Volume II, Chapter 7
Cowlitz Subbasin—Toutle

TABLE OF CONTENTS

7.0 Cowlitz Subbasin—Toutle

7.1 Subbasin Description

7.1.1 Topography & Geology

The Toutle basin encompasses approximately 513 mi^2 in portions of Lewis, Cowlitz, and Skamania Counties. The basin is within WRIA 26 of Washington State. The Toutle enters the Cowlitz at RM 20, just north of the town of Castle Rock. Elevations range from near sea level at the mouth to over 8,000 feet at the summit of Mount St. Helens. The Toutle drains the north and west sides of Mount St. Helens and flows generally westward towards the Cowlitz. The watershed contains three main drainages: the North Fork Toutle, the South Fork Toutle, and the Green River. Most of the North and South Fork were impacted severely by the 1980 eruption of Mount St. Helens and the resulting massive debris torrents and mudflows.

7.1.2 Climate

The basin has a typical northwest maritime climate. Summers are dry and warm and winters are cool, wet, and cloudy. Mean annual precipitation is 61 inches at Kid Valley (North Fork Toutle). Most precipitation occurs between October and March. Snowfall predominates in the higher elevations around Mount St. Helens and rainfall predominates in most of the remaining, lower elevation portion of the basin.

7.1.3 Land Use/Land Cover

Forestry is the dominant land use in the basin. Commercial forestland makes up over 90% of the Toutle basin. Much of the upper basin around Mount St. Helens is within the Mount St. Helens National Volcanic Monument and is managed by the US Forest Service. A significant proportion of the forests to the north and west of Mount St. Helens were decimated in the 1980 eruption and are now in early seral or 'other forest' (bare soil, shrubs) vegetation conditions. Population centers in the basin consist primarily of small rural towns. Projected population change from 2000-2020 for unincorporated areas in WRIA 26 is 22% (LCFRB 2001). A breakdown of land ownership and land cover is presented in Figure 7-1 and Figure 7-2. Figure 7-3 displays the pattern of landownership for the basin. Figure 7-4 displays the pattern of land cover / land-use.

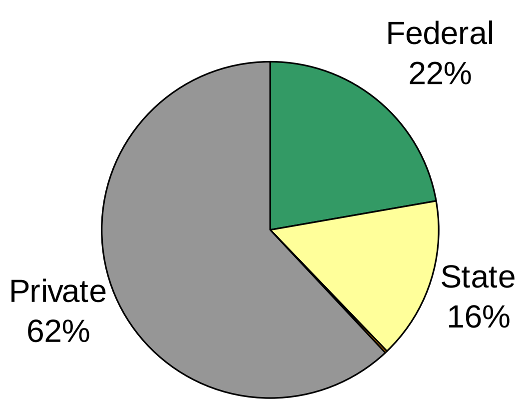


Figure 7-1. Toutle River basin land ownership

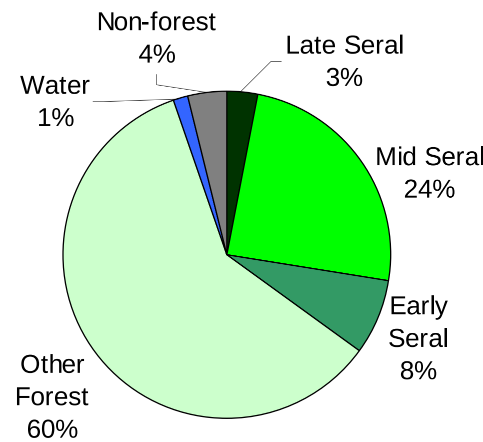


Figure 7-2. Toutle River basin land cover

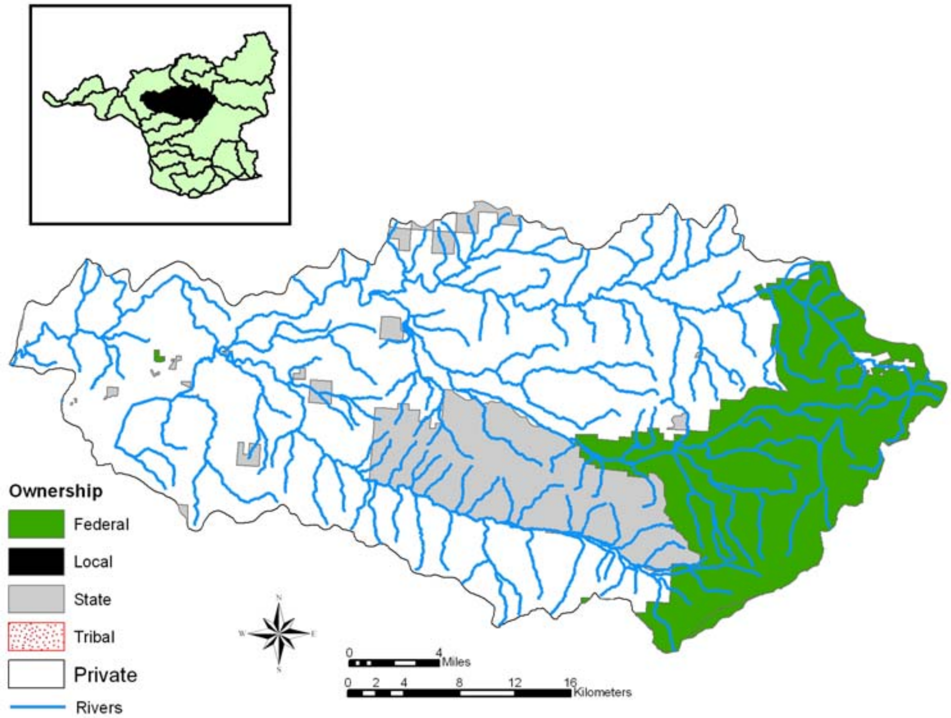


Figure 7-3. Landownership within the Toutle basin. Data is WDNR data that was obtained from the Interior Columbia Basin Ecosystem Management Project (ICBEMP).

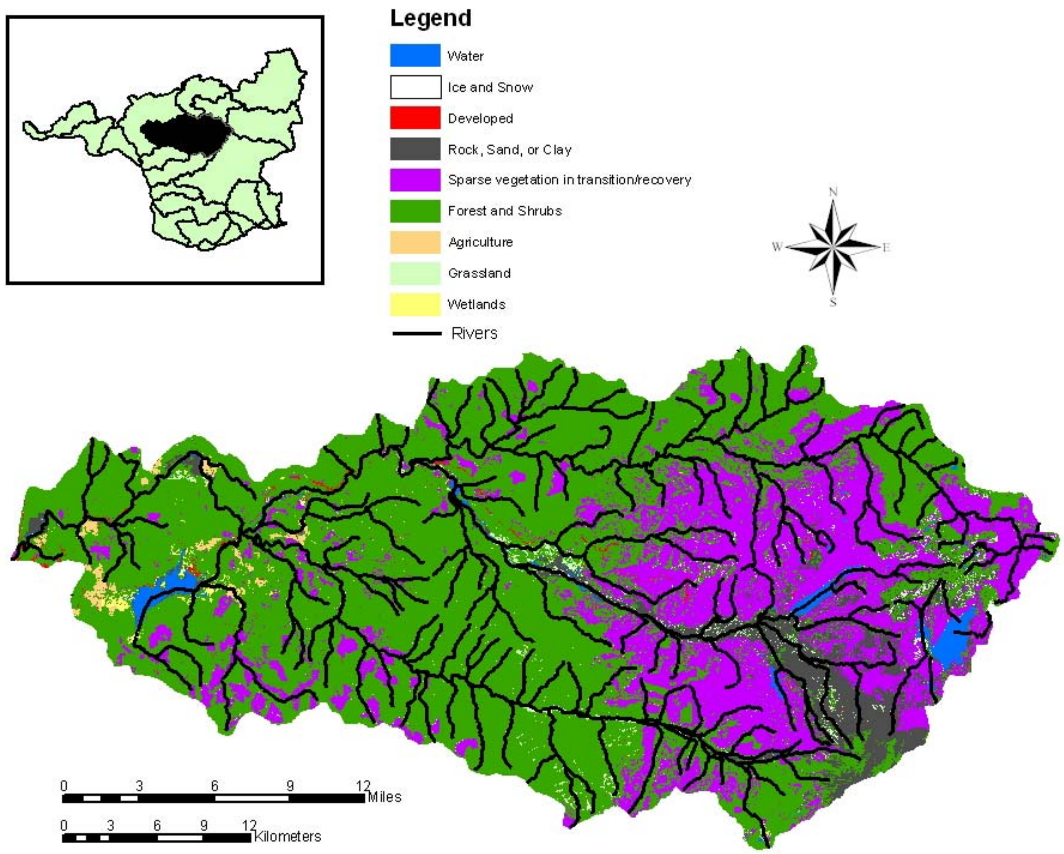
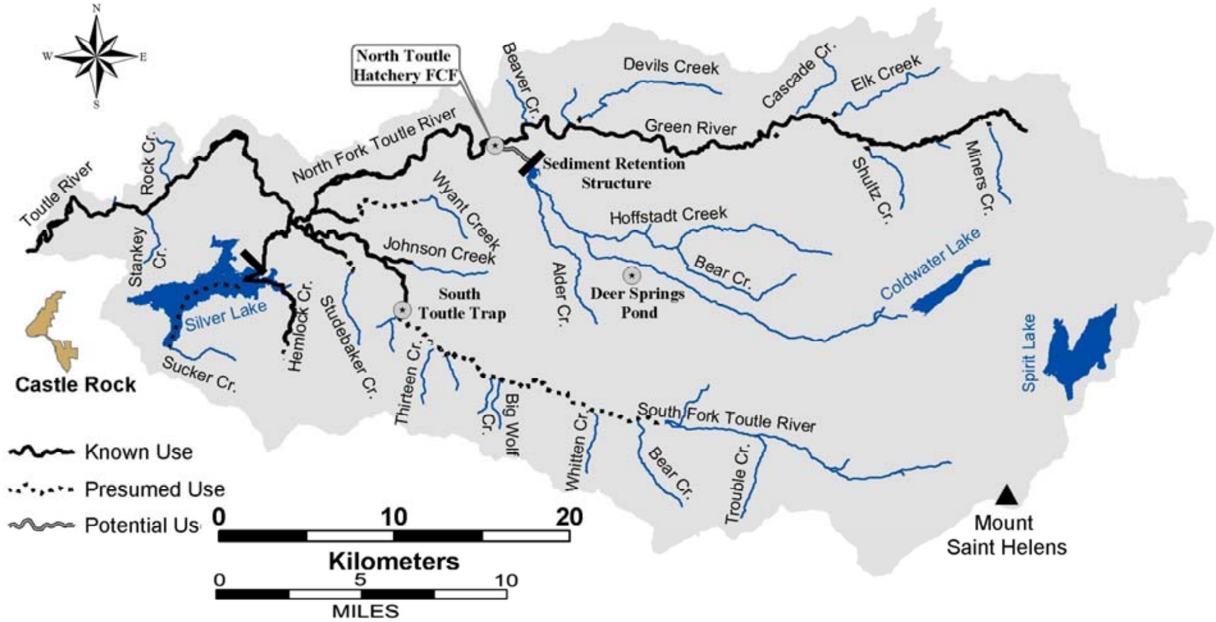


Figure 7-4. Land cover within the Toutle basin. Data was obtained from the USGS National Land Cover Dataset (NLCD).

7.2 Focal Fish Species

7.2.1 Fall Chinook—Cowlitz Subbasin (Toutle/Green River)

ESA: Threatened 1999	SASSI: South Fork—Depressed 2002, Green—Healthy 2002

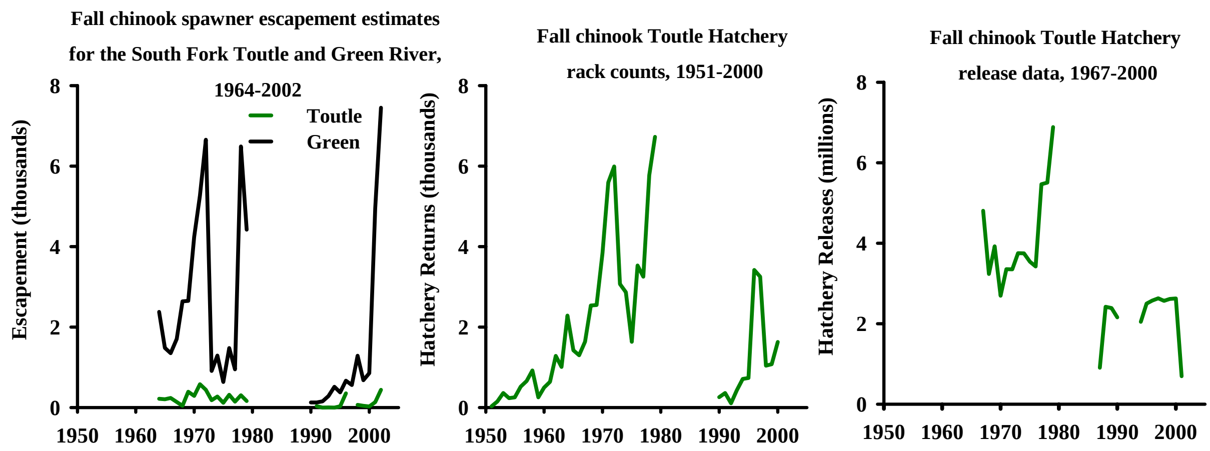


Distribution

- Toutle River fall chinook spawning distribution from 1964 to 1979 was estimated as 4.8% mainstem Toutle, 3.8% SF Toutle, 49.4% NF Toutle, and 42% Green River
- Historical spawning areas in the mainstem Toutle, NF Toutle, and lower Green River were devastated by the 1980 eruption of Mt. St. Helens
- Records indicate most historical fall chinook spawning occurred in the lower 5 miles of the mainstem Toutle River, but spawning spread as far upstream as Coldwater Creek on the NF Toutle River (46 mi from the river mouth)
- In the SF Toutle River, spawning primarily occurs from the 4700 Bridge to the confluence with the mainstem Toutle River (~2.6 mi)
- In the Green River, spawning primarily occurs from the North Toutle Hatchery to the river mouth (~0.6 mi)

Life History

- Columbia River fall chinook migration occurs from mid August to early September, depending partly on early fall rain
- Natural spawning occurs between late September and early-November, usually peaking in mid-October
- Age ranges from 2-year-old jacks to 6-year-old adults, with dominant adult ages of 3 and 4
- Fry emerge around early May, depending on time of egg deposition and water temperature; fall chinook fry spend the summer in fresh water, and emigrate in the late summer/fall as sub-yearlings



Diversity

- Considered a tule population within the lower Columbia River Evolutionary Significant Unit (ESU)
- NF and SF Toutle River stocks designated based on distinct spawning distribution

Abundance

- In 1951, WDF estimated fall chinook escapement to the Toutle River was 6,500 fish
- SF Toutle River spawning escapements from 1964-2001 ranged from 0-578 (average 177)
- Green River spawning escapements from 1964-2001 ranged from 10-6,654 (average 1,900)
- Hatchery production accounts for most fall chinook returning to the Toutle River Basin; chinook are re-establishing a population in the basin after the 1980 Mt. St. Helens eruption
- Hatchery produced adults comprise the majority of natural spawners in the Green and NF Toutle Rivers

Productivity & Persistence

- Smolt density model predicted natural production potential for the Toutle River of 2,799,000 smolts
- Juvenile production from natural spawning is presumed to be low

Hatchery

- The North Toutle Hatchery (formerly called the Green River Hatchery) is located on the lower Green River near the confluence with the NF Toutle River; operations began in 1956, but the hatchery was destroyed in the 1980 eruption of Mt. St. Helens
- The North Toutle Hatchery was renovated and began collecting brood stock again in 1990
- Rearing ponds near the original hatchery site were developed after the eruption and began operation in 1985
- Releases of fall chinook in the Toutle River basin has occurred since 1951; current program releases 2.5 million sub-yearling fall chinook annually; release data are displayed from 1967-2002

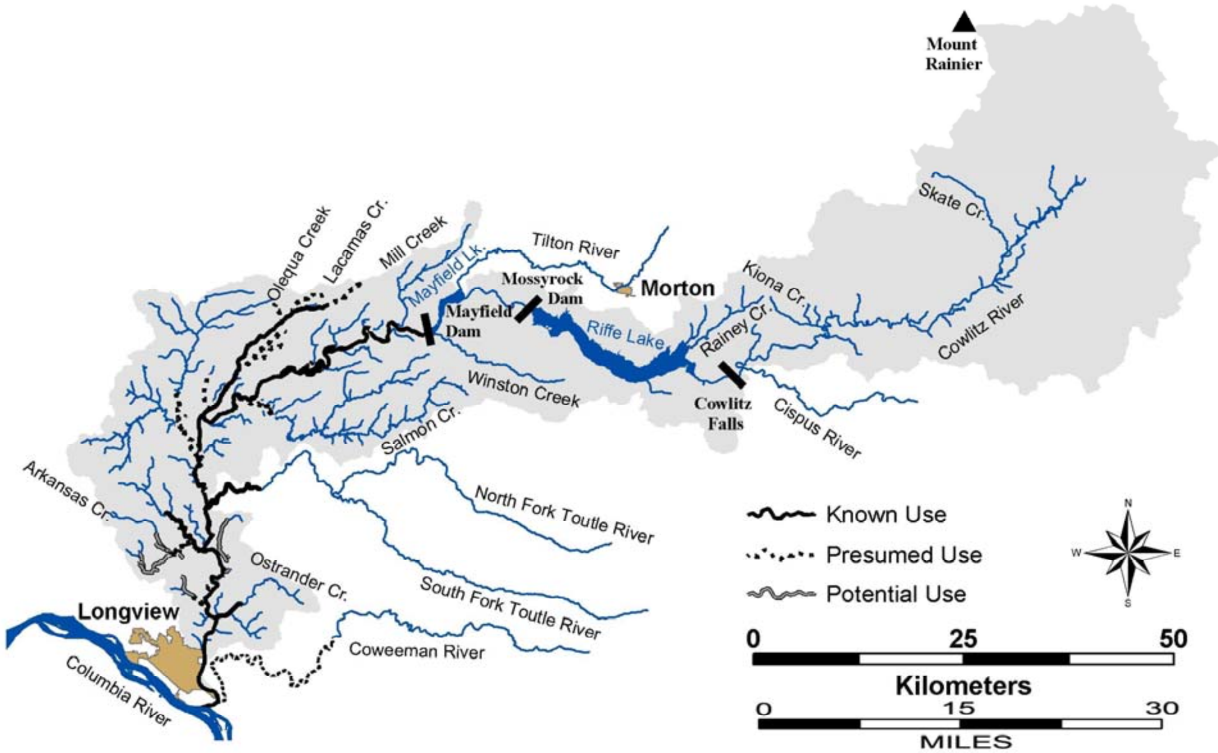
Harvest

- Fall chinook are harvested in ocean commercial and recreational fisheries from Oregon to Alaska, in addition to Columbia River commercial gill net and freshwater sport fisheries

- Lower Columbia tule fall chinook are an important contributor to Washington ocean troll and sport fisheries and to the Columbia River estuary sport fishery
- Columbia River commercial harvest occurs primarily in September, but tule chinook flesh quality is low once the fish move from salt water; the price is low compared to higher quality bright stock chinook
- Annual harvest is dependent on management response to annual abundance in Pacific Salmon Commission (PSC)(US/Canada), Pacific Fisheries Management Council (PFMC) (US ocean), and Columbia River Compact forums
- outle River and Green River chinook harvest in ocean and mainstem Columbia River limited by an ESA constraint of 49% or less on Coweeman River fall chinook
- Coded-wire tag (CWT) data analysis of the 1989-94 brood North Toutle Hatchery fall chinook indicates a total Toutle River fall chinook harvest rate of 41%
- The majority of the North Toutle Hatchery fall chinook stock harvest occurred in Toutle tributary sport (31%), British Columbia (30%), Columbia River (13%), Alaska (14%), and Washington ocean (10%) fisheries
- Sport fishing in the SF Toutle River has been closed since the 1980 eruption of Mt. St. Helens

7.2.2 Chum—Cowlitz Subbasin

ESA: Threatened 1999 **SASSI: NA**



Distribution

- Chum were reported to historically utilize the lower Cowlitz River and tributaries downstream of the Mayfield Dam site

Life History

- Lower Columbia River chum salmon run from mid-October through November; peak spawner abundance occurs in late November
- Dominant age classes of adults are 3 and 4
- Fry emerge in early spring; chum emigrate as age-0 smolts generally from March to May

Diversity

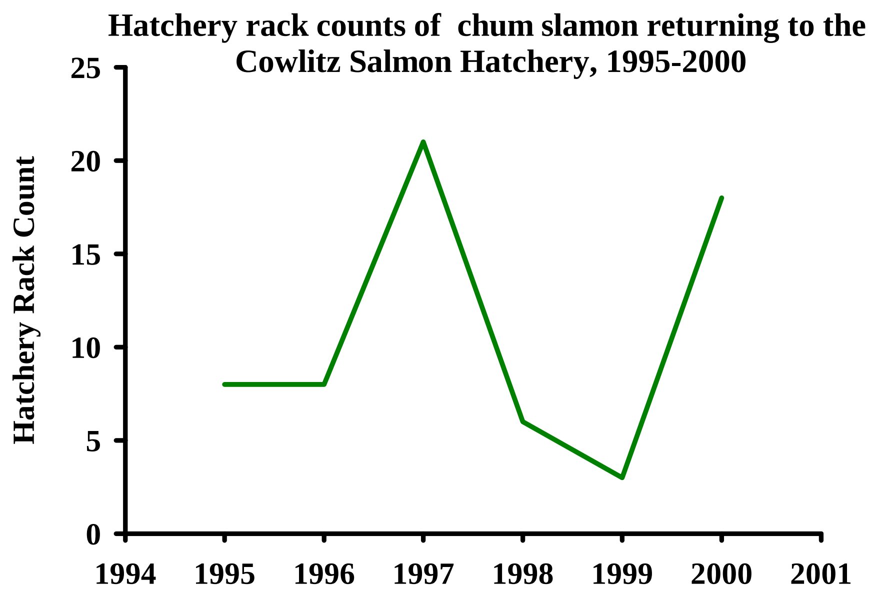
- No hatchery releases of chum have occurred in the Cowlitz basin

Abundance

- Estimated escapement of approximately 1,000 chum in early 1950's
- Between 1961 and 1966, the Mayfield Dam fish passage facility counted 58 chum
- Typically less than 20 adults are collected annually at the Cowlitz Salmon Hatchery

Productivity & Persistence

- Anadromous chum production primarily in lower watershed
- Harvest, habitat degradation, and to some degree construction of Mayfield and Mossyrock Dams contributed to decreased productivity



Hatchery

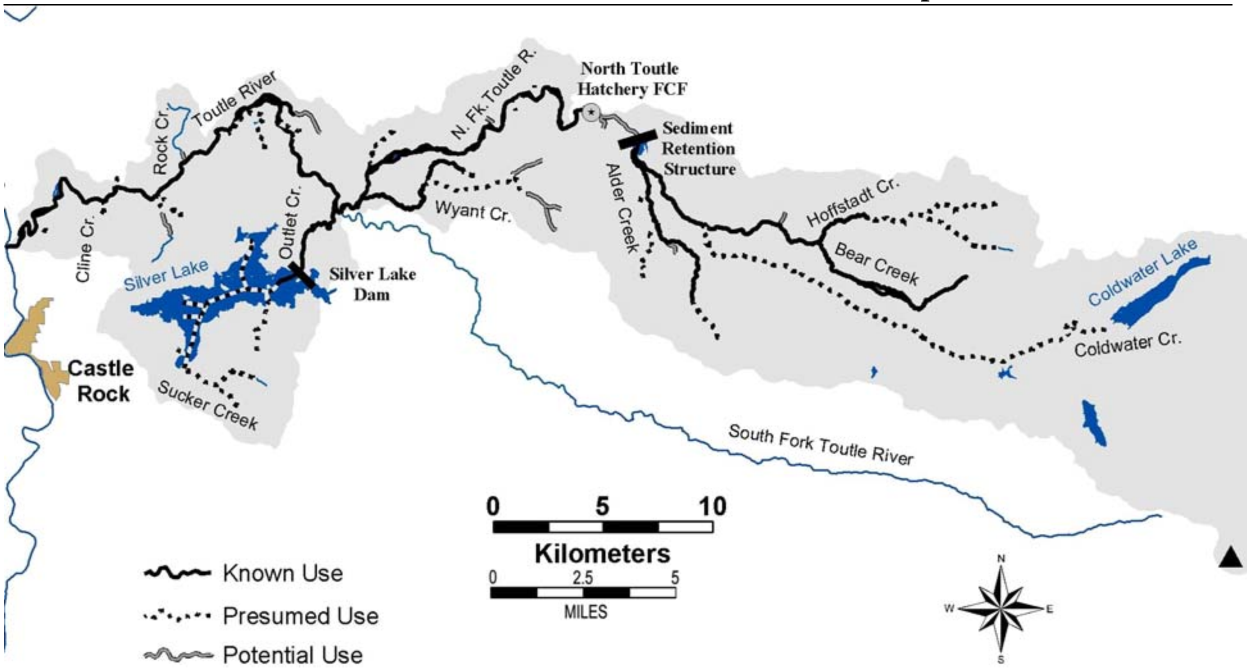
- Cowlitz Salmon Hatchery does not produce/release chum salmon
- Chum salmon are captured annually in the hatchery rack

Harvest

- Currently very limited chum harvest occurs in the ocean and Columbia River and is incidental to fisheries directed at other species
- Columbia River commercial fishery historically harvested chum salmon in large numbers (80,000 to 650,000 in years prior to 1943); from 1965-1992 landings averaged less than 2,000 chum, and since 1993 less then 100 chum
- In the 1990s November commercial fisheries were curtailed and retention of chum was prohibited in Columbia River sport fisheries
- The ESA limits incidental harvest of Columbia River chum to less then 5% of the annual return

7.2.3 Winter Steelhead—Cowlitz Subbasin (Mainstem & NF Toutle/Green)

ESA: Threatened 1998 **SASSI: Depressed 2002**



Distribution

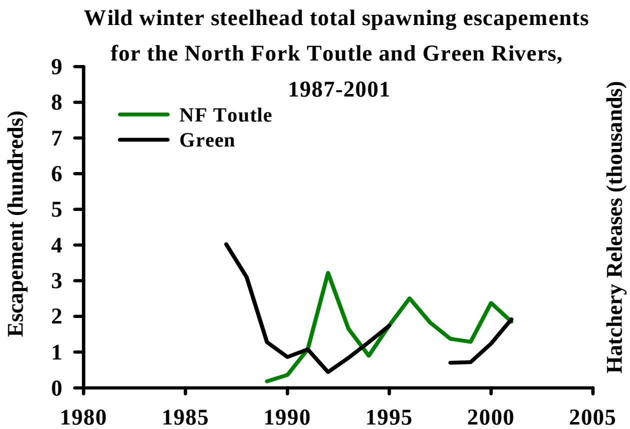
- Historically, steelhead were distributed throughout the mainstem Toutle, NF Toutle and Green Rivers
- In the mainstem/NF Toutle, spawning occurs in the mainstem and Alder and Deer Creeks
- In the Green River, spawning occurs in the mainstem and Devil, Elk, and Shultz Creeks
- The 1980 eruption of Mt. St. Helens greatly altered the habitat within the Toutle River Basin; the NF Toutle sustained the most significant habitat degradation

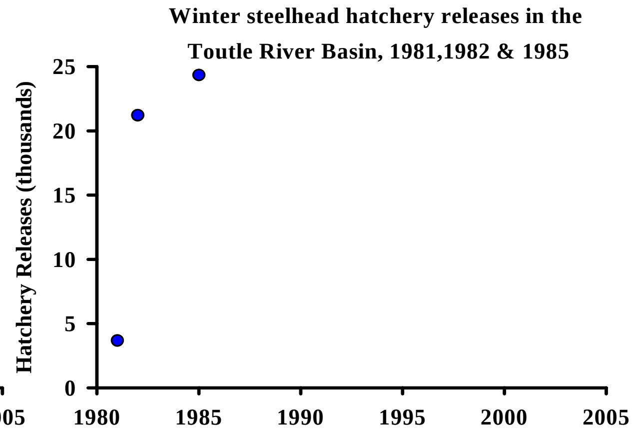
Life History

- Adult migration timing for mainstem/NF Toutle and Green River winter steelhead is from December through April
- Spawning timing on the mainstem/NF Toutle and Green River is generally from March to early June
- Limited age composition data for Toutle River winter steelhead indicate that the dominant age class is 2.2 (58.6%)
- Wild steelhead fry emerge from March through May; juveniles generally rear in fresh water for two years; juvenile emigration occurs from April to May, with peak migration in early May

Diversity

- Mainstem/NF Toutle and Green River winter steelhead stocks designated based on distinct spawning distribution
- Wild stock interbreeding with hatchery brood stock from the Elochoman River, Chambers Creek, and the Cowlitz River is a concern
- Allele frequency analysis of Green River winter steelhead in 1995 was unable to determine the distinctiveness of the stock compared to other lower Columbia steelhead stocks





Abundance

- In 1936, steelhead were observed in the Toutle River during escapement surveys
- Between 1985-1989, an average of 2,743 winter steelhead escaped to the Toutle River annually to spawn
- North Fork Toutle total escapement counts from 1989-2001 ranged from 18-322 (average 157)
- Green River total escapement counts from 1985-2001 ranged from 44-775 (average 193)
- From 1991-1996, the winter steelhead run was believed to be completely from naturally produced fish

Productivity & Persistence

- Live-spawning of Toutle River winter steelhead in 1982 and 1988 resulted in mean fecundity estimates of 2,251 and 3,900 eggs per female, respectively
- Estimated potential winter steelhead smolt production for the Toutle River is 135,573
- The NMFS Status Assessment estimated that the risk of 90% decline in 25 years was 0.71, the risk of 90% decline in 50 years was 0.93, and the risk of extinction in 50 years was 0.73 for the Green River winter steelhead

Hatchery

- The Cowlitz Trout Hatchery, located on the mainstem Cowlitz at RM 42, is the only hatchery in the basin producing winter steelhead
- Hatchery winter steelhead have been planted in the NF Toutle River basin from 1953-1985; broodstock from the Elochoman and Cowlitz Rivers and Chambers Creek have been used
- Aside from small releases of winter steelhead fry after the 1980 Mt. St. Helens eruption, no hatchery winter steelhead have been released in the Green River
- Hatchery fish contribute little to natural production of winter steelhead

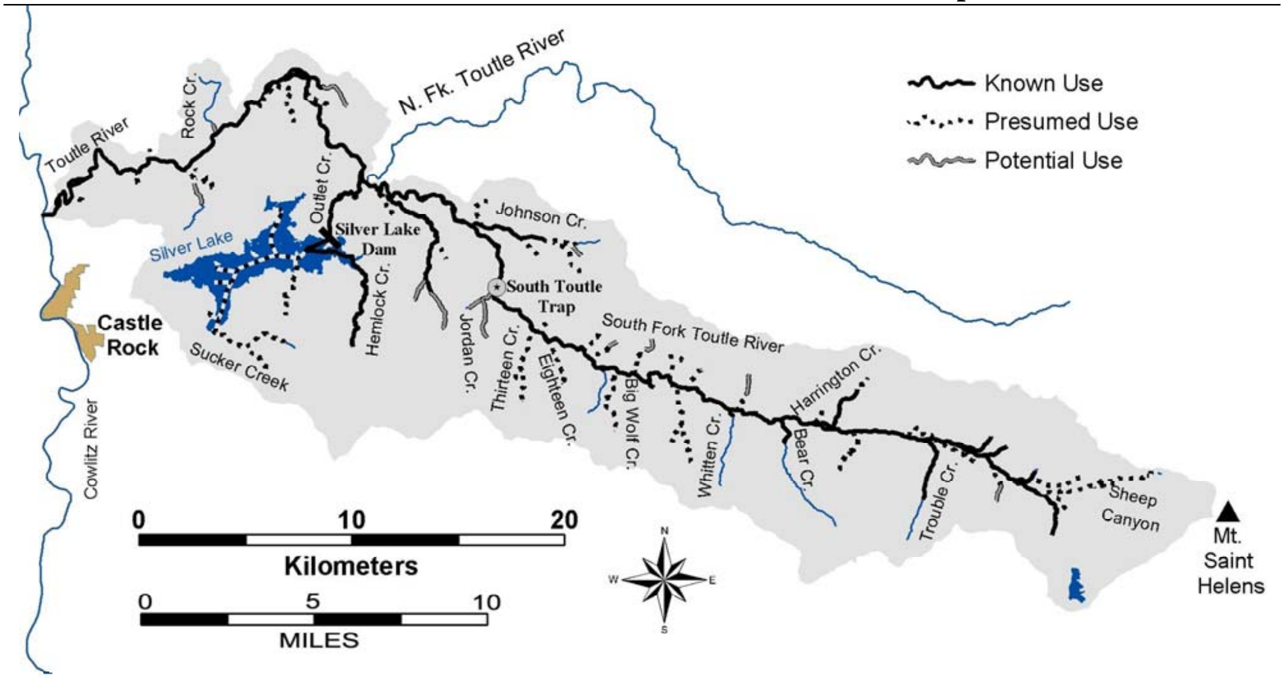
Harvest

- No directed commercial or tribal fisheries target NF Toutle winter steelhead; incidental mortality currently occurs during the lower Columbia River spring chinook tangle net fisheries
- Approximately 6.2% of returning Cowlitz River hatchery steelhead are harvested in the Columbia River sport fishery

- Winter steelhead sport harvest (hatchery and wild) in the mainstem Toutle River from 1987-1990 averaged 223; the NF Toutle River has been closed to sport fishery harvest since 1980; the Green River has been closed since 1981
- ESA limits fishery impact of wild winter steelhead to 2% per year

7.2.4 Winter Steelhead—Cowlitz Subbasin (SF Toutle)

ESA: Threatened 1998	SASSI: Depressed 2002



Distribution

- Spawning occurs in the mainstem SF Toutle and Studebaker, Johnson, and Bear Creeks
- The 1980 eruption of Mt. St. Helens greatly altered the habitat within the Toutle River

Life History

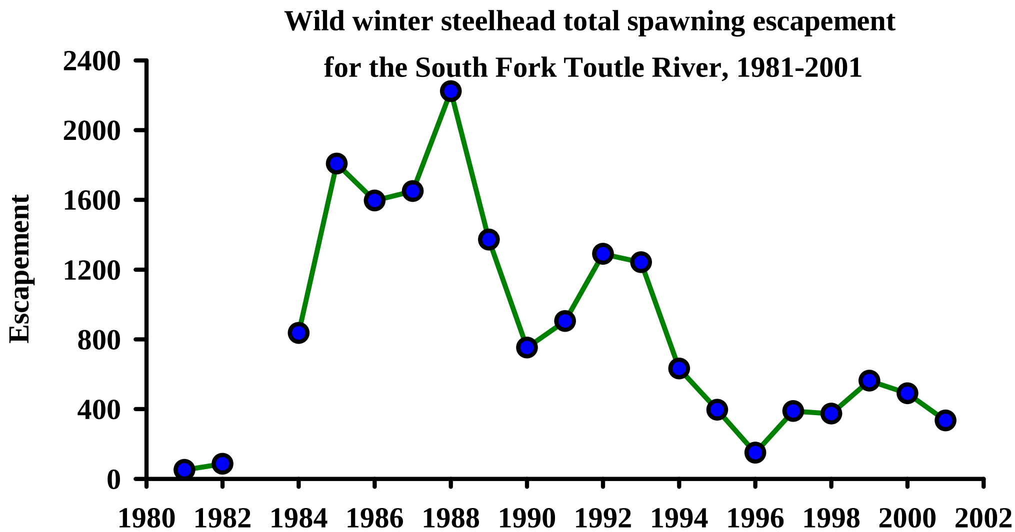
- Adult migration timing for SF Toutle winter steelhead is from December through April
- Spawning timing on the SF Toutle is generally from early March to early June
- Limited age composition data for Toutle River winter steelhead indicate that the dominant age class is 2.2 (58.6%)
- Wild steelhead fry emerge from March through May; juveniles generally rear in fresh water for two years; juvenile emigration occurs from April to May, with peak migration in early May

Diversity

- SF Toutle winter steelhead stock designated based on distinct spawning distribution
- Allele frequency analysis of SF Toutle winter steelhead in 1996 was unable to determine the distinctiveness of this stock compared to other lower Columbia steelhead stock

Abundance

- In 1936, steelhead were observed in the Toutle River during escapement surveys
- Between 1985-1989, an average of 2,743 winter steelhead escaped to the Toutle River annually to spawn
- SF Toutle total escapement counts from 1981-2001 ranged from 51-2,222 (average 857); escapements have been low since 1994
- Escapement goal for the SF Toutle River is 1,058 wild adult steelhead



Productivity & Persistence

- The NMFS Status Assessment estimated that the risk of 90% decline in both 25 years and 50 years was 1.0 for the SF Toutle River winter steelhead
- Estimated potential winter steelhead smolt production for the Toutle River is 135,573

Hatchery

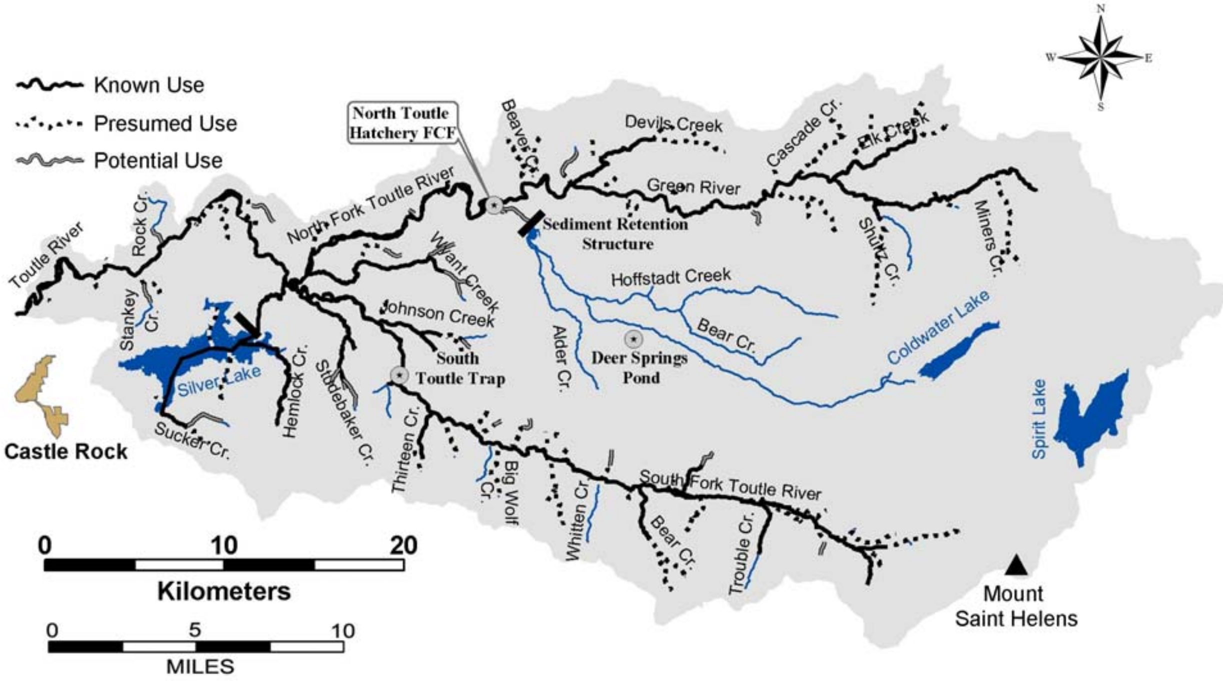
- The Cowlitz Trout Hatchery, located on the mainstem Cowlitz at RM 42, is the only hatchery in the basin producing winter steelhead
- Aside from small releases of winter steelhead fry after the 1980 Mt. St. Helens eruption, no hatchery winter steelhead have been released in the SF Toutle River; total winter steelhead hatchery releases are estimated as 58,079 from 1968-1985

Harvest

- No directed commercial or tribal fisheries target South Fork Toutle winter steelhead; incidental mortality currently occurs during the lower Columbia River spring chinook tangle net fisheries
- Treaty Indian harvest does not occur on the South Fork Toutle River
- Approximately 6.2% of returning Cowlitz River steelhead are harvested in the Columbia River sport fishery
- Winter steelhead sport harvest (hatchery and wild) in the Toutle River from 1987-1990 averaged 223; the SF Toutle River was closed to sport fish harvest in 1981 and reopened to limited harvest in 1987
- ESA fishery impact on wild winter steelhead to 2% per year

7.2.5 Cutthroat Trout—Cowlitz River Subbasin (Toutle)

ESA: Not Listed	**SASSI: Depressed 2000**



Distribution

- Anadromous forms have access to most of the watershed except upper tributary, high gradient reaches
- Adfluvial forms are documented in Silver Lake
- Resident and fluvial forms are observed throughout the subbasin

Life History

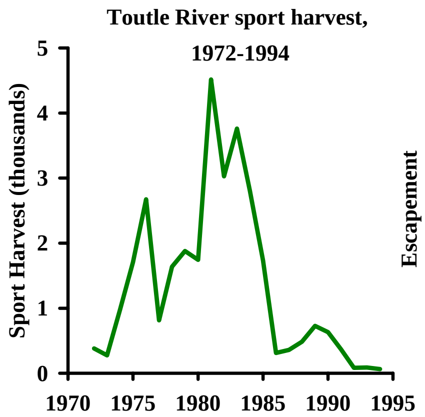
- Anadromous, adfluvial, fluvial and resident forms are present
- Anadromous river entry peaks from September through November
- Anadromous spawning occurs from January through June
- Fluvial and resident spawn timing is not documented but is believed to be similar to anadromous timing

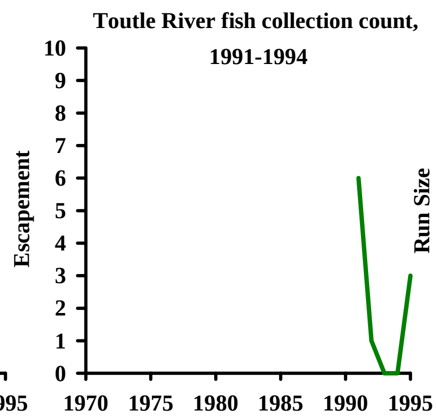
Diversity

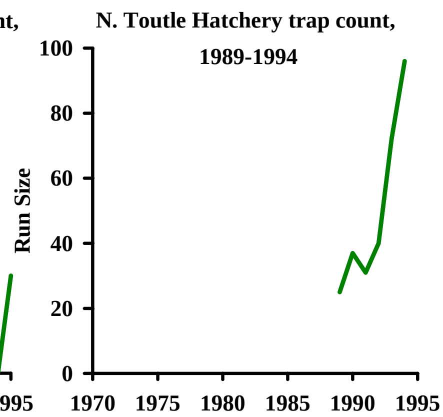
- Distinct stock based on geographic distribution of spawning areas
- No genetic sampling has been conducted

Abundance

- No abundance information exists for resident and fluvial forms
- Long term negative decline in the lower Columbia River cutthroat catch
- North Toutle Hatchery counts have shown a steady increase since the eruption of Mt. St. Helens in 1980, but escapement remains low
- Chronically low escapement at Toutle River Fish Collection Facility (0 to 6 fish annually since 1991)







Hatchery

- North Toutle Hatchery raises chinook and coho
- Summer steelhead smolts from Elochoman or Kalama Hatchery are released into the SF and NF Toutle and Green Rivers annually
- Silver Lake was stocked with rainbow trout prior to 1980

Harvest

- Not harvested in ocean commercial or recreational fisheries
- Angler harvest for adipose fin clipped hatchery fish occurs in mainstem Columbia River summer fisheries downstream of the Cowlitz River
- Toutle River wild cutthroat (unmarked fish) must be released in mainstem Columbia River and Toutle basin sport fisheries

7.3 Potentially Mangeable Impacts

In Volume I of this Technical Foundation, we evaluated factors currently limiting Washington lower Columbia River salmon and steelhead populations based on a simple index of potentially manageable impacts. The index incorporated human-caused increases in fish mortality, changes in habitat capacity, and other natural factors of interest (e.g. predation) that might be managed to affect salmon productivity and numbers. The index was intended to inventory key factors and place them in perspective relative to each other, thereby providing general guidance for technical and policy level recovery decisions. In popular parlance, the factors for salmon declines have come to be known as the 4-H's: hydropower, habitat, harvest, and hatcheries. The index of potentially manageable mortality factors has been presented here to prioritize impacts within each subbasin.

- Loss of tributary habitat quantity and quality is highly important to all five populations, and is extremely important to winter steelhead. Effects from losses to estuary habitat are relatively minor for spring chinook, steelhead and coho, but are moderately imporant to both fall chinook and chum.
- Harvest is important to spring and fall chinook and coho, but is of lesser importance to winter steelhead and chum.
- Hatchery impacts are moderately important to coho, spring and fall chinook, and are of minor importance to chum. For winter steelhead, hatchery impacts are non-existent.
- Predation impacts are moderately important to all five populations within the Toutle.

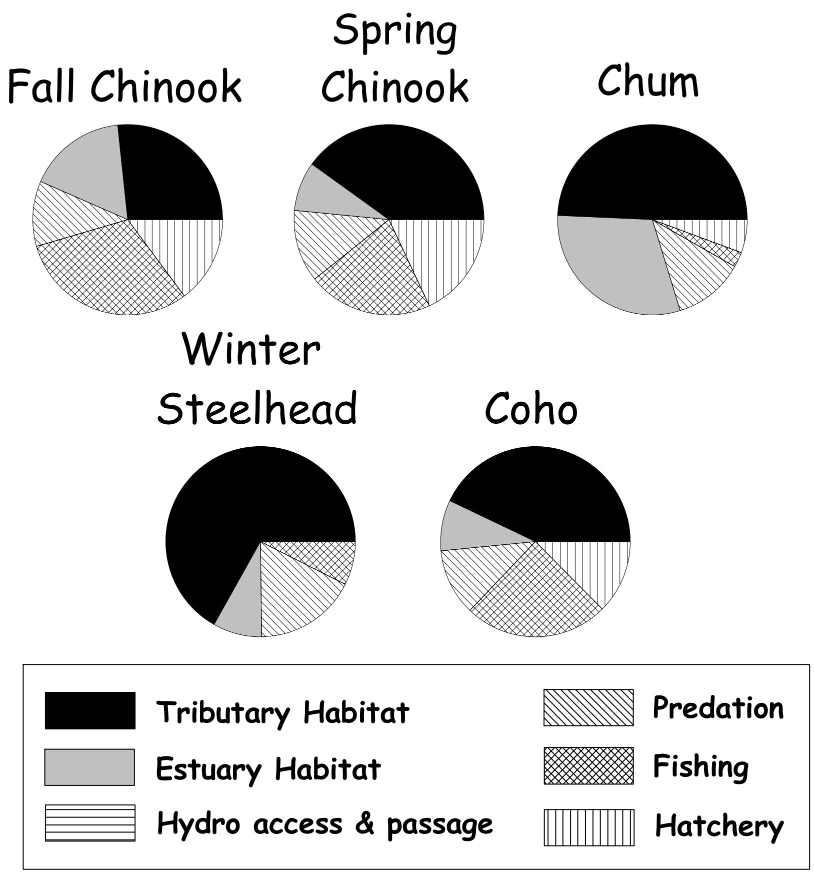


Figure 7-5. Relative index of potentially manageable mortality factors for each species in the Toutle subbasin.

7.4 Hatchery Programs

Vol II, Chapter 7 discusses hatcheries in the Cowlitz basin.

7.5 Fish Habitat Conditions

7.5.1 Passage Obstructions

The two major passage barriers in the Toutle basin are the Sediment Retention Structure (SRS) on the North Fork Toutle and the Silver Lake Dam on Outlet Creek. Problems at Silver Lake Dam are associated with lack of sufficient flows in the fishway and low flows and high temperatures in Outlet Creek. These problems may limit fish access into the Silver Lake basin. Other passage problems in the Toutle basin are associated with culverts, road crossings, trash racks, beaver dams, and fish weirs. A thorough description is provided in the WRIA 26 Limiting Factors Analysis (Wade 2000).

7.5.2 Stream Flow

Runoff is predominantly generated by fall, winter, and spring rainfall, with a portion of spring flows coming from snowmelt in the upper elevations and occasional winter peaks related to rain-on-snow events. Combined surface water and groundwater demand in the Toutle basin, which totaled 389 acre-feet per year in 2000, is expected to increase 21.9% by 2020

The Integrated Watershed Assessment (IWA), which is presented in greater detail later in this chapter, indicates that the majority of the basin suffers from'impaired' runoff conditions as a result of immature forest stands and high road densities. Several headwater subwatersheds around Mount St. Helens were modeled to only have 'moderately impaired' conditions. Only 1 subwatershed, located in the upper Green River basin, was identified as hydrologically 'functional'.

The Upper Toutle Watershed Analysis found that 55% of the upper basins have the potential for an increase in peak flow volumes of over 10% due to a lack of mature coniferous stand structures. The USFS also noted that stream lengths have been increased by as much as 63% due to roads, with an addition of approximately 370 miles to the stream network as a result of roads and road ditches (USFS 1997). Increasing the stream network can accelerate the delivery of streamflow to downstream channels, thereby increasing stormflow peaks.

Low summer flows in Outlet Creek were identified in the Silver Creek Watershed Analysis as a problem for juvenile rearing (Weyerhaeuser 1994).

7.5.3 Water Quality

Water temperatures in the upper Toutle basin are thought to be high due to channel widening and loss of riparian cover associated with mud and debris flows. Temperatures near the mouth of the Green River at the Toutle River Hatchery often exceed state standards. The Green River and Harrington Creek (South Fork Toutle tributary) were listed on the State's 1998 303(d) list for elevated water temperatures (WDOE 1998). High suspended sediment and turbidity are considered major limiting factors in the North Fork and mainstem Toutle, restricting suitable fish habitat to tributary streams. Nutrient problems may exist in the Toutle basin as a result of low steelhead, chinook, and coho escapement (Wade 2000).

Silver Lake was identified as being in an advanced state of eutrophication in the 1994 watershed analysis. This is likely due to natural rates of phosphorous delivery as well as anthropogenic nutrient sources including forest fertilizers and residential septic systems (Weyerhaeuser 1994). Water temperatures are also a concern in the Silver Lake basin.

7.5.4 Key Habitat

Following the eruption of Mount St. Helens, some channels in the NF and SF Toutle basins re-developed pool habitats to near pre-eruption levels, however, pool quality was generally low (Jones and Salo 1986). Large sediment loads will likely continue to reduce the quality of pools throughout the Toutle system. Side channel habitat may be created in the upper Toutle channels that experienced debris flows, though adequate LWD and riparian cover necessary for good side channel habitat will take a long time to develop (Wade 2000). Side channel habitat in the Silver Lake basin is lacking (Weyerhaeuser 1994).

7.5.5 Substrate & Sediment

Massive debris torrents and mud flows in the NF and SF Toutle buried, scoured, or filled spawning gravels with sediment. Conditions have improved quicker in the South Fork and Green River than in the North Fork (USFWS 1984). Annual sediment yields in the North Fork had not changed appreciably 5 years following the eruption (Lucas 1986) and sediment delivery is still considered a major liming factor in the system. The SRS is considered a major source of sediment in the mainstem North Fork and its existence is believed to be preventing the recovery of the system (Wade 2000).

Sediment supply conditions were evaluated as part of the IWA watershed process modeling, which is presented in greater detail later in this chapter. The results indicate that sediment supply conditions are 'moderately impaired' throughout the basin, with a few 'impaired' subwatersheds scattered throughout and a few 'functional' subwatersheds in headwater areas around Mount St. Helens. Risk of increased sediment supply is related to the 1980 eruption as well as intensive road building in the 1980s and 1990s. There is an average road density of 4.63 mi/mi^2. Furthermore, the eruption prevented access to many private roads that may now have elevated erosion potential due to lack of maintenance. The Silver Lake Watershed Analysis concluded that road erosion contributed to fine sediment production in the Silver Lake basin. A lack of spawning gravels was attributed to a lack of coarse material delivery and low LWD levels (Weyerhaeuser 1996).

Sediment production from private forest roads is expected to decline over the next 15 years as roads are updated to meet the new forest practices standards, which include ditchline disconnect from streams and culvert upgrades. The frequency of mass wasting events should also decline due to the new regulations, which require geotechnical review and mitigation measures to minimize the impact of forest practices activities on unstable slopes.

7.5.6 Woody Debris

Low levels of LWD likely existed prior to 1980 due to extensive logging. Mud and debris flows associated with the eruption of Mount St. Helens further reduced LWD through channel scouring, destruction of riparian forests, and burying of in-stream wood (Jones and Salo 1986). Salvage operations removed much of the remaining LWD in areas outside the National Monument (USFS 1997). LWD concentrations are considered poor in nearly all of the tributary basins. Wood accumulations have formed pools in the upper Green River, but they are of low quality (Wade 2000). Recruitment potential is also regarded as poor. 80-100% of riparian areas in the upper basin (National Forest portion) contain grass/forb vegetation structures (USFS 1997).

7.5.7 Channel Stability

The eruption of Mount St. Helens, combined with years of logging impacts, has increased the potential for elevated peak flows, exacerbating channel erosion and channel shifting. Eruption-related mud and debris flows in the North Fork, South Fork, and many tributaries altered channel form and location. Channel adjustments frequently occur during high flow events (USFWS 1984). Dredging and the placement of dredge spoils along channel margins are believed to have increased bank instability on portions of the lower river. Channel stability is improving in some areas, as the systems are slowly recovering from the effects of the eruption.

7.5.8 Riparian Function

The eruption of Mount St. Helens, timber harvest, timber salvage, and fire have drastically altered the quality of riparian forests; most of the riparian areas in the basin are in early- to mid-successional stages (USFS 1997). Only 11.6% of the basin has >70% mature coniferous cover. Low canopy cover in the upper basin is believed to contribute to elevated stream temperatures. The Silver Lake and Outlet Creek basins have degraded riparian areas that are dominated by deciduous species (Wade 2000).

According to IWA watershed process modeling, which is presented in greater detail later in this chapter, nearly the entire watershed has 'moderately impaired' riparian function. This rating was based on the amount of mature forest stands along stream channels. Riparian function is expected to improve as forests continue to recover from the eruption and timber harvest impacts.

Riparian function is expected to improve over time on private forestlands. This is due to the requirements under the Washington State Forest Practices Rules (Washington Administrative Code Chapter 222). Riparian protection has increased dramatically today compared to past regulations and practices.

7.5.9 Floodplain Function

Following the eruption of Mount St. Helens, significant floodplain loss occurred due to the dredging and placement of sediment in the floodplain and near-stream wetlands, essentially creating levees along the channel. Floodplain disconnection has occurred on several Toutle River tributaries as well, also as a result of diking, channel incision, and dredging (Wade 2000).

7.6 Fish/Habitat Assessments

The previous descriptions of fish habitat conditions can help identify general problems but do not provide sufficient detail to determine the magnitude of change needed to affect recovery or to prioritize specific habitat restoration activities. A systematic link between habitat conditions and salmonid population performance is needed to identify the net effect of habitat changes, specific stream sections where problems occur, and specific habitat conditions that account for the problems in each stream reach. In order to help identify the links between fish and habitat conditions, the Ecosystem Diagnosis and Treatment (EDT) model was applied to Toutle River fall chinook, spring chinook, chum and winter steelhead. A thorough description of the EDT model, and its application to lower Columbia salmonid populations, can be found in section XX.

Three general categories of EDT output are discussed in this section: population analysis, reach analysis, and habitat factor analysis. Population analysis has the broadest scope of all model outputs. It is useful for evaluating the reasonableness of results, assessing broad trends in population performance, comparing among populations, and for comparing past, present, and desired conditions against recovery planning objectives. Reach analysis provides a greater level of detail. Reach analysis rates specific reaches according to how degradation or restoration within the reach affects overall population performance. This level of output is useful for identifying general categories of management (i.e. preservation and/or restoration), and for focusing recovery strategies in appropriate portions of a subbasin. The habitat factor analysis section provides the greatest level of detail. Reach specific habitat attributes are rated according to their relative degree of impact on population performance. This level of output is most useful for practitioners who will be developing and implementing specific recovery actions.

7.6.1 Population Analysis

Population assessments under different habitat conditions are useful for comparing fish trends and establishing recovery goals. Fish population levels under current and potential habitat conditions were inferred using the EDT model based on habitat characteristics of each stream reach and a synthesis of habitat effects on fish life cycle processes. Habitat-based assessments were completed in the Toutle basin for winter steelhead, fall chinook, spring chinook and chum. It is important to note that spring chinook have become functionally extinct in the Toutle subbasin. As such, all current estimates for spring chinook in the population analysis are approximately zero (Table 7-1). Therefore, there will be no discussion of relative change among model variables for spring chinook.

Model results indicate a decline in adult productivity for all species in the Toutle basin (Table 7-1). Declines in adult productivity from historical levels range from 70% for fall chinook to greater than 90% for winter steelhead. Similarly, adult abundance levels have declined for all species (Figure 7-6). Current estimates of abundance are 44% of historical levels for fall chinook, 13% of historical levels for winter steelhead, 11% of historical levels for coho and only 5% of historical levels for chum.

Estimated diversity has also decreased significantly for all species in the Toutle basin (Table 7-1). Declines in species diversity range from 34% for fall chinook, to greater than 70% for coho. This sharp decline in diversity may be due to a dramatic loss of available habitats compared to pre-Mount St. Helens eruption conditions. The 1980 eruption may also contribute to the observed trends in productivity and abundance. Timber harvest and road building in the post-eruption years has further depressed the stocks and has limited the rate of recovery.

As with adult productivity, model results indicate that current smolt productivity is sharply reduced compared to historical levels. Current smolt productivity estimates are between 17% and 52% of historical productivity, depending on species (Table 7-1). Smolt abundance numbers are similarly low, especially for chum and coho (Table 7-1). Current smolt abundance estimates for chum and coho are at 13% and 10% of historical levels, respectively.

Model results indicate that restoration of PFC conditions would have large benefits in all performance parameters for all species (Table 7-1). For adult abundance, restoration of PFC conditions would increase current returns by 107% for fall chinook, by 255% for winter steelhead, by 496% for chum and by 600% for coho. Similarly, smolt abundance numbers would increase for all species (Table 7-1). Coho would see the greatest increase in smolt numbers with a modeled 709% increase.

Table 7-1. Toutle subbasin — Population productivity, abundance, and diversity (of both smolts and adults) based on EDT analysis of current (P or patient), historical (T or template), and properly functioning (PFC) habitat conditions.

	Adult Abundance			Adult Productivity			Diversity Index			Smolt Abundance			Smolt Productivity		
Species	**P**	**PFC**	**T[1]**	**P**	**PFC**	**T[1]**	**P**	**PFC**	**T[1]**	**P**	**PFC**	**T[1]**	**P**	**PFC**	**T[1]**
Fall Chinook	4,370	9,066	10,046	3.2	8.3	10.7	0.66	1.00	1.00	499,147	919,467	1,022,259	306	738	937
Spring Chinook	0	2,703	3,083	0.0	10.9	15.8	0.00	1.00	1.00	0	85,801	96,292	0	319	454
Chum	1,376	8,196	25,984	1.9	7.1	10.5	0.39	1.00	1.00	595,692	2,731,905	4,495,859	548	901	1,057
Winter Steelhead	1,343	4,766	10,330	3.1	13.0	36.1	0.45	0.94	0.99	29,188	86,779	100,718	64	233	345

[1] Estimate represents historical conditions in the subbasin and current conditions in the mainstem and estuary.

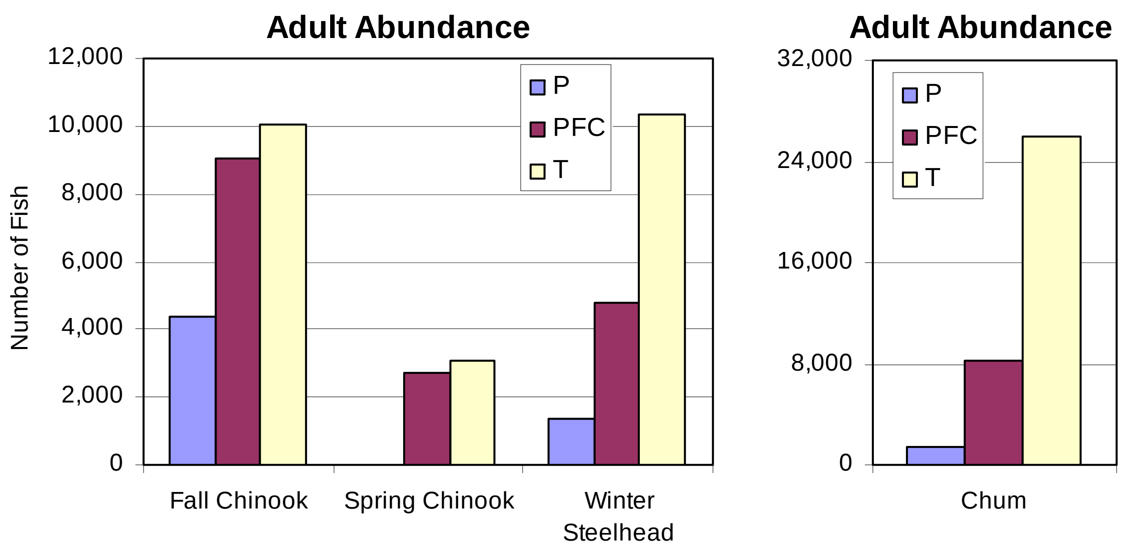


Figure 7-6. Adult abundance of Toutle subbasin fall chinook, spring chinook, winter steelhead and chum based on EDT analysis of current (P or patient), historical (T or template), and properly functioning (PFC) habitat conditions.

7.6.2 Reach Analysis

Habitat conditions and suitability for fish are better in some portions of a subbasin than in others. The reach analysis of the EDT model uses estimates of the difference in projected population performance between current/patient and historical/template habitat conditions to identify core and degraded fish production areas. Core production areas, where habitat degradation would have a large negative impact on the population, are assigned a high value for preservation. Likewise, currently degraded areas that provide significant potential for restoration are assigned a high value for restoration. Collectively, these values are used to prioritize the reaches within a given subbasin.

The Toutle basin is one of the largest basins in the region analyzed with the EDT model. It consists of nearly 100 EDT reaches in the Toutle, South Fork, North Fork, and Green River basins. Spawning and rearing for winter steelhead occurs throughout the mainstems and tributaries of these basins. Fall chinook use is constrained primarily to the mainstems, and chum use is limited to just the first several lower Toutle River reaches. Each major stream system within the Toutle basin is characterized by a variety of channel and valley types, from steep and confined sections—like Hollywood Gorge—to broad alluvial floodplain valleys—like those found in the lower South Fork and upper North Fork. See Figure 7-7 for a map of reaches in the Toutle River subbasin.

Reaches with a high priority ranking for winter steelhead are located in the South Fork Toutle (SF Toutle 12-20), the Green River (Green 6), and the North Fork Toutle (NF Toutle 7 and 12-13) (Figure 7-8). All high priority reaches in the NF Toutle show a strong habitat restoration emphasis, while reaches in the SF Toutle have either a restoration emphasis or a combined preservation and restoration emphasis. The one high priority reach in the Green River shows a combined habitat preservation and restoration emphasis (Figure 7-8). The Green River was spared the worst of the eruption impacts and therefore has some good preservation value.

High priority reaches for fall chinook include those in the lower Green River (Green River 3 and 4), the mainstem Toutle (Toutle 4 and 9), and the South Fork Toutle (SF Toutle 1-4, 7-9, 11-13 and 16) (Figure 7-9). The lower and middle South Fork reaches are widely used by chinook, especially since the North Fork and lower Toutle channels have been slower to recover from eruption impacts. Reach Green River 4 has the highest habitat preservation potential and highest habitat restoration potential of any fall chinook reach modeled in the Toutle basin.

For spring chinook, the high priority reaches are located in the middle and upper NF Toutle (NF Toutle 10-12) (Figure 7-10). Due to the fact that spring-run chinook are functionally extinct from the basin, these reaches all show a huge habitat restoration potential, with reach NF Toutle 10 having the highest restorative potential of any spring chinook reach in the system.

High priority reaches for chum are located in the lower mainstem Toutle River (Toutle 1 and 3-6) (Figure 7-11). These reaches are important for chum spawning and rearing and have significantly degraded habitat. As such, all of the high priority reaches modeled for chum show a strong habitat restoration emphasis. Reach Toutle 4 has the highest restorative potential of any reach modeled for chum.

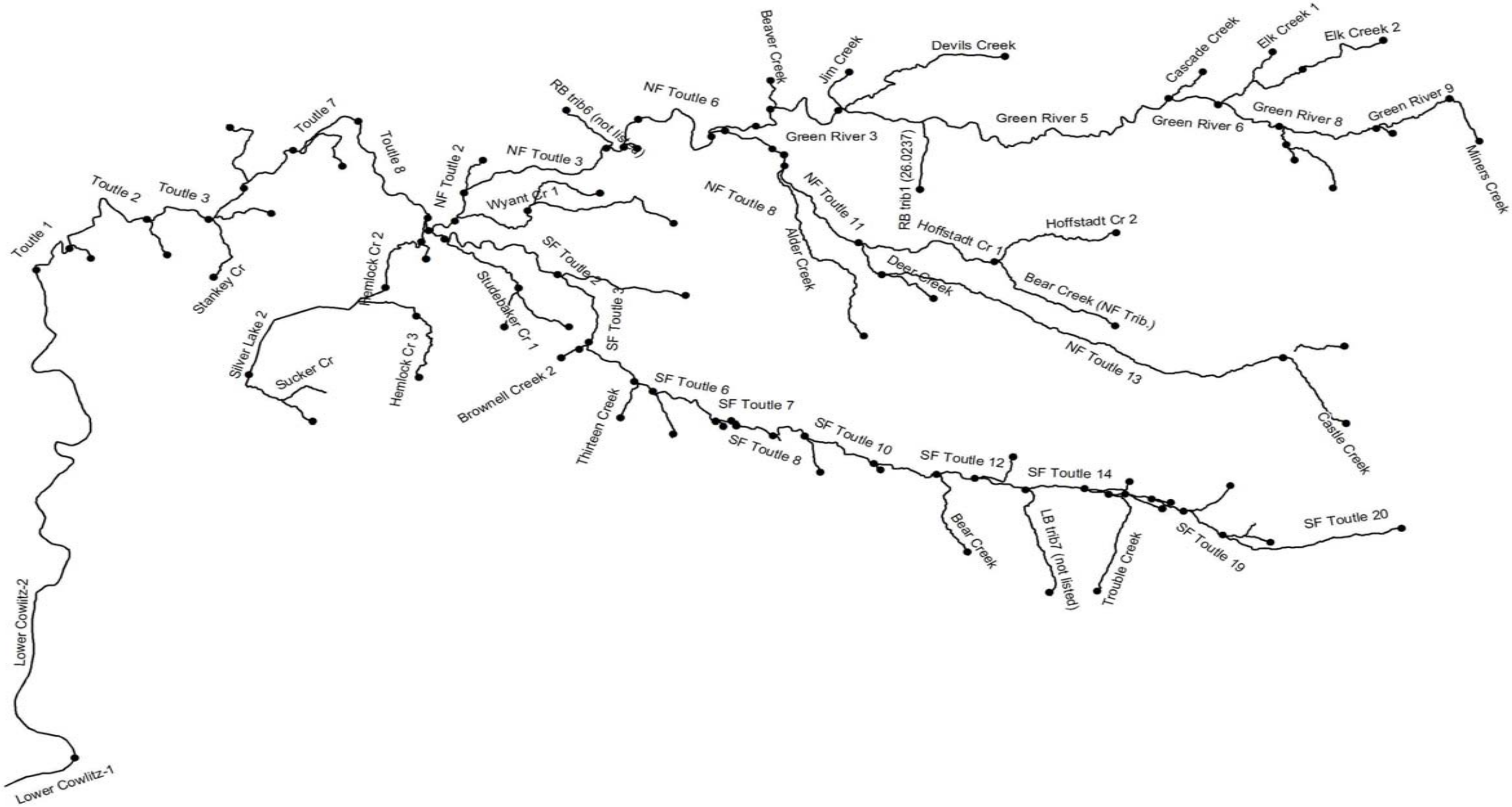


Figure 7-7. Toutle basin EDT reaches. Some reaches not labeled for clarity.

Toutle Winter Steelhead

Potential change in population performance with degradation and restoration

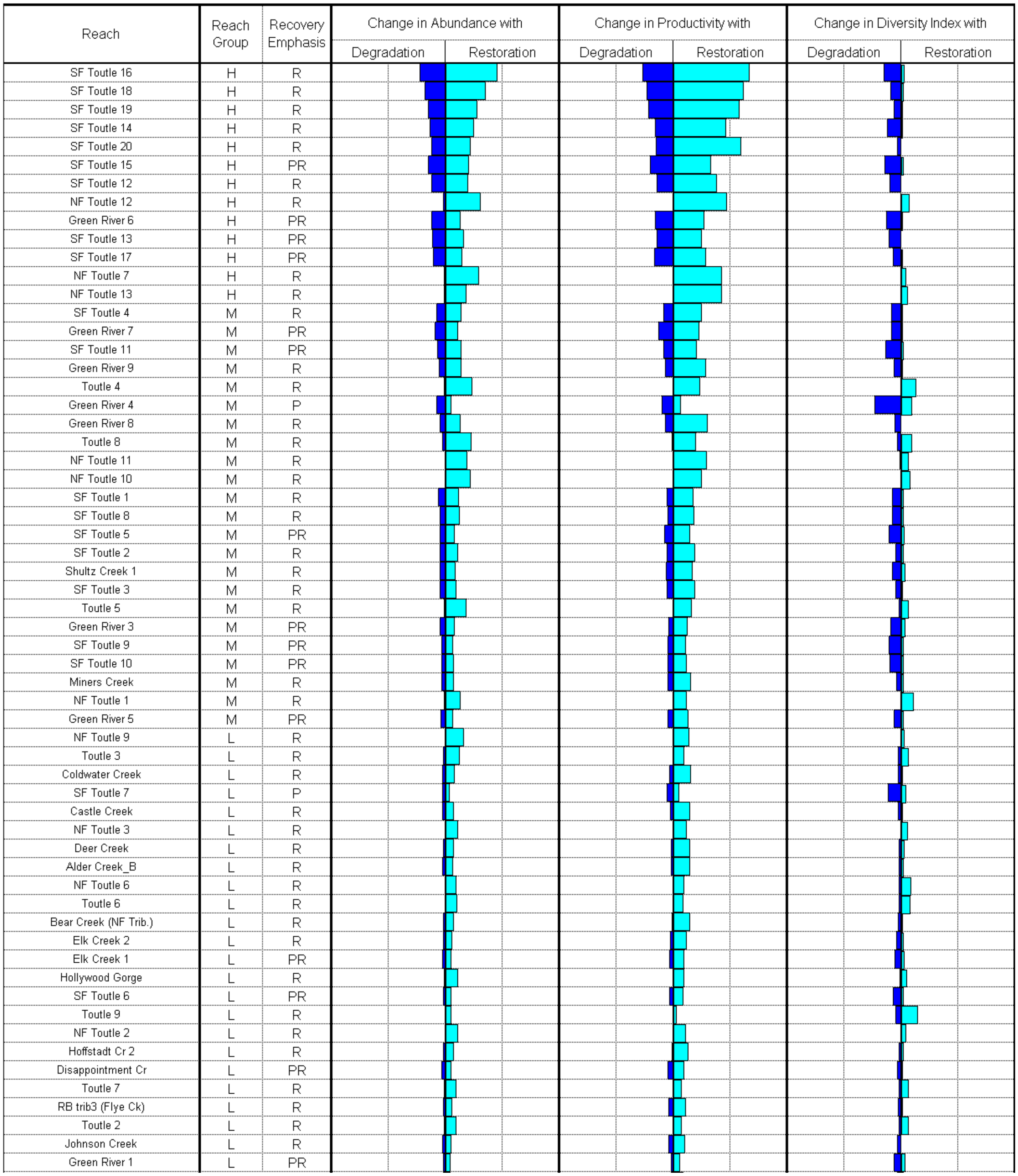


Figure 7-8. Toutle River winter steelhead ladder diagram. The rungs on the ladder represent the reaches and the three ladders contain a preservation value and restoration potential based on abundance, productivity, and diversity. The units in each rung are the percent change from the current population. For each reach, a reach group designation and recovery emphasis designation is given. Percentage change values are expressed as the change per 1000 meters of stream length within the reach. See Volume VI for more information on EDT ladder diagrams. Some low priority reaches are not included for display purposes.

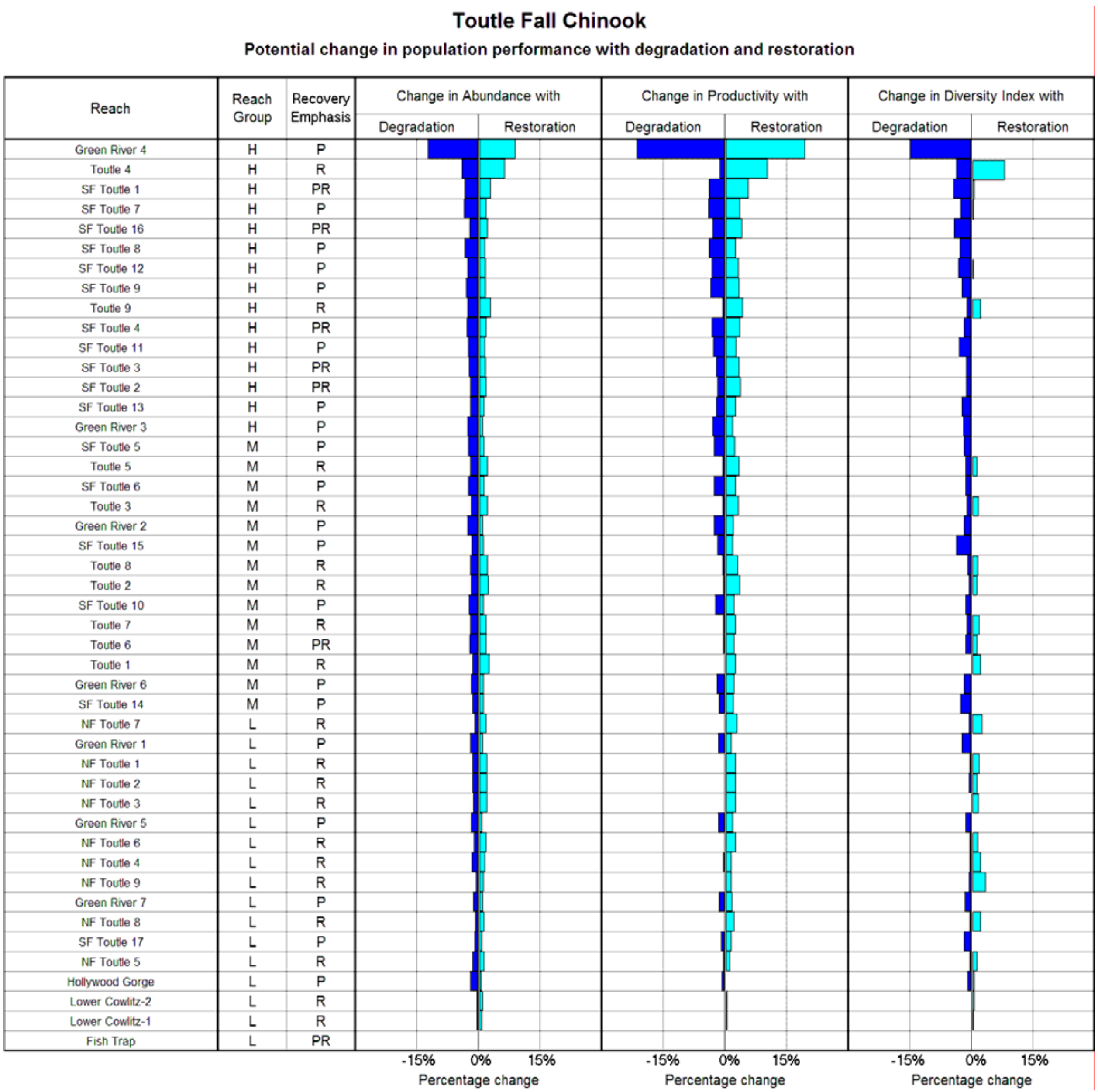


Figure 7-9. Toutle fall chinook ladder diagram.

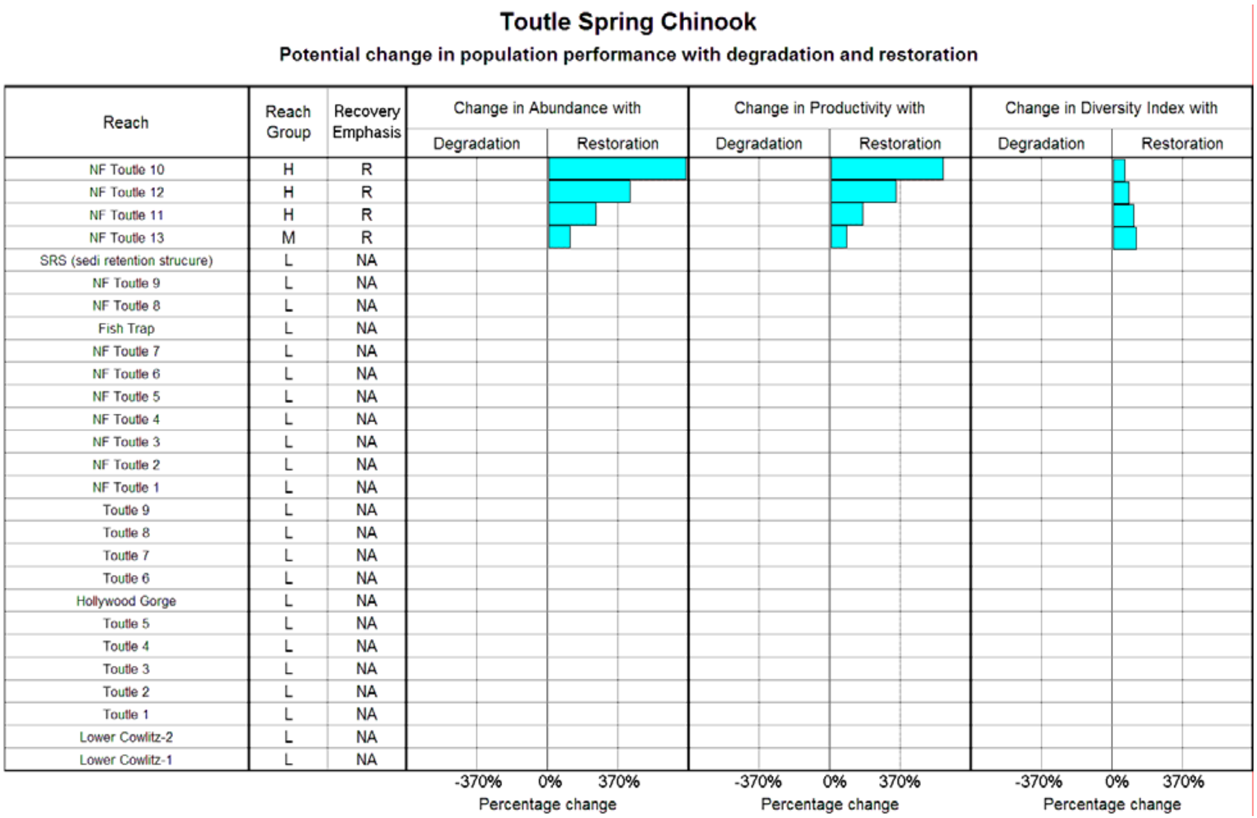


Figure 7-10. Toutle spring chinook ladder diagram.

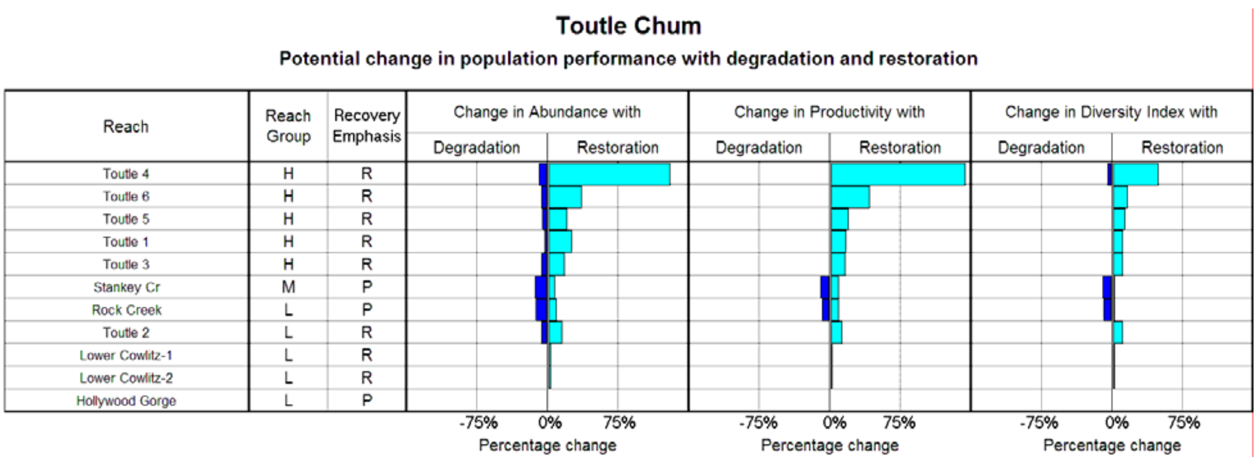


Figure 7-11. Toutle chum ladder diagram.

7.6.3 Habitat Factor Analysis

The Habitat Factor Analysis of EDT identifies the most important habitat factors affecting fish in each reach. Whereas the EDT reach analysis identifies reaches where changes are likely to significantly affect the fish, the Habitat Factor Analysis identifies specific stream reach conditions that may be modified to produce an effect. Like all EDT analyses, the reach analysis compares current/patient and historical/template habitat conditions. The figures generated by habitat factor analysis display the relative impact of habitat factors in specific reaches. The reaches are ordered according to their combined restoration and preservation rank. The reach with the greatest potential benefit is listed at the top. The dots represent the relative degree to which overall population abundance would be affected if the habitat attributes were restored to historical conditions.

Key reaches for winter steelhead in the Toutle basin are located primarily in the South Fork and North Fork Toutle. These reaches are negatively impacted by sediment, habitat diversity, flow, channel stability, and temperature (Figure 7-12). Sediment remains in the system from the eruption and continues to be delivered as a result of unstable upslope soils and high road densities. Much of the North Fork basin was heavily roaded and harvested following the 1980 eruption, further increasing sediment and flow problems and slowing recovery rates. Except for the subwatersheds on the flanks of Mount St. Helens, the entire North Fork basin has road densities of over 5 mi/mi^2. Habitat diversity is low due to a lack of LWD. Mudflows from the eruption either scoured wood from channels or buried it with sediment. Recruitment of LWD is very low due to a lack of mature riparian forest cover. Reduced riparian cover and increased channel widths due to sediment aggradation have increased summer stream temperatures. Peak flows are believed to have increased due to the low hydrologic maturity of basin forests. Many of the upper North Fork subwatersheds have over 90% ‘other forest’ conditions, indicating severely degraded vegetation conditions.

For fall chinook, many of the important reaches and the habitat factors affecting them are similar to those for winter steelhead but with a greater emphasis on reaches lower in the system. Sediment has had the greatest impact, followed by channel stability, habitat diversity and temperature. Sediment is a significant problem for chinook as it impacts important spawning areas in the mainstem and SF Toutle. Sediment originates from channel as well as upslope sources. Severe sediment aggradation from upstream sources has initiated bank cutting that increases sedimentation from channel sources. Habitat diversity has been reduced by scour or burial of large wood pieces. Loss of channel stability and wood recruitment potential is related to the poor condition of riparian forests.

Important spring chinook reaches in the Toutle basin are located in the North Fork. Habitat factors affecting these reaches include sediment, temperature, channel stability and habitat diversity (Figure 7-14). The causes of these impacts are similar to those discussed above.

In the lower Toutle mainstem, where the majority of important reaches for chum are located, habitat has been negatively impacted by sediment, habitat diversity, and channel stability (Figure 7-15). Reaches 1-2 and 6-8 have nearly 80% of riparian forests in ‘other forest’ condition, which consists of brush, grass, or bare soil. Reach 3 up to Hollywood Gorge has over 60% of riparian forests in ‘other forest’ conditions. These poor riparian conditions contribute to impaired habitat diversity and channel stability.

Toutle Winter Steelhead

Reach Name	Channel stability	Habitat diversity	Temperature	Predation	Competition (other spp)	Competition (hatchery fish)	Withdrawals	Oxygen	Flow	Sediment	Food	Chemicals	Obstructions	Pathogens	Harassment / poaching	Key habitat quantity
SF Toutle 16	High	High	Moderate	Low		Low			High	High	Moderate			Low		Low Positive
SF Toutle 18	High	High	Moderate	Low		Low			High	High	Moderate			Low		Low Positive
SF Toutle 19	Moderate	High	Moderate	Low		Low			High	High	Moderate			Low		Moderate Positive
SF Toutle 14	Moderate	High	Moderate	Low		Low			High	Moderate	Moderate			Low		Low Positive
SF Toutle 20	Moderate	Moderate	Moderate	Low		Low			High	High	Moderate			Low		High
SF Toutle 15	Moderate	High	Moderate			Low			Moderate	Moderate	Low			Low		Low Positive
SF Toutle 12	Moderate	High	Moderate	Low					Moderate	Moderate	Low			Low		Low Positive
NF Toutle 12	Moderate	Moderate	High	Low		Low			High	High	Moderate			Low		Low Positive
Green River 6	Moderate	Moderate	Moderate	Low					Moderate	Moderate	Low			Low		Low Positive
SF Toutle 13	Moderate	High	Moderate			Low			Moderate	Moderate	Low					Low Positive
SF Toutle 17	Moderate	Moderate	Low	Low		Low			Moderate	Moderate	Moderate			Low		Low Positive
NF Toutle 7	Moderate	Moderate	High	Moderate		Moderate			Moderate	High	Low			Low		
NF Toutle 13	Moderate	Moderate	Moderate	Low		Low			Moderate	High	Low			Low		High
SF Toutle 4	Moderate	Moderate	Moderate	Low		Low			Moderate	Moderate	Low			Low		Low Positive
Green River 7	Moderate	Moderate	Low	Low					Moderate	Moderate	Low			Low		Low Positive
SF Toutle 11	Moderate	High	Low						Moderate	Moderate	Low					Low Positive
Green River 9	Moderate	Moderate	Low	Low					Moderate	Moderate						Moderate Positive
Toutle 4	Moderate	High	Moderate	Moderate		Low			Moderate	High	Low			Low		
Green River 4	Low	Moderate	Moderate						Low	Moderate						
Green River 8	Moderate	Moderate	Low	Low					Moderate	Moderate	Low					Low Positive
Toutle 8	Moderate	High	Moderate	Moderate		Moderate			Moderate	High	Low			Low		Low Positive
NF Toutle 11	Moderate	Moderate	Moderate	Low	Low	Low			Moderate	High	Moderate			Low		Low Positive
NF Toutle 10	Moderate	Moderate	High	Low	Low	Low			Moderate	High	Moderate			Low		Low Positive
SF Toutle 1	Moderate	Moderate	Moderate	Low		Low			Moderate	Moderate	Low			Low		
SF Toutle 8	Low	Moderate	Moderate						Moderate	Moderate	Low			Low		
SF Toutle 5	Low	Moderate	Low						Low	Moderate	Low					
SF Toutle 2	Moderate	Moderate	Moderate	Low		Low			Moderate	Moderate	Low			Low		
Shultz Creek 1	Low	Low	Moderate	Low					Low	Moderate				Low		Low Positive
SF Toutle 3	Moderate	Moderate	Moderate	Low		Low			Moderate	Moderate	Low			Low		
Toutle 5	Moderate	High	Moderate	Moderate		Low			Moderate	High	Low			Low		
Green River 3	Low	Moderate	Moderate						Moderate	Low				Low		
SF Toutle 9	Low	Moderate	Low						Low	Low	Low					
SF Toutle 10	Low	Moderate	Low						Low	Moderate	Low					
Miners Creek	Low	Low	Moderate	Low					Low	Moderate				Low		Low
NF Toutle 1	Moderate	Moderate	Moderate	Moderate		Low			Moderate	High	Low			Low		
Green River 5	Low	Moderate	Low						Low	Moderate						Moderate
NF Toutle 9	Moderate	Moderate	Moderate	Low		Low			Moderate	High	Low			Low		
Toutle 3	Low	Moderate	Moderate	Moderate		Low			Moderate	High	Low			Low		
Coldwater Creek	Low	Low	Moderate	Low					Moderate	Moderate	Low			Low		Low
SF Toutle 7	Low	Moderate	Low						Low	Low						
Castle Creek	Low	Low	Moderate	Low					Moderate	Moderate	Low			Low		Moderate
NF Toutle 3	Low	Moderate	Moderate	Low		Low			Moderate	High	Low			Low		

High Impact | Moderate Impact | Low Impact | None | Low Positive Impact | Moderate Positve Impact | High Positve Impact

Figure 7-12. Toutle winter steelhead habitat factor analysis diagram. Diagram displays the relative impact of habitat factors in specific reaches. The reaches are ordered according to their restoration and preservation rank, which factors in their potential benefit to overall population abundance, productivity, and diversity. The reach with the greatest potential benefit is listed at the top. The dots represent the relative degree to which overall population abundance would be affected if the habitat attributes were restored to template conditions. See Volume VI for more information on habitat factor analysis diagrams. Some low priority reaches are not included for display purposes.

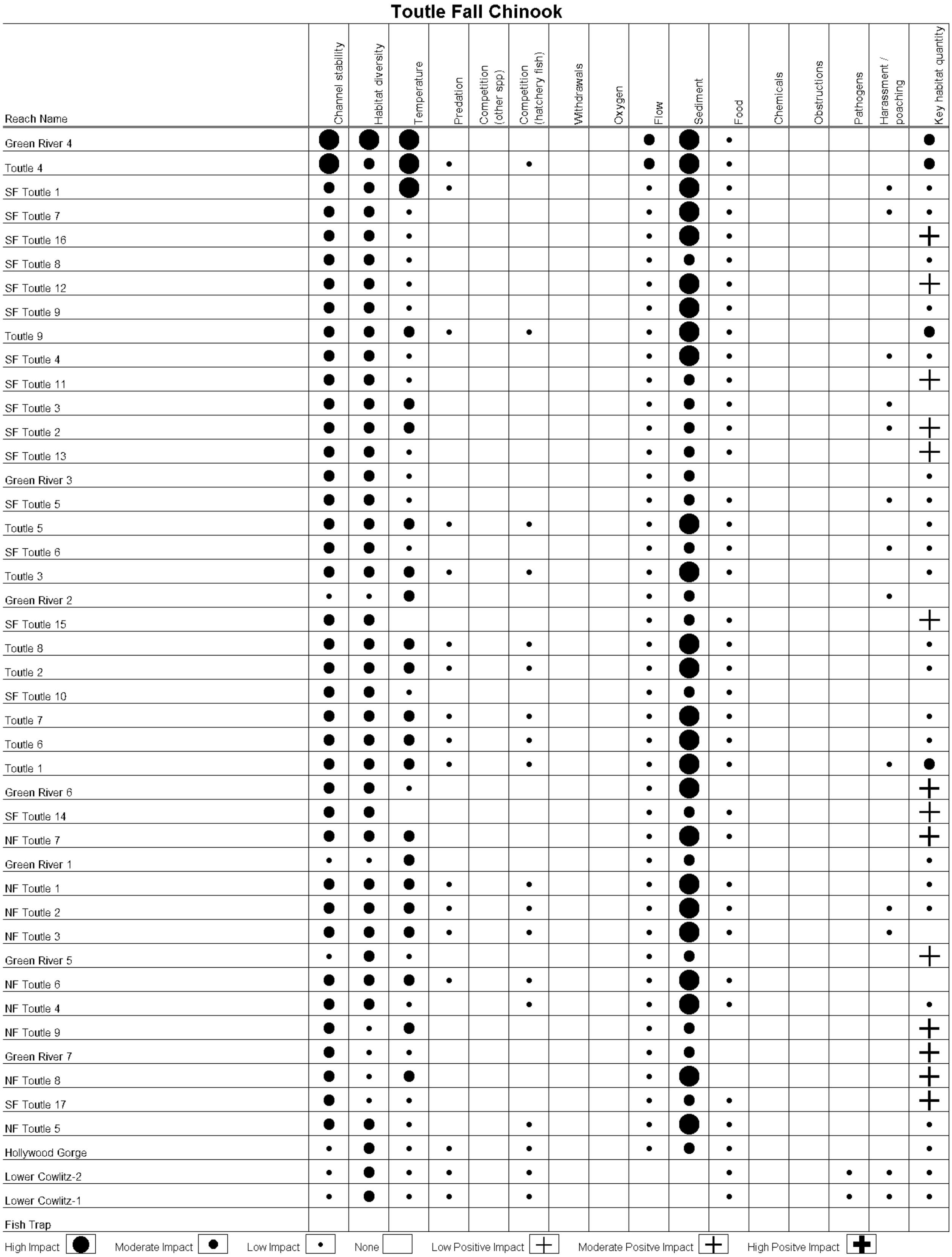


Figure 7-13. Toutle fall chinook habitat factor analysis diagram.

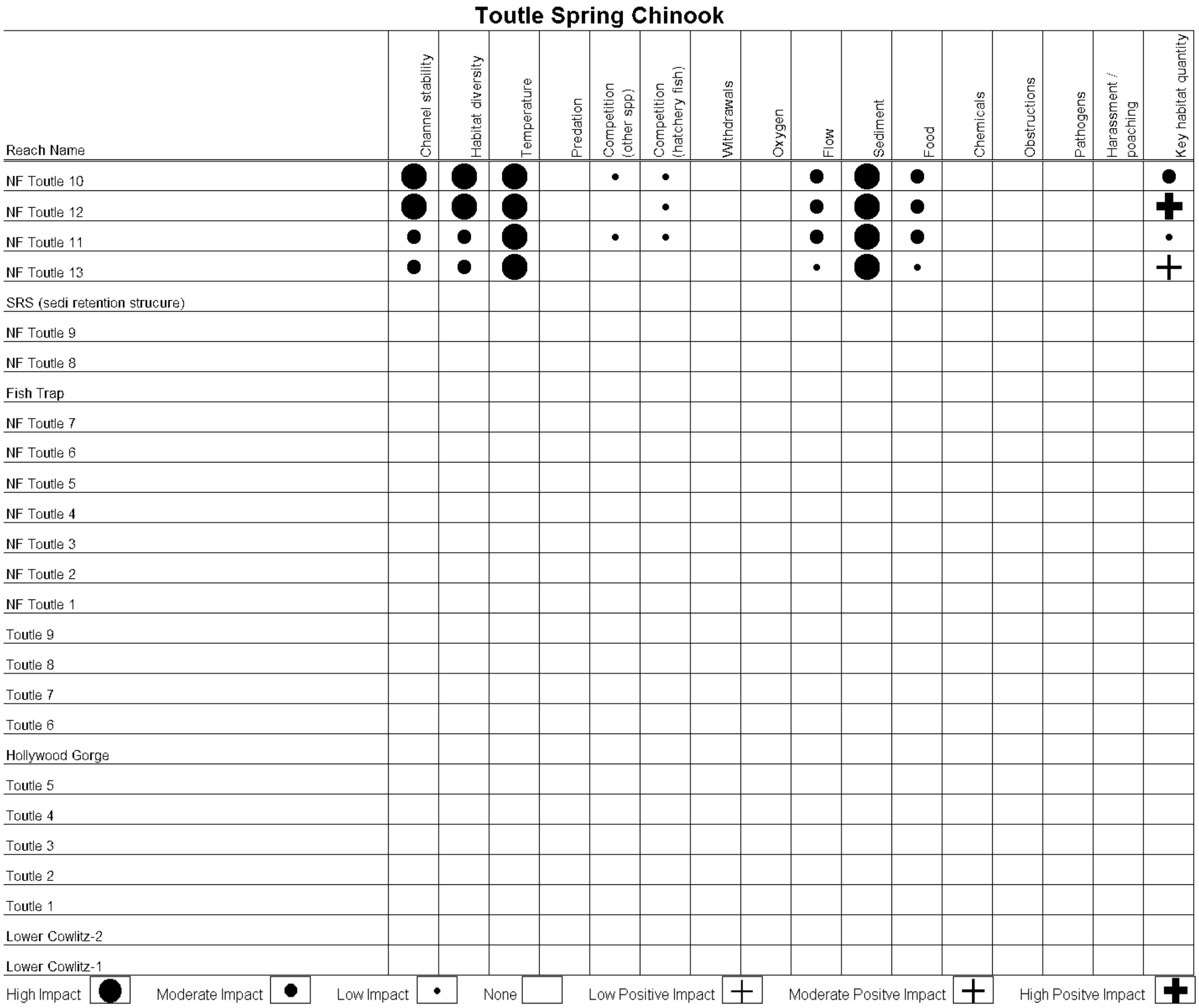


Figure 7-14. Toutle spring chinook habitat factor analysis diagram.

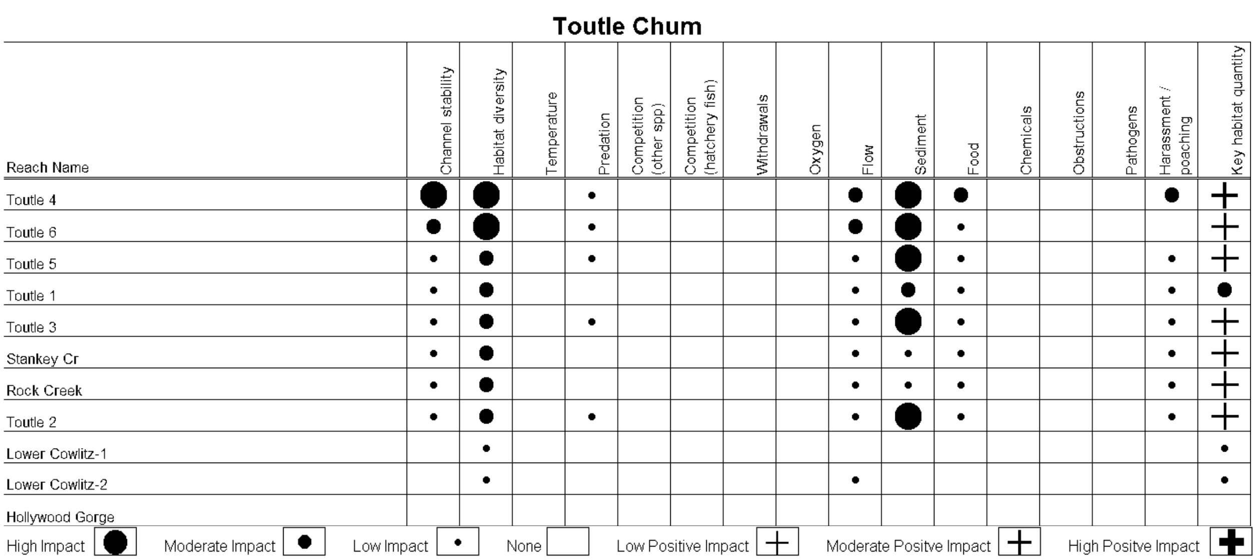


Figure 7-15. Toutle chum habitat factor analysis diagram.

7.7 Integrated Watershed Assessment (IWA)

The Toutle River watershed contains 46 planning subwatersheds, ranging from approximately 3,000 to 12,000 acres. The Toutle River watershed is primarily a high elevation system, comprised of Cascade granitic and volcanic rocks with low to moderate natural erodability. Nineteen of the subwatersheds are high elevation, headwaters subwatersheds. Another 17 subwatersheds are characterized by moderate-size, mainstem reaches situated at high elevations. Three subwatersheds include the large mainstem reaches of the Toutle River—below the confluence of the North and South Forks. In addition, some of the smaller tributaries in the western part of the watershed, such as Hemlock (70403), Studebaker (50402), and Wyant (70302) Creeks drain lowland subwatersheds consisting of erodable metamorphic and sedimentary materials.

7.7.1 Results and Discussion

IWA results were calculated for all subwatersheds in the Toutle River watershed. IWA results are calculated at the local level (i.e., within subwatershed, not considering upstream effects) and the watershed level (i.e., integrating the effects of the entire upstream drainage area as well as local effects). IWA results for each subwatershed are presented in Table 7-2. Almost all of the subwatersheds are rated as moderately impaired with respect to riparian and sediment supply conditions, and the majority of the subwatersheds are impaired with respect to hydrology. At the watershed level, the number of subwatersheds in each impairment category remains similar to the local level results. A reference map showing the location of each subwatershed in the basin is presented in Figure 7-16. Maps of the distribution of local and watershed level IWA results are displayed in Figure 7-17.

Table 7-2. IWA results for the Toutle River watershed

Subwatershed[a]	Local Process Conditions[b]			Watershed Level Process Conditions[c]		Upstream Subwatersheds[d]
	Hydrology	Sediment	Riparian	Hydrology	Sediment	
30101	M	M	M	M	M	none
30102	M	F	M	M	F	none
30103	I	M	M	I	M	none
30104	M	F	M	M	F	none
30201	I	F	M	M	F	30101, 30102, 30103, 30104, 30203, 30204, 30205, 30301, 30302
30202	I	M	M	M	F	30101, 30102, 30103, 30104, 30201, 30203, 30204, 30205, 30301, 30302
30203	M	M	M	M	F	30204
30204	M	F	M	M	F	none
30205	M	M	M	M	M	none
30301	I	M	M	I	M	30302, 30305
30302	I	M	M	I	M	none
30303	M	M	M	M	M	none
30304	I	M	M	I	M	30101, 30102, 30103, 30104, 30201, 30202, 30203, 30204, 30205, 30301, 30302, 30303, 30305, 30306
30305	I	M	M	I	M	30302
30306	I	M	M	M	M	30101, 30102, 30103, 30104, 30201, 30202, 30203, 30204, 30205
40101	F	M	F	M	M	40102
40102	M	M	M	M	M	none
40201	I	M	M	I	M	40101, 40102, 40202
40202	I	M	M	I	M	none
40203	I	I	M	I	I	none
40301	I	M	I	I	M	40101, 40102, 40201, 40202, 40203, 40302
40302	I	I	M	I	I	none
40401	M	M	M	I	M	40101, 40102, 40201, 40202, 40203, 40301, 40302
40402	I	M	M	I	M	40101, 40102, 40201, 40202, 40203, 40301, 40302, 40401, 40403, 40404
40403	M	M	M	M	M	none

Subwatershed[a]	Local Process Conditions[b]			Watershed Level Process Conditions[c]		Upstream Subwatersheds[d]
	Hydrology	Sediment	Riparian	Hydrology	Sediment	
40404						40101, 40102, 40201, 40202, 40203, 40301, 40302, 40401
50101	M	M	M	M	M	none
50102	M	M	M	M	M	none
50201	I	M	M	I	M	50101, 50102
50202	I	I	M	I	I	none
50301	M	M	M	I	M	50101, 50102, 50201, 50202, 50302
50302	I	M	M	I	M	50101, 50102, 50201, 50202
50401	I	M	M	I	M	50101, 50102, 50201, 50202, 50301, 50302, 50404, 50405
50402	I	M	M	I	M	none
50403	I	I	M	I	M	50101, 50102, 50201, 50202, 50301, 50302, 50401, 50404, 50405
50404	M	M	M	I	M	50101, 50102, 50201, 50202, 50301, 50302, 50405
50405	M	M	M	I	M	50101, 50102, 50201, 50202, 50301, 50302, 50401, 50402, 50403
70301	I	M	M	I	M	30101, 30102, 30103, 30104, 30201, 30202, 30203, 30204, 30205, 30301, 30302, 30303, 30304, 30305, 30306, 40101, 40102, 40201, 40202, 40203, 40301, 40302, 40401, 40402, 40403, 40404
70302	I	M	M	I	M	none
70401	I	M	M	I	M	70402, 70403
70402	I	M	M	I	M	none
70403	I	M	M	I	M	none
70602	M	M	M	M	M	none
70603	I	M	M	I	M	30101, 30102, 30103, 30104, 30201, 30202, 30203, 30204, 30205, 30301, 30302, 30303, 30304, 30305, 30306, 40101, 40102, 40201, 40202, 40203, 40301, 40302, 40401, 40402, 40403, 40404, 50101, 50102, 50201, 50202, 50301, 50302, 50401, 50402, 50403, 50404, 50405, 70301, 70302, 70401, 70402, 70403
70604	I	M	M	I	M	30101, 30102, 30103, 30104, 30201, 30202, 30203, 30204, 30205, 30301, 30302, 30303, 30304, 30305, 30306, 40101, 40102, 40201, 40202, 40203, 40301, 40302, 40401, 40402, 40403, 40404, 50101, 50102, 50201, 50202, 50301, 50302, 50401, 50402, 50403, 50404, 50405, 70301, 70302, 70401, 70402, 70403, 70602, 70603
70607	I	M	M	I	M	30101, 30102, 30103, 30104, 30201, 30202, 30203, 30204, 30205, 30301, 30302, 30303, 30304, 30305, 30306, 40101, 40102, 40201,

Subwatershed[a]	Local Process Conditions[b]			Watershed Level Process Conditions[c]		Upstream Subwatersheds[d]
	Hydrology	Sediment	Riparian	Hydrology	Sediment	
						40202, 40203, 40301, 40302, 40401, 40402, 40403, 40404, 50101, 50102, 50201, 50202, 50301, 50302, 50401, 50402, 50403, 50404, 50405, 70301, 70302, 70401, 70402, 70403, 70602, 70603, 70604

Notes:

[a] LCFRB subwatershed identification code abbreviation. All codes are 14 digits starting with 170800050#####.

[b] IWA results for watershed processes at the subwatershed level (i.e., not considering upstream effects). This information is used to identify areas that are potential sources of degraded conditions for watershed processes, abbreviated as follows:

F: Functional

M: Moderately impaired

I: Impaired

[c] IWA results for watershed processes at the watershed level (i.e., considering upstream effects). These results integrate the contribution from all upstream subwatersheds to watershed processes and are used to identify the probable condition of these processes in subwatersheds where key reaches are present.

[d] Subwatersheds upstream from this subwatershed

Figure 7-16. Map of the Toutle basin showing the location of the IWA subwatersheds.

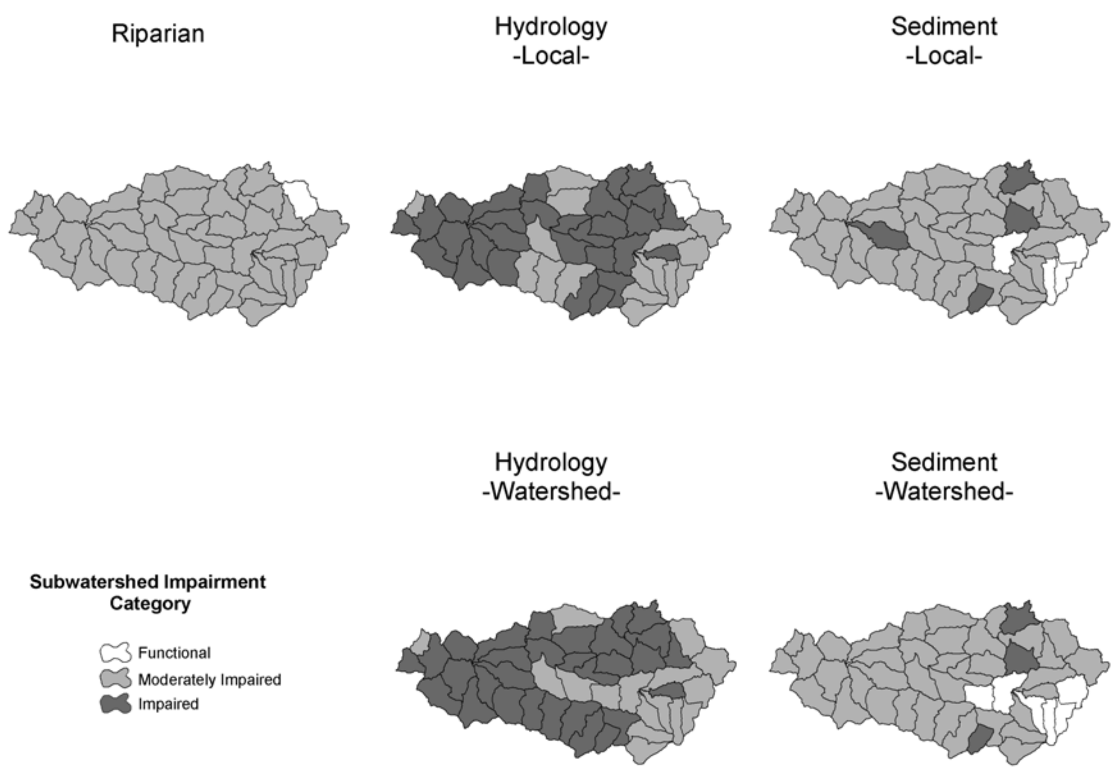


Figure 7-17. IWA subwatershed impairment ratings by category for the Toutle basin.

7.7.1.1 Hydrology

Local level hydrologic conditions across the Toutle River watershed range from moderately impaired to impaired. The only functional hydrologic rating is in the upper Green River-Falls Creek subwatershed (40101). Moderately impaired subwatersheds are located in headwater areas, along the lower Green River, and along the middle mainstem of the SF Toutle. Impaired conditions make up the remainder of the basin. Watershed level conditions have a slightly different pattern across the basin. Impaired subwatersheds are concentrated in the entire lower porton of the basin, along the mainstem SF Toutle, throughout the Green River basin, and in the Hoffstadt basin (tributary to the middle NF Toutle). Less impaired hydrologic conditions in headwater subwatersheds buffer downstream conditions in the upper NF, but this is not the case in the Green and SF basins, which contain impaired subwatersheds. Except for the moderately impaired subwatersheds in the upper NF basin (30306, 30202, 30201), all major anadromous fish bearing subwatersheds are impaired at the watershed level.

Subwatersheds in the NF drainage are susceptible to hydrologic impacts due to vegetation destruction caused by the 1980 eruption. This risk is mitigated by low road densities (0-2.7 mi/sq mi) and large amounts of wetland area (>10%). The exception is the South Coldwater Creek subwatershed (30103) and the NF Toutle below Maratta Creek (30306, 30302), which have high road and stream crossing densities.

Hydrologic impairments along the lower NF subwatersheds are caused by locally high road densities, young forest vegetation, and upstream inputs. The mainstem NF Toutle above the Green River confluence (30304) supports important winter steelhead habitat and suffers from high road densities (6.6 mi/sq mi) and low mature forest vegetation coverage (33%). It is also impacted by the Hoffstadt Creek drainage (30301, 30302, 30305), which is rated as impaired across all subwatersheds. The lower NF Toutle (70301) has even worse values for road density (7.1 mi/sq mi) and mature forest cover (23%). It also receives inputs from hydrologically impaired upstream subwatersheds (Green River and North Fork drainages).

IWA impairment ratings for the SF Toutle basin (50201-50302, 50402-50405) are strongly influenced by local hydrologic conditions, including high road densities (average 6.3 mi/sq mi) and moderate rain-on-snow zone coverage (avg. 37%). Similar conditions exist in subwatersheds drained by the Green River (40201-40402), with IWA results showing impaired local and watershed level conditions driven by high road densities (average 6.1 mi/sq mi) and moderate rain-on-snow area (average is 47% and maximum is 84%). Current land cover conditions in the Green River subwatersheds are poor, with only 27% of subwatershed area in hydrologically mature forest. Impaired hydrologic conditions in subwatersheds along the upper Green and the SF Toutle contribute to impaired ratings for downstream subwatersheds.

Subwatersheds along the mainstem Toutle River that encompass important anadromous fish habitat (70603, 70604, and 70607) are rated as hydrologically impaired at the local and watershed levels. The impairments are due to upstream inputs, high local road densities (5.3-6.1 mi/sq mi), and locally young forest vegetation (22-34% hydrologically mature).

7.7.1.2 Sediment

Local and watershed level sediment supply ratings are nearly identical, with only a few exceptions. The majority of subwatersheds (80%) have moderately impaired sediment supply ratings. The few impaired subwatersheds are scattered throughout the basin. Functional conditions occur in the upper NF Toutle basin. These functional conditions improve the watershed level ratings of downstream subwatersheds. Impaired subwatersheds (40302, 40203, 50202, and 50403) suffer from young forests and high road densities on erodable geology types. Streamside road densites and stream crossing densities are also high in these areas.

Fish bearing subwatersheds along the mainstem NF Toutle are rated as moderately impaired for sediment. The impairments are due to young forests and high road densities. Inputs from upstream subwatersheds in the lower and middle part of the drainage, such as Hoffstadt Creek (30301, 30302, 30305) and the Green River, also affect sediment condition.

Most of the mainstem Toutle subwatersheds (70603, 70604, and 70607) are moderately impaired with respect to sediment supply conditions. Again, most of the problems arise from young forest vegetation, high road densities, and high stream crossing densities. Upstream sediment conditions play a major role in the watershed level sediment ratings for these lower basin subwatersheds.

7.7.1.3 Riparian

Riparian conditions are rated moderately impaired throughout the Toutle River watershed, with the exception of one subwatershed in the Green River headwaters (40101). These conditions are due to historical logging practices and the impacts of the Mount St. Helens eruption. Riparian conditions in all important anadromous subwatersheds are uniformly rated as moderately impaired.

7.7.2 Predicted Future Trends

7.7.2.1 Hydrology

Hydrologic conditions in the Toutle River watershed are generally predicted to trend towards gradual improvement over the next 20 years as a result of improved forestry practices and vegetation recovery from the Mount St. Helens eruption.

Hydrologic conditions in the NF Toutle basin are predicted to trend stable or improve gradually over the next 20 years. Much of the land in the NF Toutle drainage is publicly owned, managed by either the USFS or WDNR. Forest cover within these subwatersheds is predicted to generally mature and improve. These improvements are expected to benefit downstream mainstem reaches.

Similar conditions are prevalent throughout the SF Toutle and Green River basins, however, there is more degradation in headwaters areas of these drainages. The limited extent of hydrologically mature vegetation and high road densities limit the extent to which hydrologic conditions recover over the next 20 years. Because the majority of the area in these subwatersheds is in private holdings, forestry activities and development are expected to continue at the same level, albeit mitigated by improved forestry and road management practices. These factors are predicted to result in stable trends in hydrologic condition.

Conditions in lower mainstem reaches are dependent on the future trends in upstream areas. Based on likely trends in upstream areas, hydrologic conditions in these lower mainstem subwatersheds are predicted to trend towards gradual improvement over the next 20 years.

7.7.2.2 Sediment

In general, Toutle River basin subwatersheds have low to moderate natural erodability ratings, based on geology type and slope class, averaging less than 20, with a maximum of 40, on a scale of 0-126. This suggests that these subwatersheds would not be major sources of sediment impacts under undisturbed conditions. However, road densities, streamside road densities, and stream crossings in these subwatersheds are relatively high, leading to a risk of elevated sediment supply. Given the large amount of private and public timber holdings, and the protected areas around Mount St. Helens, the overall sediment condition is expected to remain stable over the next 20 years.

The outlook is good for improving conditions in the NF Toutle above Hoffstadt Creek because of the high degree of public ownership. In the lower NF Toutle, the large percentage of industrial timber lands and high road densities suggests that trends are likely to remain stable. However, some gradual improvement may occur as improved forestry and road management practices are implemented. Sediment conditions in the SF Toutle and Green River basins are likely to follow a similar trend, as forestry and road management practices on private timberlands improve.

Trends in sediment conditions in mainstem subwatersheds are expected to remain relatively constant due to the likelihood of ongoing timber harvest, high road densities, moderately high streamside road densities (ranging from 0.4-0.6 miles/stream mile), and the potential for increased development.

7.7.2.3 Riparian Condition

In general, riparian conditions are likely to improve over time with improved forestry practices and recovery of vegetation destroyed by the Mount St. Helens eruption.

Mainstem subwatersheds on the upper NF Toutle (30201, 30202, 30306), which contain important anadromous fish habitat, have large areas of public and private lands managed for timber harvest and low to moderate streamside road densities (12 miles/stream mile). The predicted trend in these subwatersheds is for riparian conditions to remain the same or to slightly improve. Some riparian recovery is expected on timber lands where streamside roads are not present, however, these gains may be offset by streamside development in some areas.

Riparian conditions along the lower mainstem Toutle, the SF Toutle, and the Green River are expected to remain stable or trend towards further degradation over the next 20 years, as development pressure and timber production continue in the lower basin.

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