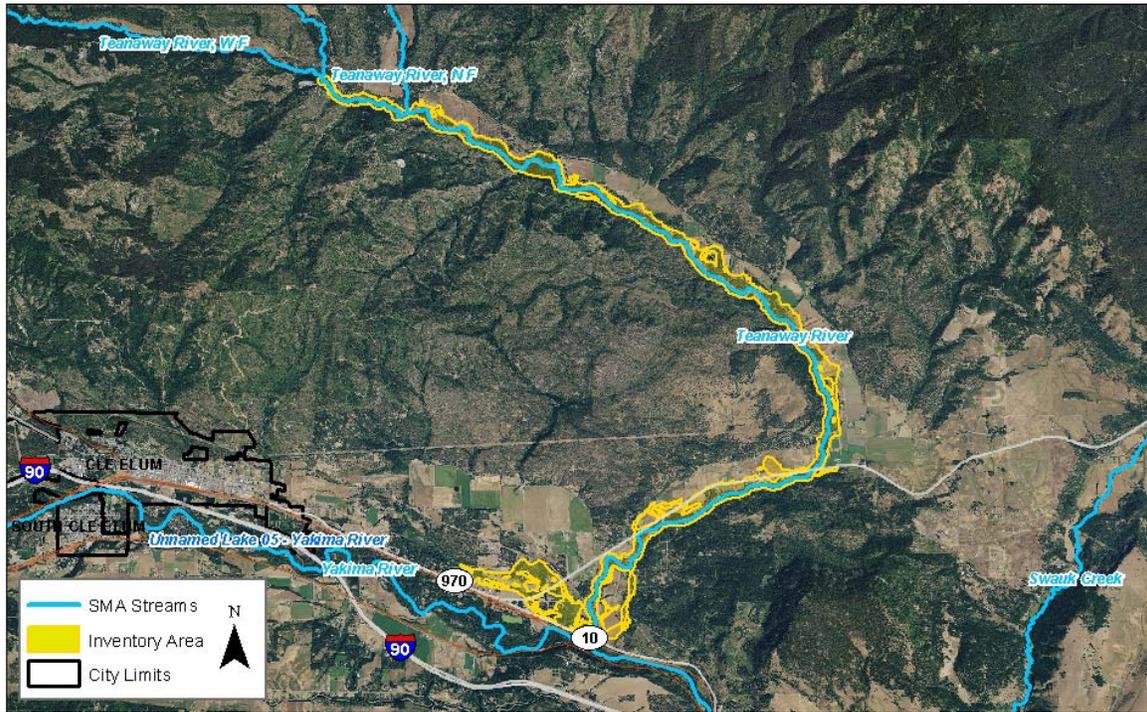
TEANAWAY RIVER (MAINSTEM)

SHORELINE LENGTH:

12.4 Miles

REACH INVENTORY AREA:

1,337.4 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach flows along the southern portion of a broad valley, with low topographic relief. The river is generally confined within a single, wide channel that allows flows though a significant number of gravel bars. The channel is confined at several locations highway infrastructure. The entire reach has migration potential.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily agriculture (37%), conifer-dominated forest (27%), and riparian woodland/shrubland (19%), with patches of other (6%), harvested forest (4%), shrubland (3%), developed lands (3%), and grassland (1%).

HAZARD AREAS (MAP FOLIO #2)

About three-quarters of the reach (73%) are located within the FEMA 100-year floodplain, and a few landslide hazard areas (1%) are mapped on the right bank of the river. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and rearing habitat for spring Chinook and summer steelhead. The presence of coho salmon, Dolly Varden/bull trout, mountain whitefish, and rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

A TMDL has been implemented for temperature and turbidity in this reach.

Patches of wetland habitat are mapped along the river throughout the reach (17% of the reach), and a large wetland complex near the Yakima River confluence is identified as priority wood duck nesting habitat. Priority elk calving habitat is also mapped within the reach along with a limited area of mule deer winter range.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Much of the channel within the reach is constrained by hydromodifications. In addition, SR 970 runs parallel to the lower 4 miles river, thus cutting it off from its natural floodplain.

PUBLIC ACCESS (MAP FOLIO #4)

There is no public access to this reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

The primary land uses along the reach are rural (83%) and forestry (17%). Land ownership is 100% private.

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for rural residential (36%), agriculture (24%), forest & range (17%), commercial forest (16%), and other (7%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

The historic irrigation ditch (circa 1885) is associated with early agriculture in the Teanaway and is potentially eligible for listing on the National Register.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach provides spawning and juvenile rearing habitat for priority fish species (including spring Chinook salmon), but low summer flows are a limiting factor for fish use.

TERRESTRIAL HABITAT QUALITY

Medium: There is significant development and agriculture usage along the river, but area of dense riparian cover and connections to large, relatively-undisturbed habitat areas exist

VEGETATION FUNCTIONS

Medium: Areas of dense forest and shrub cover are present in the reach, but much of the area has been altered by agriculture and residential development.

HYDROLOGIC FUNCTIONS

Low: The floodplain of the reach is highly altered by development, agriculture, and hydromodifications.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- In the recent past, some resource and agriculture land within the reach have been converted to more intensive uses (e.g., from agriculture to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- There is no public access within the reach.
- Low summer flows in the river are a limiting factor for salmon. Irrigation systems have been modified to conserve water, reduce diversions, and increase streamflow in the Teanaway River. However, these gains may be partially offset by water used for residential development and drilling of permit exempt wells.
- Protect the high value wetland complex at the downstream end of the reach (YSFWPB, 2004).
- Correct a fish passage barrier resulting from the January 2009 flood event that caused a headcut of the channel and required water right holders to create rock and gravel dams to direct water into their pump stations. The project will construct four channel spanning rock weirs to stabilize the streambed and return water flows to pump stations (YBFWRB, 2011).
- Protect high-quality forest and wildlife habitat in the upper reaches.
- Educate shoreline property owners about measures to protect and restore riparian areas.

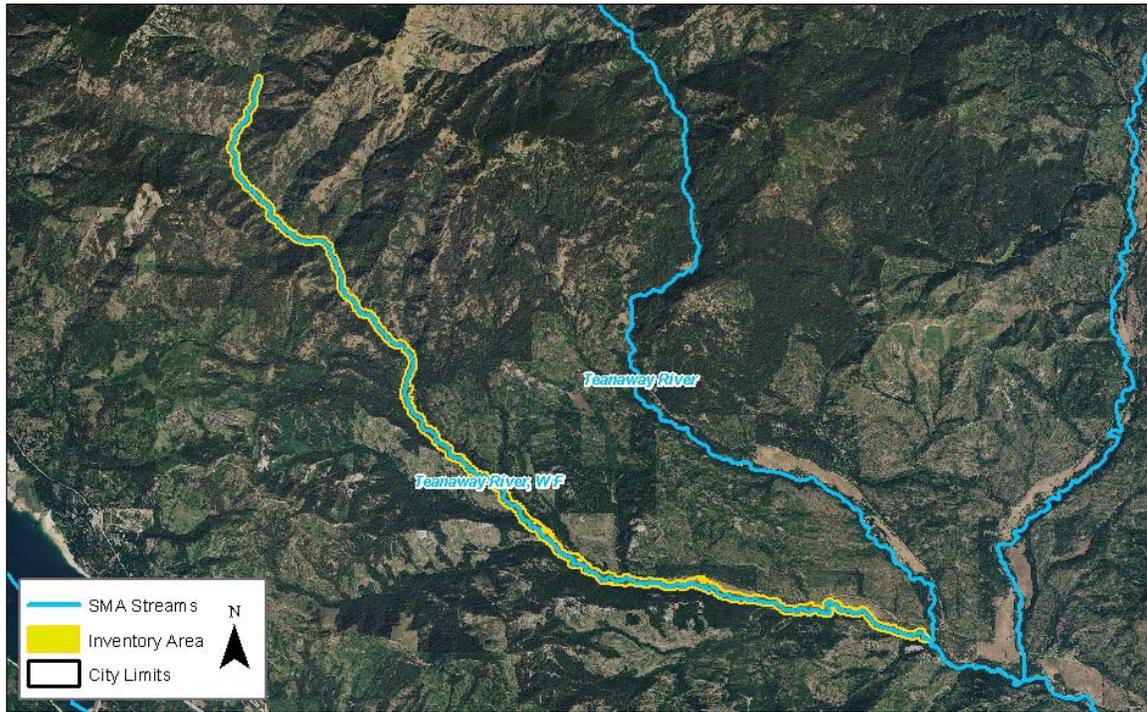
WEST FORK TEANAWAY RIVER

SHORELINE LENGTH:

11.1 Miles

REACH INVENTORY AREA:

559.2 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The upstream portion of the reach flows through a valley with moderate topographic relief, while downstream, the ravine widens to a flat valley bottom. The river is generally confined within a single, wide channel that migrates within its banks. West Fork Teanaway Road parallels much of the left bank of the river.

LAND COVER (MAP FOLIO #3)

This reach is mostly conifer-dominated forest (81%), with some riparian vegetation (9%), harvested forest (5%), agricultural lands (3%), and developed lands (1%).

HAZARD AREAS (MAP FOLIO #2)

Approximately 33% of the reach is located within the FEMA 100-year floodplain and multiple landslide hazard areas (3%) are mapped on the right bank of the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides juvenile rearing habitat for spring Chinook. The presence of summer steelhead, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

A TMDL has been implemented for temperature in this reach.

Limited wetland habitat is mapped along the river throughout the reach (5% of the reach). Priority elk winter range and calving habitat is mapped within the lower portion of the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Much of the reach is bordered by West Fork Teanaway Road.

PUBLIC ACCESS (MAP FOLIO #4)

A snowmobile trail crosses the middle portion of the reach; the West Fork Teanaway Trail provides access at several locations in the upstream section of the reach.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily forestry (92%) with rural lands along the downstream end (8%). Land ownership is 73% private and 27% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (96%), rural residential (2%), and other (2%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach is minimally altered and provides spawning and juvenile rearing habitat for priority fish species, but low summer flows are a limiting factor for fish use.

TERRESTRIAL HABITAT QUALITY

Medium: The downstream end of the reach is in agricultural protection and a road bordered much of the stream, but a majority of the reach is covered with dense riparian forests and is connected to large, relatively-undisturbed habitat areas.

VEGETATION FUNCTIONS

Medium: Most of the reach consists of dense forest cover, but vegetation is disturbed by agriculture at the downstream end and by West Fork Teanaway Road, which parallels much of the stream channel.

HYDROLOGIC FUNCTIONS

Medium: Portions of the river's floodplain are altered by a road and agricultural development at the downstream end, but much of the floodplain is intact.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- In the recent past, some resource and agriculture lands along the Teanaway have been converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Low summer flows in the river are a limiting factor for salmon.
- Protect high-quality forest and wildlife habitat in the upper reaches.

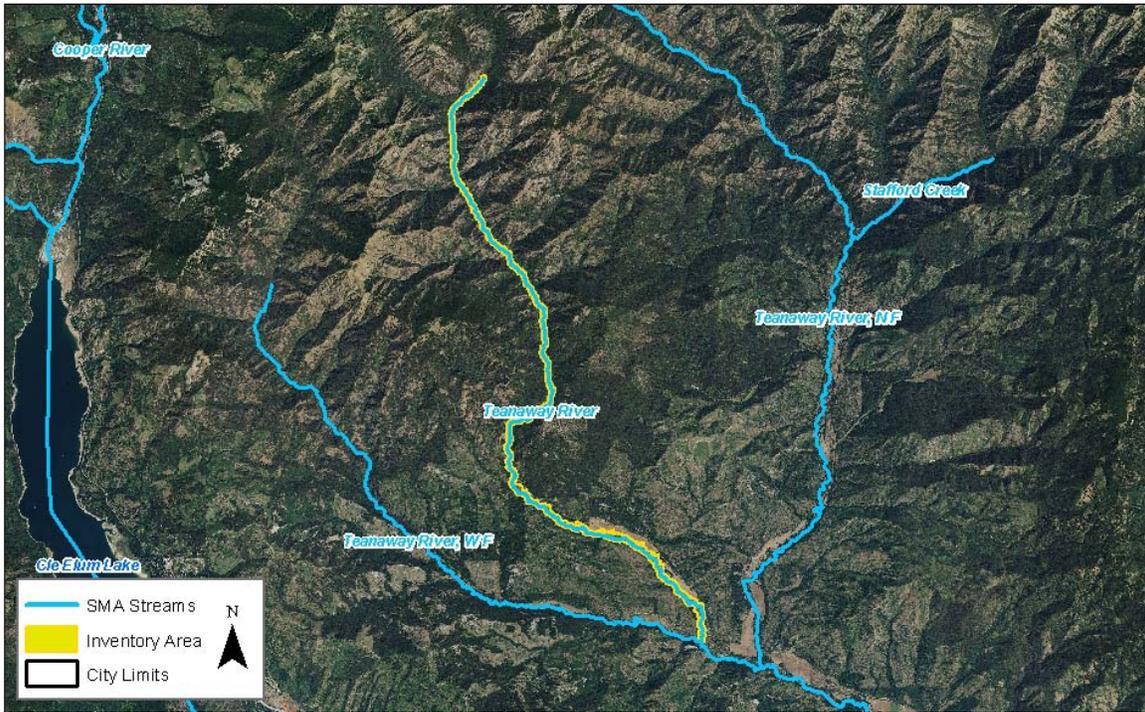
MIDDLE FORK TEANAWAY RIVER

SHORELINE LENGTH:

12.5 Miles

REACH INVENTORY AREA:

639.6 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

Upstream, the river flows through a narrow valley with steep slopes as a single channel; a forest service road is mapped in the river channel for most of this section. Downstream, the river flows along the southern portion of a flat valley, through many gravel banks.

LAND COVER (MAP FOLIO #3)

The reach is dominated by conifer-dominated forest (78%) and riparian vegetation (10%), with limited agricultural (7%), and harvested forest (5%).

HAZARD AREAS (MAP FOLIO #2)

Approximately one-quarter (25%) of the reach is located within the FEMA 100-year floodplain and numerous landslide hazard areas (10%) are mapped on both banks of the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for summer steelhead. The presence of rainbow trout and westslope cutthroat is also mapped.

WATER QUALITY

A TMDL has been implemented for temperature in this reach.

A small extent of wetland habitat is mapped along the river throughout the reach (4% of the reach). Priority elk calving habitat is also mapped within the lower portion of the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

A Forest Service road parallels and crosses the reach in several locations.

PUBLIC ACCESS (MAP FOLIO #4)

The Middle Fork Teanaway Trail provides river access to the upstream half of the reach. A snowmobile trail crosses the reach downstream of the trail.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily forestry (73%) with rural lands along the downstream end (27%). Land ownership is 61% private and 39% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (73%), with forest & range (17%), rural residential (9%), and other (1%) areas at the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are no recorded sites within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach is minimally altered and provides habitat for priority fish species (including spawning habitat for spring Chinook), but low summer flows are a limiting factor for fish use.

TERRESTRIAL HABITAT QUALITY

Medium: The downstream end of the reach is in agricultural protection and a road bordered much of the stream, but a majority of the reach is covered with dense riparian forests and is connected to large, relatively-undisturbed habitat areas.

VEGETATION FUNCTIONS

Medium: Most of the reach consists of dense forest cover, but vegetation is disturbed by agriculture at the downstream end and by a Forest Service road, which parallels much of the stream channel.

HYDROLOGIC FUNCTIONS

Medium: Portions of the river's floodplain are altered by a road and agricultural development at the downstream end, but much of the floodplain is intact.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- In the recent past, some resource lands within the reach have been converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions and protect structures from flooding.
- Low summer flows in the river are a limiting factor for salmon.
- Protect high-quality forest and wildlife habitat in the upper reaches.

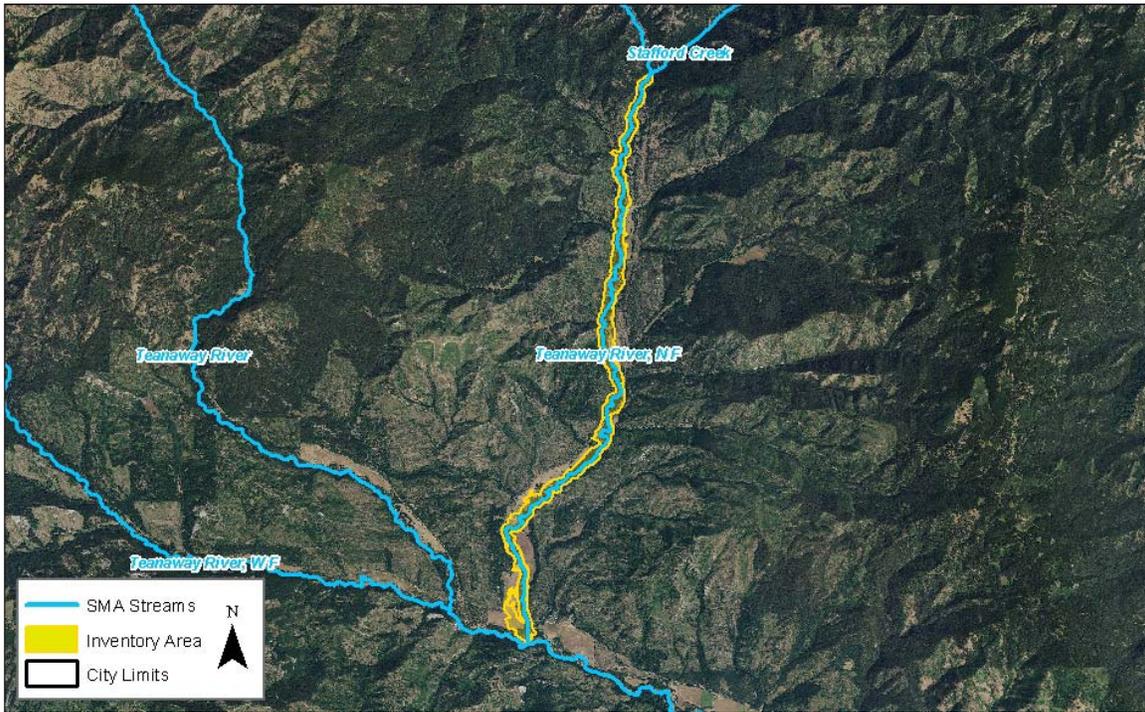
NORTH FORK TEAWAY RIVER

SHORELINE LENGTH:

9.8 Miles

REACH INVENTORY AREA:

643.8 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

Much of the reach flows through a broad valley via multiple channels. The reach also contains many gravel bars. Steep topographic relief on either side of the valley bottom and a Forest Service road confine the channel in areas.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily conifer-dominated forest (56%) and riparian vegetation (20%). Other cover types include: harvested forest (10%), agricultural lands (9%), other (4%), and developed lands (1%).

HAZARD AREAS (MAP FOLIO #2)

The majority of the reach (71%) is located within the FEMA 100-year floodplain and a limited number of landslide hazard areas (1%) are mapped within the reach. The entire reach has potential for channel migration.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning and rearing habitat for summer steelhead and Dolly Varden/bull trout. The presence of coho salmon, eastern brook trout, mountain whitefish, rainbow trout, and westslope cutthroat is also mapped.

WATER QUALITY

A TMDL has been implemented for temperature in this reach.

Wetland habitat is mapped along the downstream half of the reach (12% of reach total). A significant amount of priority elk calving habitat is also mapped within the reach; mountain goat habitat is located at the upstream extent of the reach.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

The reach is paralleled and crossed in several locations by North Fork Teanaway Road and Forest Service roads.

PUBLIC ACCESS (MAP FOLIO #4)

The North Fork Teanaway Trail provides river access to the upstream half of the reach. A snowmobile trail crosses the reach downstream of the trail.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily forestry (74%) with rural lands along the downstream end (26%). Land ownership is 100% private.

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned primarily for commercial forestry (74%), with rural residential (24%) and other (2%) along the downstream end.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

There are 7 recorded precontact sites, and 1 recorded historic site located within the reach.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

High: The reach is minimally altered and provides habitat for priority fish species (including spawning habitat for spring Chinook).

TERRESTRIAL HABITAT QUALITY

Medium: The downstream end of the reach is in agricultural protection and a road bordered much of the stream, but a majority of the reach is covered with dense riparian forests and is connected to large, relatively-undisturbed habitat areas.

VEGETATION FUNCTIONS

Medium: Most of the reach consists of dense forest cover, but vegetation is disturbed by agriculture at the downstream end and by roads which parallel much of the stream channel.

HYDROLOGIC FUNCTIONS

Medium: Portions of the river's floodplain are altered by a road and agricultural development at the downstream end, but much of the floodplain is intact.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- In the recent past, some resource lands within the reach have been converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Several important cultural and archaeological sites are located within the reach.
- Protect high-quality forest and wildlife habitat in the upper reaches.
- Identified restoration actions in the reach include:
 - Acquire a conservation easement on 5.83 miles of river and over 354 acres of floodplain, riparian forest, and meadow habitat along the river. Potential Phase I effort is to secure a conservation easement on the southern-most 96 acres of riparian area (YBFWRB, 2011).
 - Potential Phase II effort to fund a conservation easement on the middle two miles of stream and 100 acres of floodplain habitat between Dickey Creek and Jack Creek; this would be a continuation of Phase I (SRFB project 04-1672) efforts described above (YBFWRB, 2011).

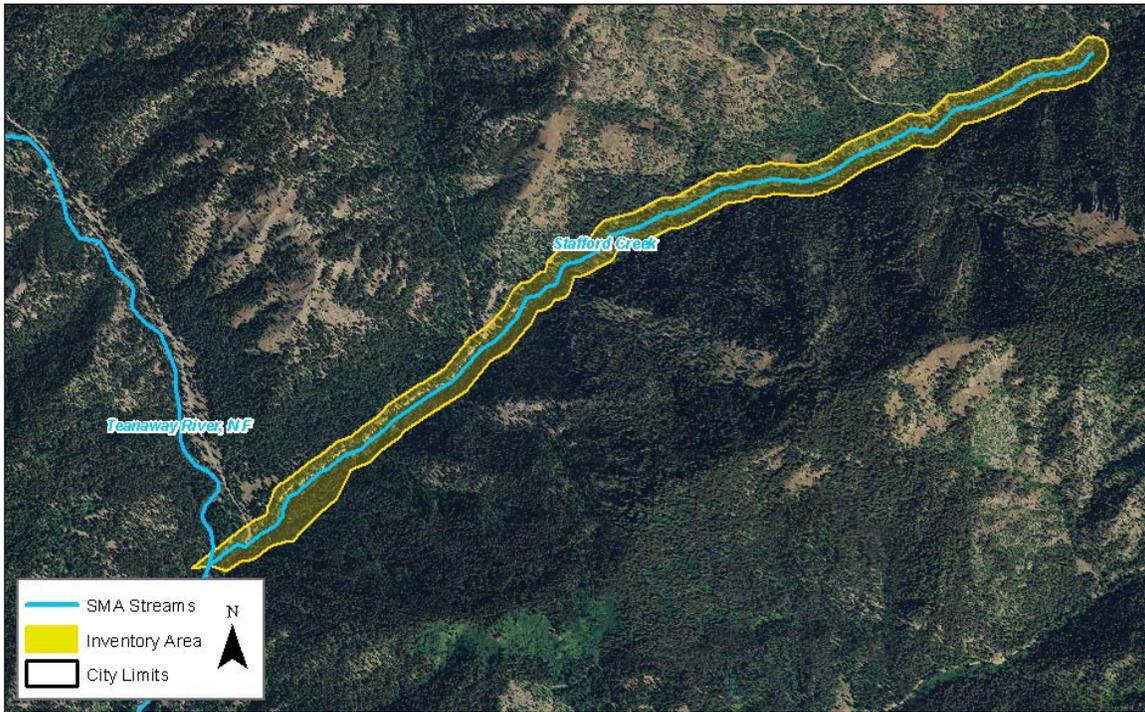
STAFFORD CREEK

SHORELINE LENGTH:

2.7 Miles

REACH INVENTORY AREA:

133.3 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

The reach is located within a narrow valley with steep topographic relief. The stream is generally confined within a single channel that migrates within its banks.

LAND COVER (MAP FOLIO #3)

The reach is composed of conifer-dominated forest (88%) and riparian vegetation (11%).

HAZARD AREAS (MAP FOLIO #2)

Only 12% of the reach is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for summer steelhead and juvenile rearing habitat for Dolly Varden/bull trout. The presence of rainbow trout, and westslope cutthroat is also documented.

WATER QUALITY

A TMDL has been implemented for temperature in this reach.

No wetland habitat is mapped in the reach. The entire reach contains mapped priority elk calving habitat.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

A Forest Service road parallels the entire reach.

PUBLIC ACCESS (MAP FOLIO #4)

A snowmobile trail crosses the downstream portion of the reach and a cross country ski trail parallels the majority of the right bank.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is forestry (100%). Land ownership is 66% private and 34% public (Forest Service).

CONTAMINATED SITES

No identified contaminated sites are located within this reach.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry (100%).

CULTURAL AND ARCHAEOLOGICAL RESOURCES

The Stafford, or Standup Lookout, is a historic road that was built by the CCC during the 1930s. Additionally, there are 2 precontact sites within the reach.

1

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

High: The reach is minimally altered and provides habitat for priority fish species (including spawning and rearing habitat).

TERRESTRIAL HABITAT QUALITY

Medium: A road borders much of the stream, but a majority of the reach is covered with dense riparian forests and is connected to large, relatively-undisturbed habitat areas.

VEGETATION FUNCTIONS

High: Most of the reach consists of dense riparian forest cover.

HYDROLOGIC FUNCTIONS

Medium: Portions of the river's floodplain are altered by a road, but there are generally minimal hydromodifications located within the reach.

2

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- Resource lands within the reach have the potential to be converted to more intensive uses (e.g., from forestry to residential subdivisions). Future new structures should be set back an adequate distance to protect stream functions and protect structures from flooding and channel migration.
- Protect high-quality forest and wildlife habitat in the upper reaches.

3

1 3.16 Swauk Creek

2 Swauk Creek enters the Yakima River at RM 169.9 as a left-bank tributary. The
3 stream generally flows north to south.

4 3.16.1 Physical Characterization

5 Precipitation is limited in the Swauk Creek watershed, resulting in low streamflows
6 during the dry season. During summer, flows become very low to intermittent
7 downstream of RM 6, while flows typically become absent during the fall
8 downstream of RM 4 to 6 (Haring 2001; Sullivan 2008). In addition to limited
9 precipitation, low or absent flows are the result of irrigation diversions, which have
10 cut off hyporheic connectivity between subsurface stream waters and floodplain
11 waters (Sullivan 2008).

12 Seven roads and a railroad crossing are located over the stream, including Highways
13 970, 97 and 10, with the majority of crossings located in the upper watershed
14 (WDFW 2010). In addition, two utility corridors cross the stream. Steeps slopes are
15 also mapped over most of the upper watershed and adjacent to the lower portion of
16 the stream (Kittitas County 2012). The FEMA 100-year floodplain is mapped in the
17 downstream half of the river's inventory area, occupying most of the area (FEMA
18 1996).

19 Swauk Creek has a naturally confined stream corridor and physical alterations have
20 significantly modified the corridor's extent. Road construction and mining have
21 straightened and steepened the channel, resulting in downstream bank erosion
22 (Haring 2001). Along the lower reaches, the stream is confined in areas by an old
23 railroad bed, while further up the canyon, State Route 97 and another abandoned
24 railroad bed impair floodplain functions and reduce channel sinuosity. Undersized
25 culverts result in debris blockages, fish passage barriers, and localized erosion
26 during peak flows at several locations along the stream.

27
28 Much of the upper canyon, upstream of RM 8, is forested, while the lower portions of
29 the stream, downstream of RM 3, flow through an arid canyon. Substantial
30 recreational and commercial gold prospecting occurs upstream of RM 11 (Haring
31 2001). Limited residential development is located adjacent to the stream in the
32 lower portion of the upper watershed.

1 3.16.2 Habitats and Species

2 3.16.2.1 Fish Use

3 Swauk Creek supports Dolly Varden/bull trout and steelhead (Middle Columbia
4 River Distinct Population Segment), both federally listed as threatened. This stream
5 is considered a major steelhead producer in the upper Yakima basin (Conley et al.
6 2009). Other salmonid species in this stream include eastern brook trout, rainbow
7 trout, and westslope cutthroat (StreamNet 2010).

8 Swauk Creek was historically a substantial producer of coho salmon. Coho were
9 witnessed spawning in Swauk Creek in the early 1960s, but are now largely
10 extirpated due to impairment of side channels and loss of meandering stream
11 courses (StreamNet 2010, Haring 2001).

12 Swauk Creek provides a stable rearing environment for spring Chinook salmon in
13 the summer, when irrigation water is released from upstream reservoirs. Juvenile
14 Chinook enter can Swauk Creek to escape high flows (Nason 2004).

15 Spawning habitat in much of Swauk Creek is fair to poor. Fish habitat has been
16 impacted by sedimentation and a lack of large woody debris. Mining for gold has
17 likely increased sedimentation and decreased successful incubation and emergence
18 of salmonid eggs. Toxic chemicals such as arsenic may still be present as a remnant
19 of historic gold mining and processing in the watershed. (Haring 2001, YSFWPB
20 2004)

21 Roads in the Swauk Creek watershed have also contributed to an increase in
22 sediment and a loss of complexity in the stream system. Sediment loading from
23 extreme rain and snowmelt events on Highway 97 can be disastrous to fish
24 populations if it occurs during spawning times (Nason 2004).

25 Summer and early fall streamflows in lower Swauk Creek are very low or
26 intermittent as far upstream as RM 6. The lack of flow prevents adult salmonids
27 from reaching the upper watershed until fall rains occur. Low flows may result from
28 a combination of natural conditions plus a loss of floodplain water storage,
29 floodplain confinement, impaired riparian function, and water withdrawals (Haring
30 2001). Some diversions on Swauk and First Creeks have been dedicated to instream
31 flow purposes through acquisition from the Mountain Star Resort (Reclamation and
32 Ecology 2011a).

33 Other impacts to fisheries include undersized culverts that cause debris blockages,
34 fish passage barriers, and localized erosion during peak flows (Haring 2001).

1 The banks of lower Swauk Creek, upstream from the confluence with the Yakima
2 River, contain small, disjunct stands of Oregon white oak (a state priority habitat).
3 This represents the northernmost known extent of this species in eastern
4 Washington (Nelson 2004).

5 3.16.3 Land Use

6 The land bordering the lower approximately 4 miles of Swauk Creek is primarily
7 undeveloped forest and shrub land, zoned for agriculture. An electric power line
8 corridor crosses the creek within the segment. Upstream of the agriculture-zoned
9 area, the creek is bordered by low- to moderate-density residential development,
10 agriculture, and some undeveloped forest land that is zoned for rural residential
11 development. The upper creek flows through National Forest land.

12 3.16.4 Public Access

13 The lower approximately 8 miles of Swauk Creek is bordered by private lands, and
14 no public access is available. Upper Swauk Creek, within the National Forest, can be
15 accessed from various hiking, snowmobile, and snowshoe/ski trails.

16 3.16.5 Reach Sheet

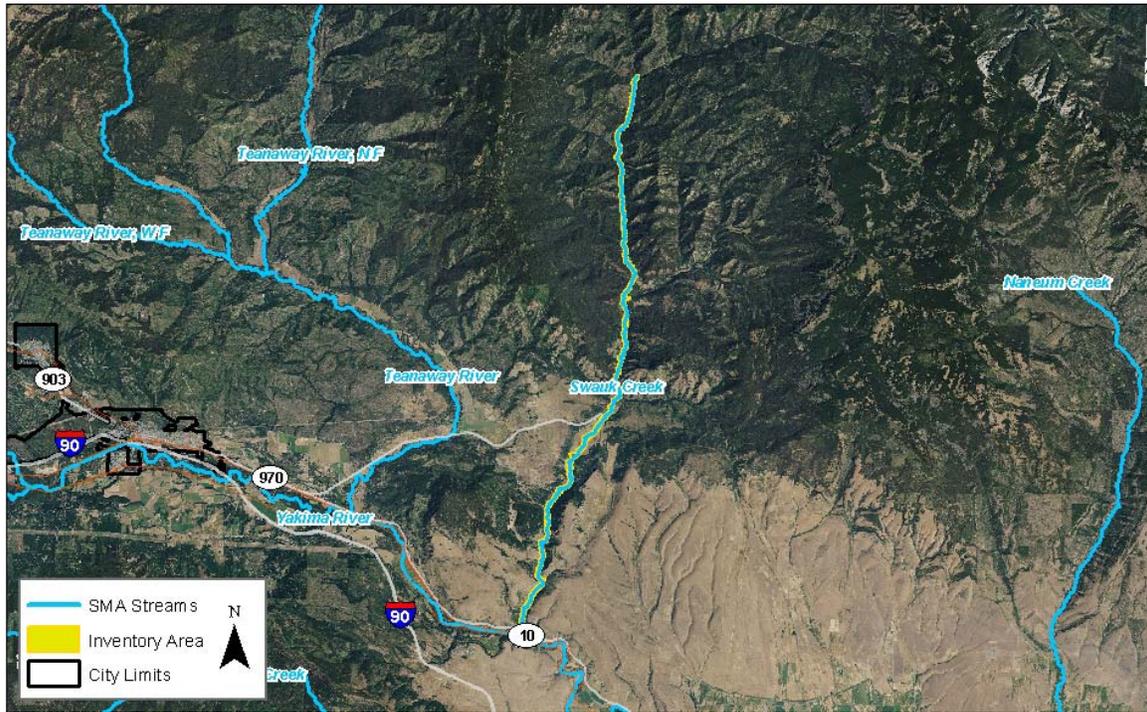
SWAUK CREEK

SHORELINE LENGTH:

16.8 Miles

REACH INVENTORY AREA:

855.1 Acres



PHYSICAL AND ECOLOGICAL FEATURES

CHANNEL CONFIGURATION

Upstream, the stream is located within a moderately narrow valley with steep topographic relief, and is generally confined within a single channel with multiple gravel bars. Downstream, terrain flattens and the channel is relatively unconfined.

LAND COVER (MAP FOLIO #3)

Land cover within the reach is primarily conifer-dominated forest (35%), riparian vegetation (34%), and developed lands (20%). Other cover types located within the reach include: agricultural lands (5%), shrublands (5%), and unvegetated (1%).

HAZARD AREAS (MAP FOLIO #2)

Almost half of the reach (47%) is located within the FEMA 100-year floodplain. No landslide hazard areas are mapped within the reach.

HABITATS AND SPECIES (MAP FOLIO #1)

WDFW mapping shows that the reach provides spawning habitat for summer steelhead and rearing habitat for spring Chinook. The presence of coho salmon, Dolly Varden/bull trout, eastern brook trout, rainbow trout, and westslope cutthroat is also mapped. Several patches of wetland habitat are mapped along the river throughout the reach (6% of the reach). Priority habitat and species include: cliff/bluffs and oak woodland, and elk winter area and calving habitat, mule deer winter range, and rocky mountain elk habitat. The Swauk Creek shoreline inventory area supports one rare plant species mapped by the Washington Natural Heritage Program.

WATER QUALITY

The reach is listed on the State's Water Quality Assessment list of 303 (d) Category 5 waters for temperature.

BUILT ENVIRONMENT AND LAND USE

SHORELINE MODIFICATIONS (MAP FOLIO #1)

Seven roads and a railroad cross the reach, with the majority of crossings in the upper watershed. In the lower reach, the channel is confined in areas by a railroad bed, while Highway 97 and another railroad bed confine the channel upstream.

PUBLIC ACCESS (MAP FOLIO #4)

Upper Swauk Creek, upstream of approximately RM 8, can be accessed from hiking, ATV, and snowmobile trails at various locations.

EXISTING LAND USES AND OWNERSHIP (MAP FOLIO #4)

Land use along the reach is primarily rural (73%) with forestry lands along the upstream end. Land ownership is 68% private and 32% public (Forest Service).

CONTAMINATED SITES

A voluntary toxics cleanup site is located at the downstream end of the reach and a previous enforcement action occurred mid-reach, north of Liberty Road.

ZONING (MAP #5)

Lands within the reach are zoned for commercial forestry at the upstream end (25%); agriculture at the downstream end (34%); and forest & range (12%), rural residential (13%), mixed use (9%), and other (9%) [right-of-way] in the middle region.

CULTURAL AND ARCHAEOLOGICAL RESOURCES

A total of 33 recorded precontact and historic sites are located within the reach. The sites are primarily historic and related to early mining infrastructure built during the late 1800s and early 1900s.

SHORELINE FUNCTION ANALYSIS

FISH HABITAT QUALITY

Medium: The reach provides habitat for priority fish species (including spawning and rearing habitat), but low summer flows are a limiting factor for fish use.

TERRESTRIAL HABITAT QUALITY

Medium: Vegetation is disturbed in some areas by development, agriculture, and roads, but a majority of the reach is covered with dense riparian forests and is connected to large, relatively-undisturbed habitat areas.

VEGETATION FUNCTIONS

Medium: Most of the reach consists of dense forest cover, but vegetation is disturbed in areas by agriculture and development at the downstream end, and Highway 97 which parallels the creek.

HYDROLOGIC FUNCTIONS

Medium: Much of the river's floodplain is altered by Highway 97 and agriculture and other development at the downstream end, but significant portions of the floodplain is intact.

KEY MANAGEMENT ISSUES AND OPPORTUNITIES

- New development should be set back an adequate distance to protect stream functions and protect structures from flooding.
- Low summer flows in the river are a limiting factor for salmon.
- Many important cultural and archaeological sites are located within the reach.
- Restoration actions identified within the reach include:
 - Grants are used to identify and design restoration alternatives for a 1.5-mile reach of Swauk Creek (RM 17.3-18.8). Alternatives will be designed to enhance groundwater storage, increase in-stream habitat complexity, and improve conditions of riparian habitat. Feasibility reports have been prepared and one alternative has been funded (SRFB 08-2001) (YBFWRB, 2011).
 - Fish screen projects have been completed over the last decade; stream restoration work is ongoing downstream of the US 97/Lauderdale Lane junction (Anna Lael, pers. comm.)
- Culverts within the reach are a barrier to fish passage.
- Protect Oregon white oak habitat in lower reaches.

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