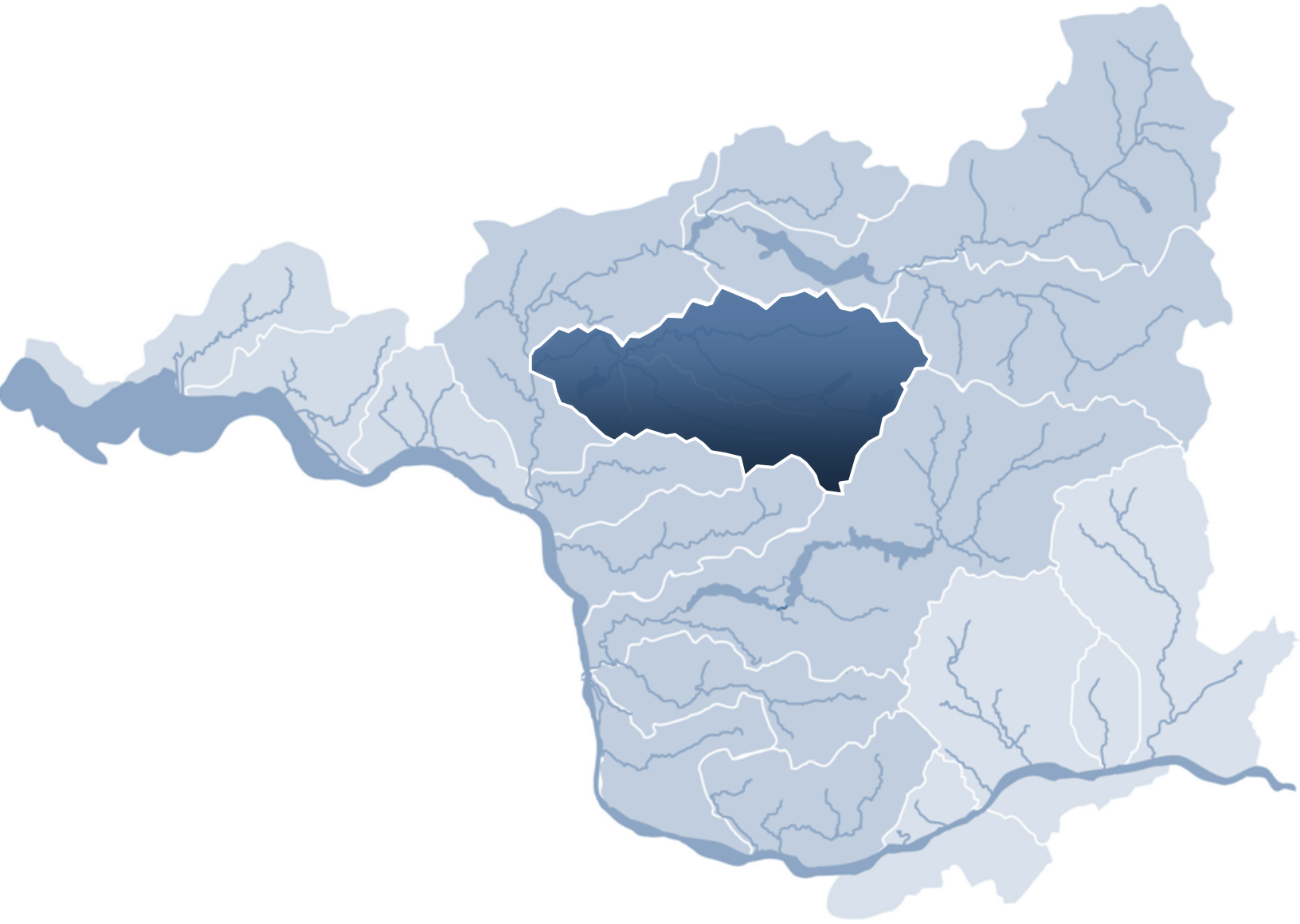
I.TOUTLE SUBBASIN



I. TOUTLE SUBBASIN

Tables

Figures

I.1. Executive Summary

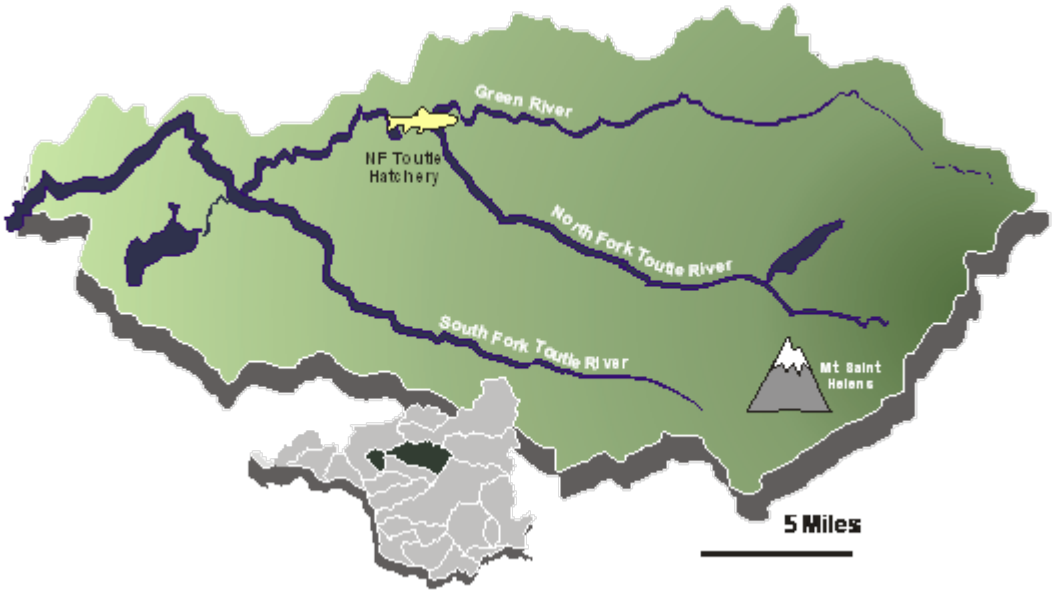


Figure I-1. Map of the Toutle River.

This Plan describes a vision, strategy, and actions for recovery of listed salmon, steelhead, and trout species to healthy and harvestable levels, and mitigation of the effects of the Columbia River Hydro system in Washington lower Columbia River subbasins. Recovery of listed species and hydropower mitigation is accomplished at a regional scale. This plan for the Toutle River Subbasin describes implementation of the regional approach within this subbasin, as well as assessments of local fish populations, limiting factors, and ongoing activities that underlie local recovery or mitigation actions. The plan was developed in a partnership between the Lower Columbia Fish Recovery Board (Board), Northwest Power and Conservation Council (NPCC), federal agencies, state agencies, tribal nations, local governments, and others.

The Toutle River is part of the Cowlitz Subbasin, one of twelve major NPCC subbasins in the Washington portion of the Lower Columbia Region. The North Fork Toutle Basin has historically supported populations of fall Chinook, winter steelhead, and coho. The South Fork Toutle Basin has historically supported large populations of spring Chinook, coho, and winter steelhead. Today, numbers of naturally spawning salmon and steelhead have plummeted to levels far below historical numbers. Chinook, chum, coho, and steelhead have been listed as Threatened under the Endangered Species Act. The decline has occurred over decades and the reasons are many. Freshwater and estuary habitat quality has been reduced by agricultural and forestry practices. Key habitats have been isolated or eliminated by channel modifications including channel dredging, construction of levees, filling of floodplains, and wetland draining and filling. Altered habitat conditions have increased predation. Competition and interbreeding with domesticated or nonlocal hatchery fish has reduced productivity. The mainstem Columbia hydropower system has altered flows, habitat, and migration conditions. Fish are harvested in fresh and saltwater fisheries. In addition to these human caused factors, the eruption of Mt. St. Helens in 1980 has substantially altered the habitat conditions in the Toutle basin.

Toutle River salmon and steelhead will need to be restored to moderate to high levels of viability to meet regional recovery objectives. This means that the populations are productive, abundant, exhibit multiple life history strategies, and utilize significant portions of the subbasin. In recent years, agencies,

local governments, and other entities have actively addressed the various threats to salmon and steelhead, but much remains to be done. One thing is clear: no single threat is responsible for the decline in these populations. All threats and limiting factors must be reduced if recovery is to be achieved. An effective recovery plan must also reflect a realistic balance within physical, technical, social, cultural and economic constraints. The decisions that govern how this balance is attained will shape the region's future in terms of watershed health, economic vitality, and quality of life.

This plan represents the current best estimation of necessary actions for recovery and mitigation based on thorough research and analysis of the various threats and limiting factors that impact Toutle River fish populations. Specific strategies, measures, actions and priorities have been developed to address these threats and limiting factors. The specified strategies identify the best long term and short term avenues for achieving fish restoration and mitigation goals. While it is understood that data, models, and theories have their limitations and growing knowledge will certainly spawn new strategies, the Board is confident that by implementation of the recommended actions in this plan, the population goals in the Toutle River Basin can be achieved. Success will depend on implementation of these strategies at the program and project level. It remains uncertain what level of effort will need to be invested in each area of impact to ensure the desired result. The answer to the question of precisely how much is enough is currently beyond our understanding of the species and ecosystems and can only be answered through ongoing monitoring and adaptive management against the backdrop of what is socially possible.

I.1.1. Key Priorities

Many actions, programs, and projects will make necessary contributions to recovery and mitigation in the Toutle Basin. The following list identifies the most immediate priorities.

1. ***Address Passage and Sedimentation Issues Associated with the Sediment Retention Structure on the North Fork Toutle***

The Sediment Retention Structure (SRS) on the North Fork Toutle was constructed following the 1980 Mt. St. Helens eruption in an attempt to prevent the continuation of severe downstream sedimentation of stream channels, which created flood conveyance, transportation, and habitat degradation concerns. The SRS currently blocks volitional access to as many as 50 miles of habitat for anadromous fish, although fish are transported around the structure via a trap and haul system. The structure is also a source of chronic fine sediment to the lower river. In addition, sediment over the structure has interfered with the fish collection facility at the base of the structure. Addressing passage and sedimentation issues at the SRS will be a key component of salmon and steelhead recovery in the basin. The LCFRB, in cooperation with the Cowlitz Indian Tribe, USGS, and other partners completed an assessment of collection efficiency at the Fish Collection Facility and fish passage through the sediment plain above the SRS (LCFRB 2010). This assessment evaluated fish behavior and made recommendations for potential improvements to improve fish passage.

2. ***Manage Forest Lands to Protect and Restore Watershed Processes***

Most of the Toutle Basin is managed for commercial timber production and has experienced intensive past forest practices activities, especially in the 1980s following the 1980 Mt. St. Helens eruption. The landscape is still recovering from the eruption and subsequent intensive road building and forest harvest. Proper forest management will be critical to fish recovery. The eruption and forest practices activities have reduced fish habitat quantity and quality by altering stream flow, increasing sediment, and reducing riparian zones. In addition, forest road culverts have blocked fish passage in small tributary streams. Effective implementation of new forest practices through the Department of Natural Resources' Habitat Conservation Plan (State-owned lands), Forest Practices Rules (private lands), and

the Northwest Forest Plan (federal lands) are expected to substantially improve conditions by restoring passage, protecting riparian conditions, reducing sediment inputs, lowering water temperatures, improving flows, and restoring habitat diversity. Improvements will benefit all species, particularly winter steelhead and coho.

3. Restore Valley Floodplain Function, Riparian Function and Stream Habitat Diversity

Much of the lower mainstem Toutle was dredged and diked following the 1980 Mt. St. Helens eruption. Stream channels, floodplains, and channel migration zones are constrained and riparian areas are degraded. Land-uses along these reaches currently include timber harvest, rural residential development, and small-scale agriculture. Removing or modifying channel control and containment structures to reconnect the stream and its floodplain, where this is feasible and can be done without increasing risks of substantial flood damage,will restore normal habitat-forming processes to reestablish habitat complexity, off-channel habitats, and conditions favorable to fish spawning and rearing. These improvements will be particularly beneficial to chum, fall Chinook, and coho. Partially restoring normal floodplain functions will also help control catastrophic flooding and provide wetland and riparian habitats critical to other fish, wildlife, and plant species. Existing floodplain function and riparian habitats will be protected through local land use ordinances, partnerships with landowners, and the acquisition of land, where appropriate. Restoration will be achieved by working with willing landowners, non-governmental organizations, conservation districts, and state and federal agencies.

4. Help Address Immediate Risks with Short-term Habitat Fixes

Restoration of normal watershed processes that allow a basin to restore itself over time has proven to be the most effective strategy for long term habitat improvements. However, restoration of some critical habitats may take decades to occur. In the near term, it is important to initiate short-term fixes to address current critical low numbers of some species. Examples in the Toutle subbasin include building of chum salmon spawning channel and construction of coho overwinter habitat with alcoves, side channels, or engineered log jams. Benefits will be temporary but will help bridge the period until normal habitat-forming processes are reestablished.

5. Manage Growth and Development to Protect Watershed Processes and Habitat Conditions

The human population in the basin is relatively low, but it is projected to grow by at least twenty percent in the next twenty years. This growth is likely to result in the conversion of forest and agricultural land to residential uses, with potential impacts to habitat conditions. Land-use changes will provide a variety of risks to terrestrial and aquatic habitats. Careful land-use planning will be necessary to protect and restore natural fish populations and habitats and will also present opportunities to preserve the rural character and local economic base of the basin.

6. Align Hatchery Priorities Consistent with Conservation Objectives

Hatcheries throughout the Columbia basin historically focused on producing fish for fisheries as mitigation for hydropower development and widespread habitat degradation. Emphasis of hatchery production without regard for natural populations can pose risks to natural population viability. Hatchery priorities must be aligned to conserve natural populations, enhance natural fish recovery, and avoid impeding progress toward recovery while continuing to provide fishery mitigation benefits. The Toutle River hatchery program will produce and/or acclimate fall Chinook, coho and summer steelhead for use in the Toutle Basin. Hatchery production will be used to supplement natural production in appropriate areas of the basin and adjacent tributary streams, develop a local broodstock to reestablish historical diversity and life history characteristics, and also to provide fishery mitigation in a manner that does not pose significant risk to natural population rebuilding efforts.

7. Manage Fishery Impacts so they do not Impede Progress Toward Recovery

This near-term strategy involves limiting fishery impacts on natural populations to ameliorate extinction risks until a combination of measures can restore fishable natural populations. There is no directed Columbia River or tributary harvest of ESA-listed Toutle River salmon and steelhead. This practice will continue until the populations are sufficiently recovered to withstand such pressure and remain self-sustaining. Some Toutle River salmon and steelhead are incidentally taken in mainstem Columbia River and ocean mixed stock fisheries for strong wild and hatchery runs of fall Chinook and coho. These fisheries will be managed with strict limits to ensure this incidental take does not threaten the recovery of wild populations including those from the Toutle. Steelhead and chum will continue to be protected from significant fishery impacts in the Columbia River and are not subject to ocean fisheries. Selective fisheries for marked hatchery steelhead and coho (and fall Chinook after mass marking occurs) will be a critical tool for limiting wild fish impacts. State and federal legislative bodies will be encouraged to develop funding necessary to implement mass-marking of fall Chinook, thus enabling a selective fishery with lower impacts on wild fish. State and federal fisheries managers will better incorporate Lower Columbia indicator populations into fisheries impact models.

8. Reduce Out-of-Subbasin Impacts so that the Benefits of In-Basin Actions can be Realized

Toutle River salmon and steelhead are exposed to a variety of human and natural threats in migrations outside of the subbasin. Human impacts include drastic habitat changes in the Columbia River estuary, effects of Columbia Basin hydropower operation on mainstem, estuary, and nearshore ocean conditions, interactions with introduced animal and plant species, and altered natural predation patterns by northern pikeminnow, birds, seals, and sea lions. A variety of restoration and management actions are needed to reduce these out-of-basin effects so that the benefits in-subbasin actions can be realized. To ensure equivalent sharing of the recovery and mitigation burden, impacts in each area of effect (habitat, hydropower, etc.) should be reduced in proportion to their significance to species of interest.

I.2. Background

This plan describes a vision and framework for rebuilding salmon and steelhead populations in Washington's Toutle River Subbasin. The plan addresses subbasin elements of a regional recovery plan for Chinook salmon, chum salmon, coho salmon, steelhead, and bull trout listed as Threatened under the federal Endangered Species Act (ESA). The plan also serves as the subbasin plan for the Northwest Power and Conservation Council (NPCC) Fish and Wildlife Program to address effects of construction and operation of the Federal Columbia River Power System.

Development of this plan was led and coordinated by the Washington Lower Columbia Fish Recovery Board (LCFRB). The Board was established by state statue (RCW 77.85.200) in 1998 to oversee and coordinate salmon and steelhead recovery efforts in the lower Columbia region of Washington. It is comprised of representatives from the state legislature, city and county governments, the Cowlitz Tribe, private property owners, hydro project operators, the environmental community, and concerned citizens. A variety of partners representing federal agencies, tribal governments, Washington state agencies, regional organizations, and local governments participated in the process through involvement on the LCFRB, a Recovery Planning Steering Committee, planning working groups, public outreach, and other coordinated efforts.

The planning process integrated four interrelated initiatives to produce a single Recovery/Subbasin Plan for Washington subbasins of the lower Columbia:

- Endangered Species Act recovery planning for listed salmon and trout.
- Northwest Power and Conservation Council (NPCC) fish and wildlife subbasin planning for eight full and three partial subbasins.
- Watershed planning pursuant to the Washington Watershed Management Act, RCW 90-82.
- Habitat protection and restoration pursuant to the Washington Salmon Recovery Act, RCW 77.85.

This integrated approach ensures consistency and compatibility of goals, objectives, strategies, priorities and actions; eliminates redundancy in the collection and analysis of data; and establishes the framework for a partnership of federal, state, tribal and local governments under which agencies can effectively and efficiently coordinate planning and implement efforts.

The plan includes an assessment of limiting factors and threats to key fish species, an inventory of related projects and programs, and a management plan to guide actions to address specific factors and threats. The assessment includes a description of the subbasin, focal fish species, current conditions, and evaluations of factors affecting focal fish species inside and outside the subbasin. This assessment forms the scientific and technical foundation for developing a subbasin vision, objectives, strategies, and measures. The inventory summarizes current and planned fish and habitat protection, restoration, and artificial production activities and programs. This inventory illustrates current management direction and existing tools for plan implementation. The management plan details biological objectives, strategies, measures, actions, and expected effects consistent with the planning process goals and the corresponding subbasin vision.

I.3. Assessment

I.3.1. Subbasin Description

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 Mt. St. Helens. The Toutle drains the north and west sides of Mt. 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 Mt. St. Helens and the resulting massive debris torrents and mudflows.

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 Mt. St. Helens and rainfall predominates in most of the remaining, lower elevation portion of the basin.

Land Use, Ownership, and 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 Mt. St. Helens is within the Mt. St. Helens National Volcanic Monument and is managed by the U.S. Forest Service. A significant proportion of the forests to the north and west of Mt. 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). The State of Washington owns, and the Washington State Department of Natural Resources (DNR) manages the beds of all navigable waters within the subbasin. Any proposed use of those lands must be approved in advance by the DNR. A breakdown of land ownership and land cover is presented in Figure I-2 and Figure I-3.

Development Trends

Population centers in the basin consist primarily of small rural towns. Projected population change from 2000 to 2020 for unincorporated areas in WRIA 26 is 22%. Continued population growth will increase pressures for conversion of forestry and agricultural land uses to residential uses, with potential impacts to habitat conditions.

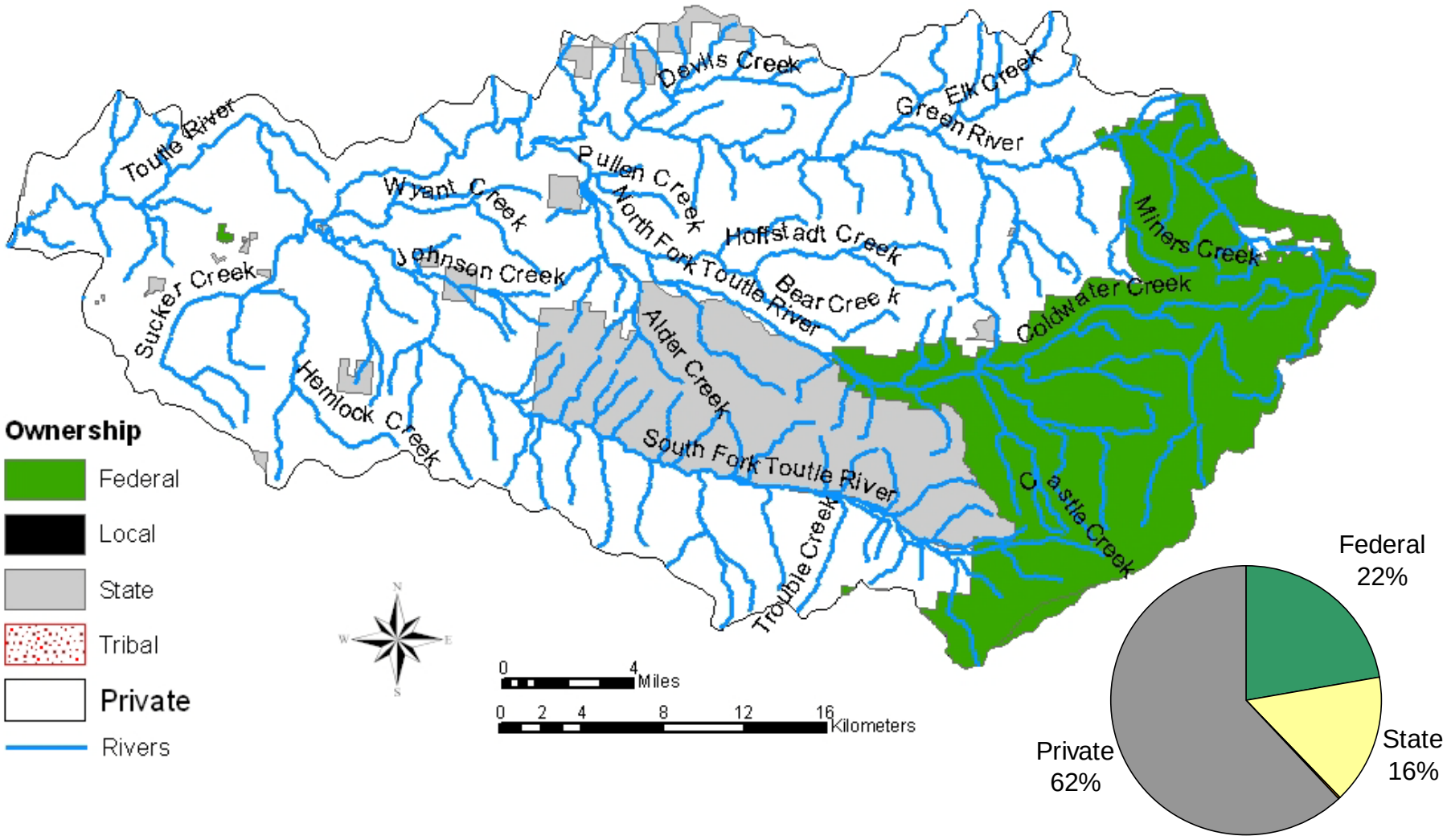


Figure I-2. Landownership within the Toutle subbasin. Data is WDNR data that was obtained from the Interior Columbia Basin Ecosystem Management Project (ICBEMP).

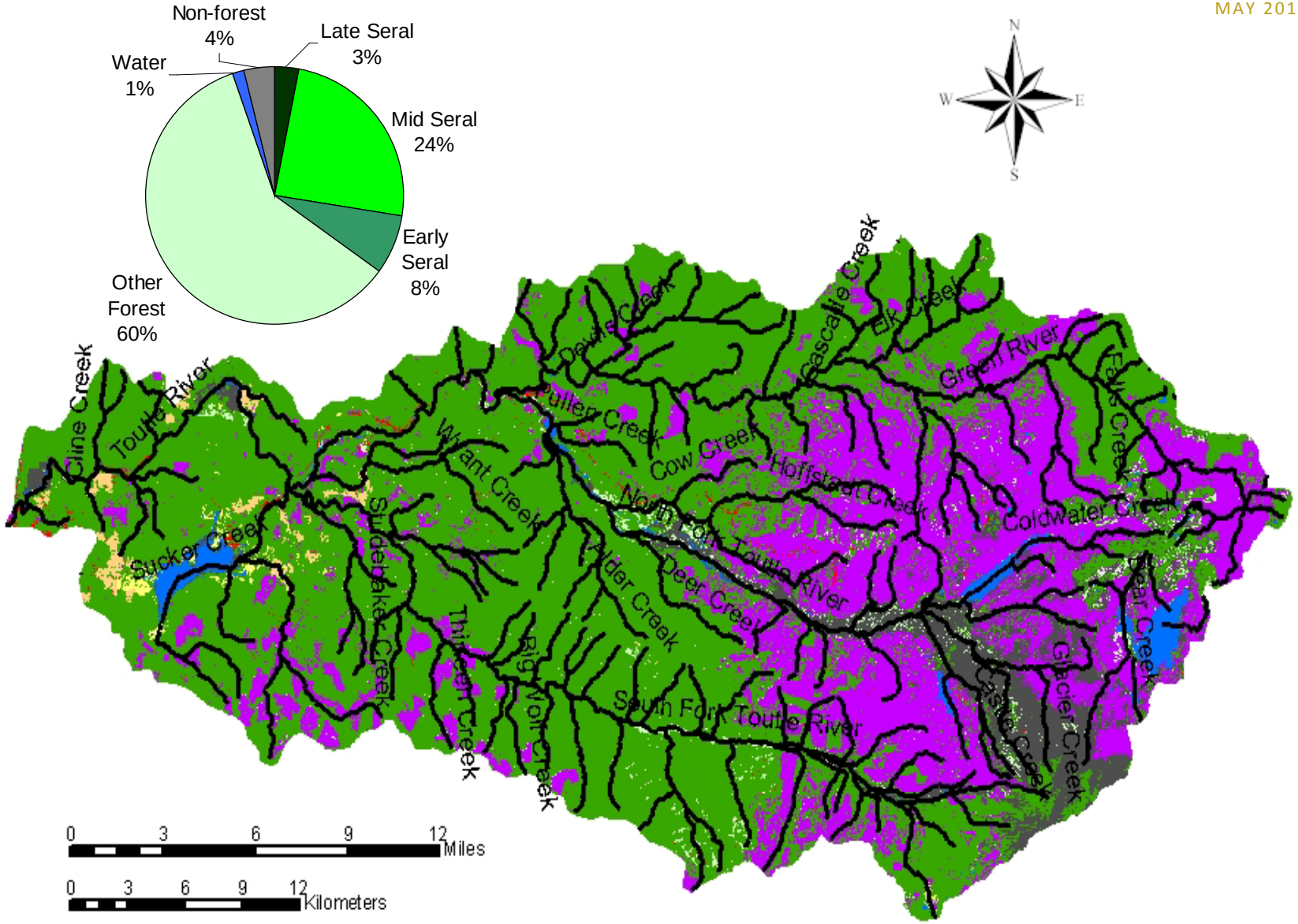


Figure I-3. Land cover within the Toutle basin. Vegetation cover (pie chart) derived from Landsat data based on methods in Lunetta et al. (1997). Mapped data was obtained from the USGS National Land Cover Dataset (NLCD).

I.3.2. Focal and Other Species of Interest

Listed salmon, steelhead, and trout species are focal species of this planning effort for the Toutle Subbasin. Other species of interest were also identified as appropriate. Species were selected because they are listed under the U.S. Endangered Species Act or because viability or use is significantly affected by the Federal Columbia Hydropower system. Federal hydropower system effects are not significant within the Toutle River basin although anadromous species are subject to effects in the Columbia River, estuary, and near shore ocean. The Toutle ecosystem supports and depends on a wide variety of fish and wildlife in addition to designated focal species. A comprehensive ecosystem-based approach to salmon and steelhead recovery will provide significant benefits to other native species through restoration of landscape-level processes and habitat conditions. Other fish and wildlife species not directly addressed by this plan are subject to a variety of other Federal, State, and local planning or management activities.

Focal salmonid species in Toutle River watersheds include fall and spring Chinook, coho, chum, and winter steelhead. Toutle River Chum are a subset of a larger population which includes the lower Cowlitz, Coweeman, and Toutle rivers. Bull trout do not occur in the subbasin. Salmon and steelhead numbers have declined to only a fraction of historical levels (Table I-1). Extinction risks are significant for all focal species – the current health or viability is very low for all species except winter steelhead (SF population), which has a viability level of medium. Returns of fall Chinook, coho, and winter steelhead, include both natural and hatchery produced fish.

Table I-1. Status of focal salmonid and steelhead populations in the Toutle subbasin.

Species	Population	Recovery Priority[1]	Viability		Improve-ment[4]	Abundance		
			Status[2]	Obj.[3]		Historic[5]	Current[6]	Target[7]
Fall Chinook (Tule)	NF Toutle	Primary	VL	H+	265%	11,000	<50	3,000
Spring Chinook	SF Toutle	Contributing	VL	M	>500%	3,100	100	1,100
Winter Steelhead	NF Toutle	Primary	VL	H	125%	3,600	120	600
Winter Steelhead	SF Toutle	Primary	M	H+	35%	--[8]	350	600
Coho	NF Toutle	Primary	VL	H	180%	27,000	<50	3,800
Coho	SF Toutle	Primary	VL	H	180%	--[9]	<50	3,800
Chum	L. Cowlitz	Contributing	VL	M	>500%	195,000	<300	900

[1] Primary, Contributing, and Stabilizing designations reflect the relative contribution of a population to major population group recovery goals.
[2] Baseline viability is based on Technical Recovery Team viability rating approach.
[3] Viability objective is based on the scenario contribution.
[4] Improvement is the relative increase in population production required to reach the prescribed viability goal
[5] Historical population size inferred from presumed habitat conditions using Ecosystem Diagnosis and Treatment Model and NMFS back-of-envelope calculations.
[6] Approximate current annual range in number of naturally-produced fish returning to the watershed.
[7] Abundance targets were estimated by population viability simulations based on viability goals.
[8] The estimated historical abundance for both the NF and SF Toutle winter steelhead population is 3,600
[9] The estimated historical abundance for both the NF and SF Toutle coho population is 27,000

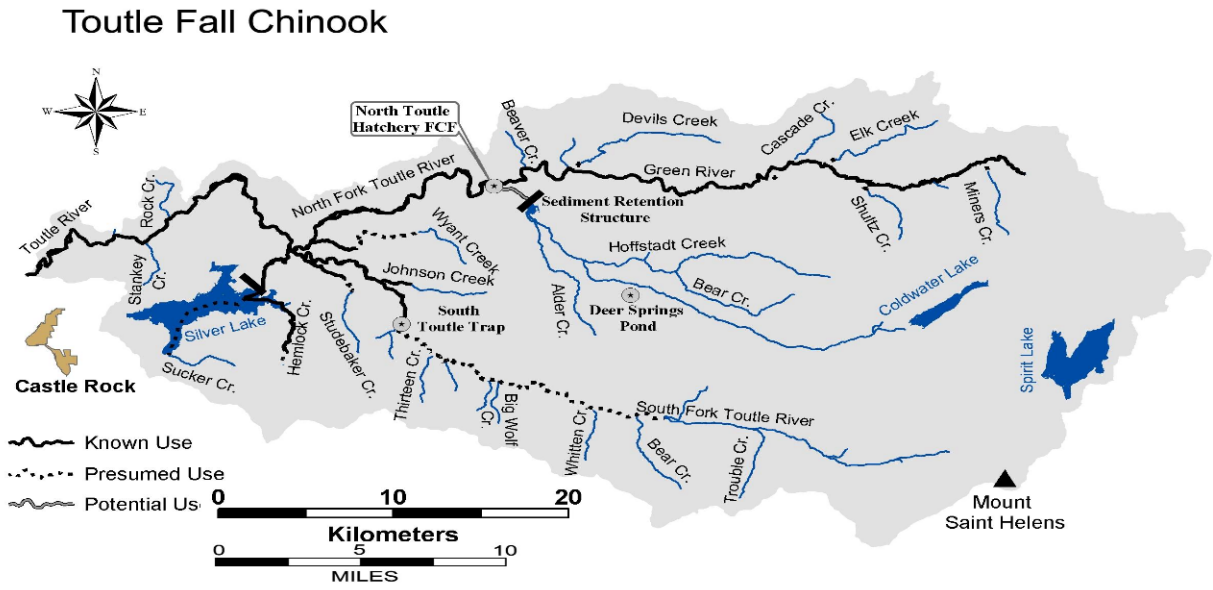
Other species of interest in the Toutle Subbasin include coastal cutthroat trout and Pacific lamprey. These species have been affected by many of the same habitat factors that have reduced numbers of anadromous salmonids.

Brief summaries of the population characteristics and status follow. Additional information on life history, population characteristics, and status assessments may be found in Appendix A (focal species) and B (other species).

Fall Chinook—Cowlitz Subbasin (Toutle River)

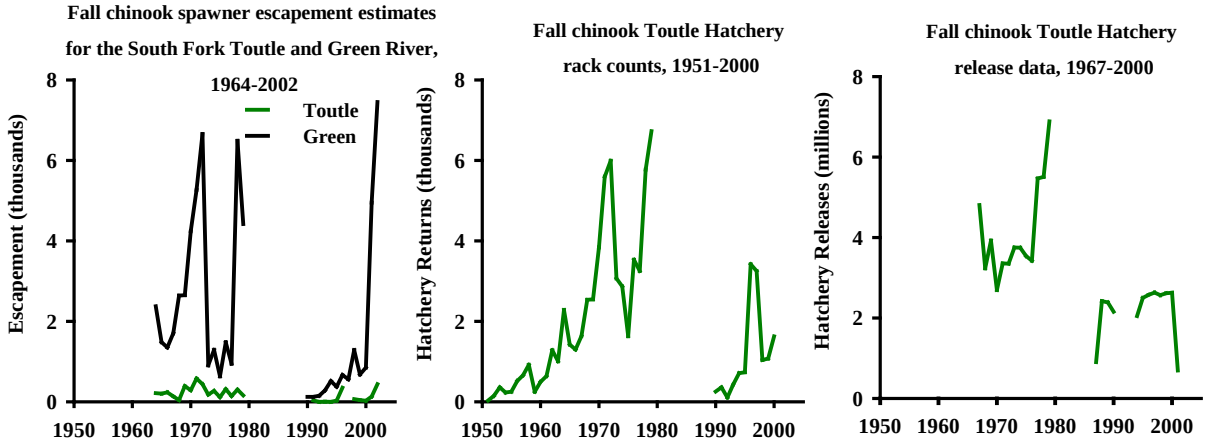
ESA: Threatened 1999	SASSI: South Fork—Depressed 2002, Green—Healthy 2002

The historical Toutle adult population is estimated from 15,000-20,000 fish. Current natural spawning returns range from 300-5,000 with the majority of hatchery origin fish spawning in the Lower 0.5 mile of the Green River. Prior to the eruption of Mt. St. Helens in 1980, Significant fall Chinook natural spawning occurred in the lower 5 miles of the mainstem Toutle and in the lower NF Toutle. The eruption devastated much of the spawning area in the mainstem and NF Toutle. Current spawning primarily occurs in the lower Green below the North Toutle Hatchery and in the lower SF Toutle. Juvenile rearing occurs near and downstream of the spawning area. Juveniles emerge in early spring and migrate to the Columbia in spring and summer of their first year.



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
- Baseline risk assessment determined a high to very high risk of extinction for fall Chinook in the Toutle subbasin

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

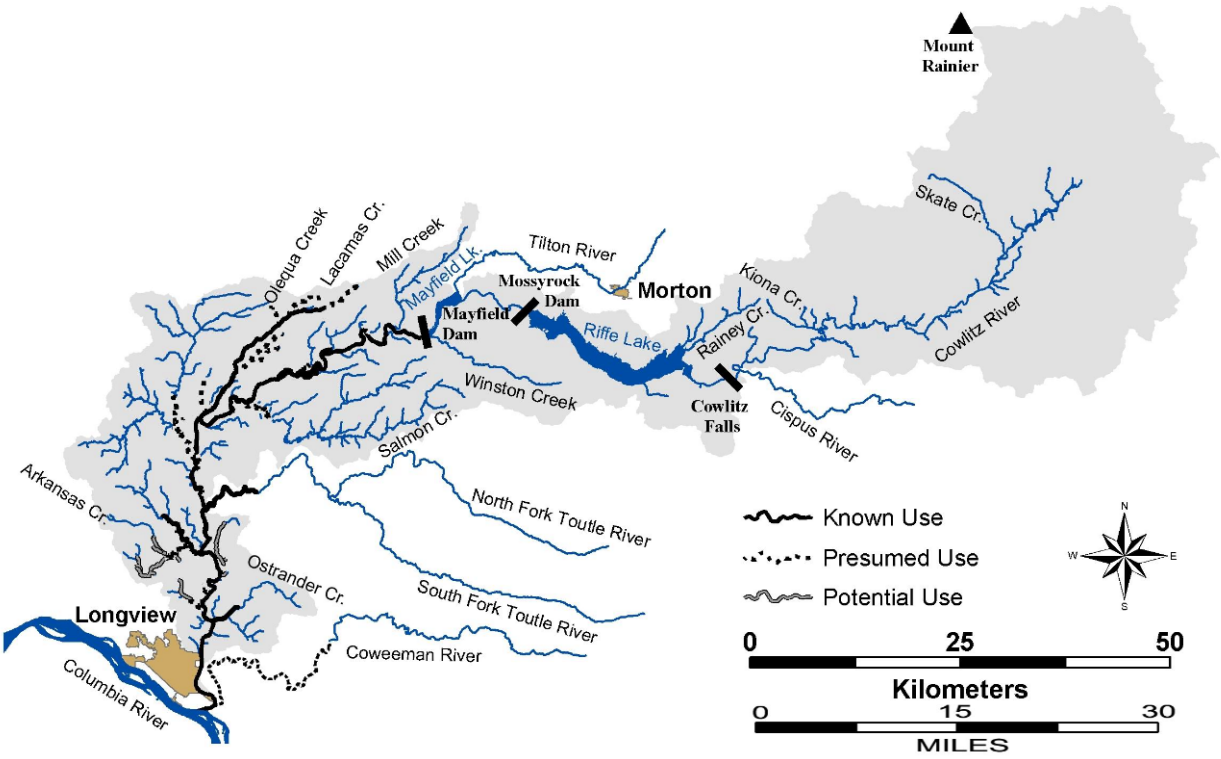
Harvest

- 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)(U.S./Canada), Pacific Fisheries Management Council (PFMC) (U.S. ocean), and Columbia River Compact forums
- Toutle 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 for salmon in the SF Toutle River has been closed since the 1980 eruption of Mt. St. Helens

Chum—Cowlitz Subbasin (Toutle River)

ESA: Threatened 1999	SASSI: NA

The chum population is considered part of the lower Cowlitz population.



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

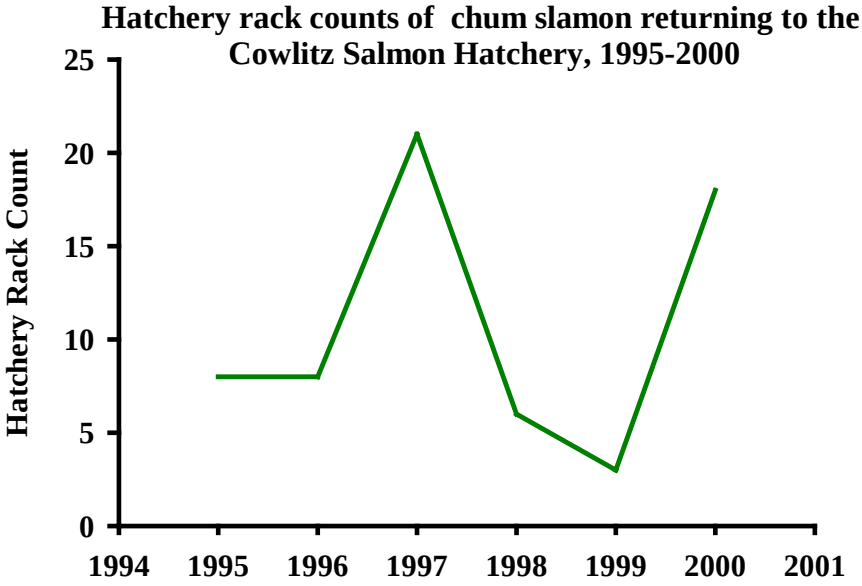
Abundance

- 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
- Baseline risk assessment determined a high to very high risk of extinction for summer/fall chum in the Cowlitz subbasin



Hatchery

- Cowlitz or NF Toutle Salmon hatcheries do not produce/release chum salmon
- Chum salmon are captured annually in the Cowlitz hatchery rack

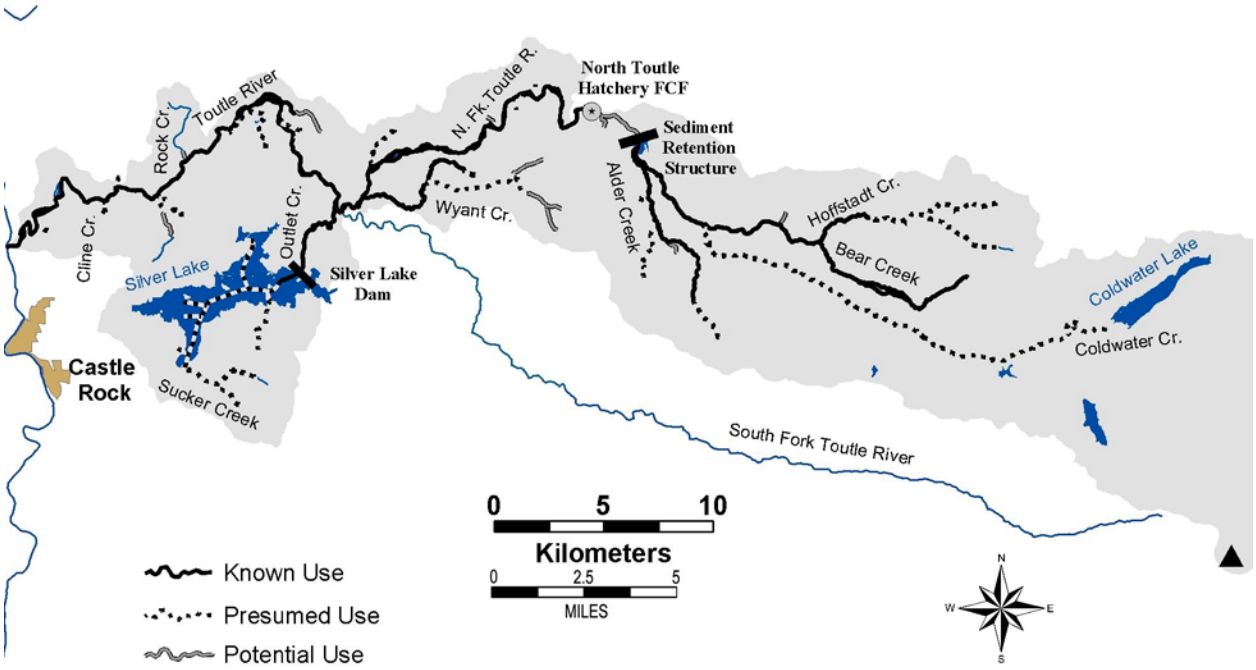
Harvest

- 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

Winter Steelhead—Cowlitz Subbasin (NF Toutle River)

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

The historical NF Toutle adult population is estimated from 7,000-15,000 fish. Current natural spawning returns are 100-300. In the Green River, spawning occurs in the mainstem, Devils, Elk, and Shultz creeks. In the NF Toutle River spawning occurs primarily in the mainstem, Alder, and Deer creeks. Spawning time is March to early June. Juvenile rearing occurs both downstream and upstream of the spawning areas. Juveniles rear for a full year or more before migrating from the Toutle basin.

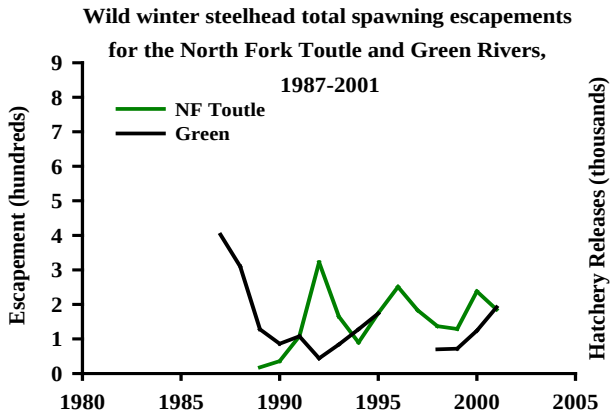


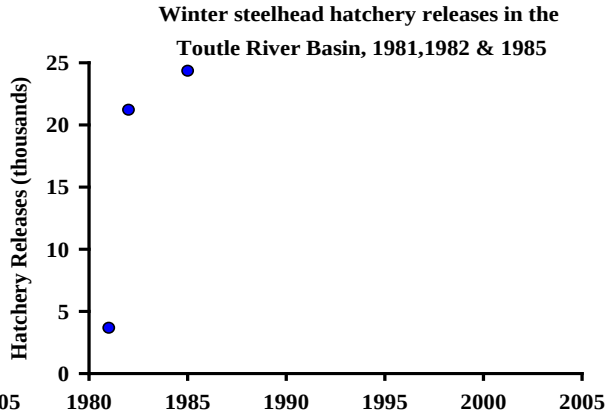
Distribution

- 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
- Baseline risk assessment determined a high to very high risk of extinction for winter steelhead in the NF Toutle subbasin

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 since 1953; 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

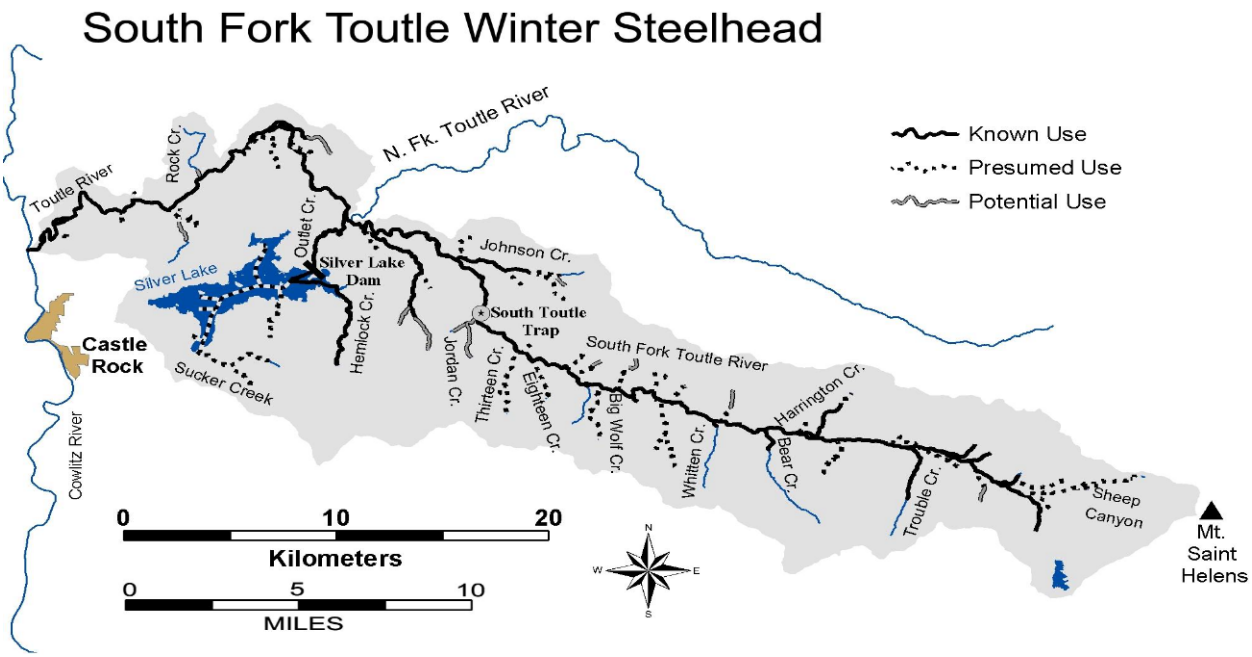
Harvest

- 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 of winter steelhead since 1980; the Green River has been closed since 1981
- Incidental harvest of Toutle basin winter steelhead is limited to ESA impact rates as described in the Fishery and Management Evaluation Plan submitted to NMFS by WDFW in 2003.

Winter Steelhead—Cowlitz Subbasin (SF Toutle River)

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

The historical SF Toutle adult population is estimated from 7,000-15,000 fish. Current natural spawning returns are 100-300. In the Green River, spawning occurs in the mainstem, Devils, Elk, and Shultz creeks. In the NF Toutle River spawning occurs primarily in the mainstem, Alder, and Deer creeks. Spawning time is March to early June. Juvenile rearing occurs both downstream and upstream of the spawning areas. Juveniles rear for a full year or more before migrating from the Toutle basin.



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

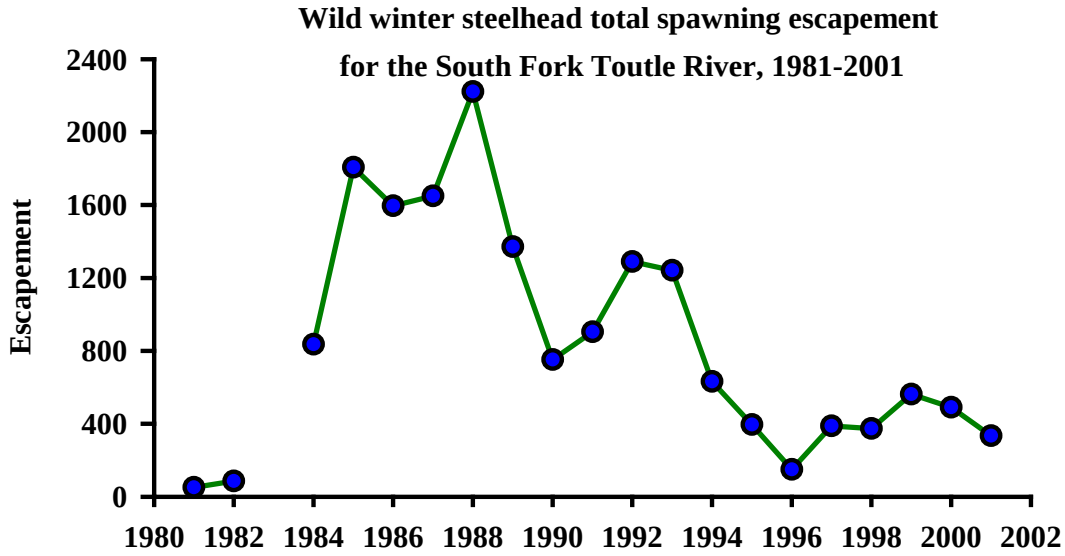
- Adult migration timing for SF Toutle winter steelhead is from December through April
- Spawning timing on the SF Toutle is generally from early March to early June
- Limited age composition data for Toutle River winter steelhead indicate that the dominant age class is 2.2 (58.6%)
- Wild steelhead fry emerge from March-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

- Baseline risk assessment determined a moderate risk of extinction for winter steelhead in the SF Toutle subbasin
- 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

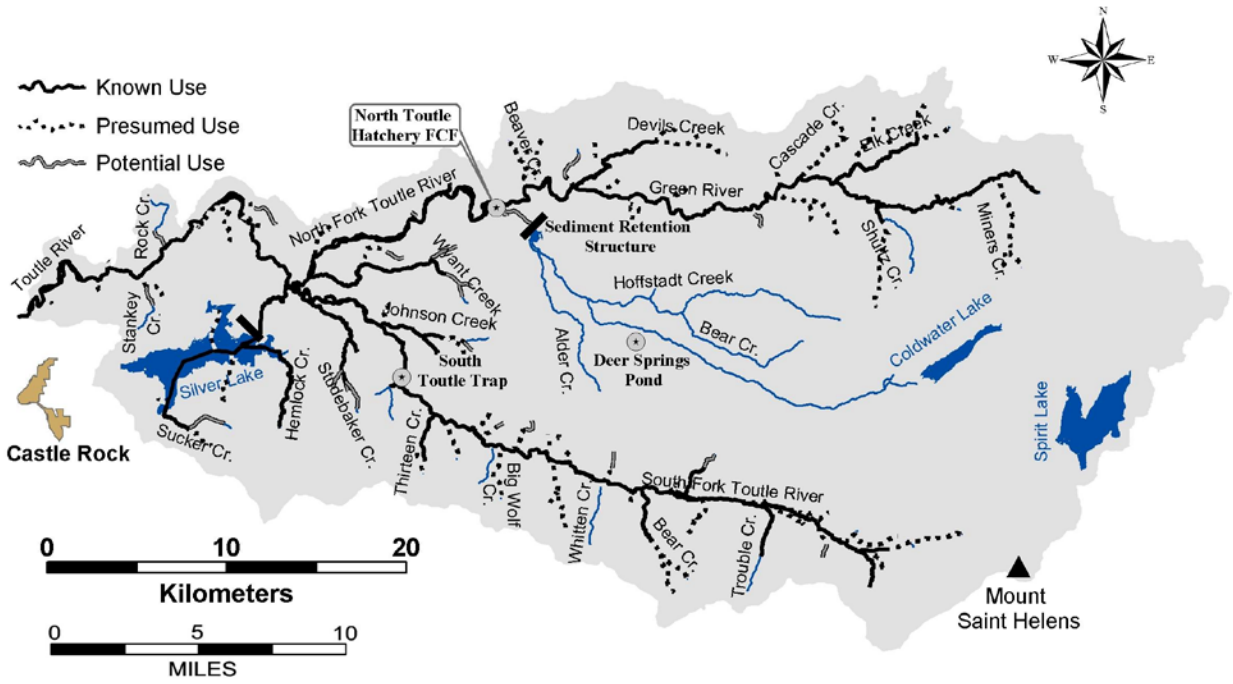
- No directed commercial or tribal fisheries target South Fork Toutle winter steelhead; incidental mortality currently occurs during the lower Columbia River spring Chinook tangle net fisheries
- Treaty Indian harvest does not occur on the South Fork Toutle River
- Approximately 6.2% of returning Cowlitz 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.
- The SF Toutlle sport fishery became selective for retention of marked hatchery steelhead only in 1994. The SF Toutle sport fishery is now closed during winter steelhead return time.
- Incidental harvest of Toutle basin winter steelhead is limited to ESA impact rates as described in the Fishery and Management Evaluation Plan submitted to NMFS by WDFW in 2003.

Cutthroat Trout—Cowlitz River Subbasin (Toutle River)

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

Coastal cutthroat abundance in the NF Toutle and Green rivers has not been quantified but the population is considered depressed. Cutthroat trout are present throughout the basin. Anadromous, fluvial, and resident forms of cutthroat trout are found in the basin. Anadromous cutthroat enter the Toutle from September-December and spawn from January through June. Most juveniles rear 2-4 years before migrating from their natal stream.



Distribution

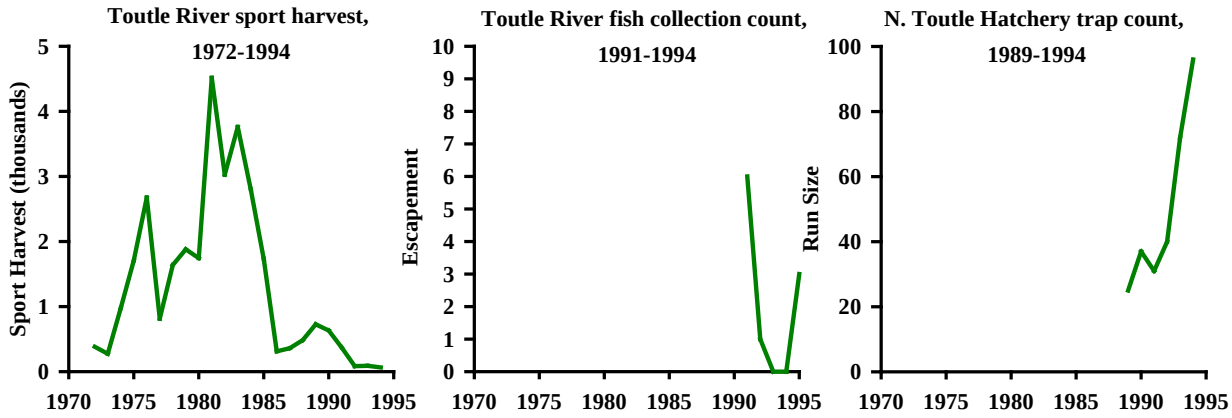
- Anadromous forms have access to most of the watershed except upper tributary, high gradient reaches
- Adfluvial forms are documented in Silver Lake
- Resident and fluvial forms are observed throughout the subbasin

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

Other Species

Pacific lamprey – Information on lamprey abundance is limited and does not exist for the Toutle Basin population. However, based on declining trends measured at Bonneville Dam and Willamette Falls it is assumed that Pacific lamprey have also declined in the Toutle. The adult lamprey return from the ocean to spawn in the spring and summer. Spawning likely occurs in the small to mid-size streams of the Toutle. Juveniles rear in freshwater up to seven years before migrating to the ocean.

I.3.3. Subbasin Habitat Conditions

This section describes the current condition of aquatic and terrestrial habitats within the subbasin. Descriptions are included for habitat features of particular significance to focal salmonid species including watershed hydrology, passage obstructions, water quality, key habitat availability, substrate and sediment, woody debris, channel stability, riparian function, and floodplain function. These descriptions will form the basis for subsequent assessments of the effects of habitat conditions on focal salmonids and opportunities for improvement.

Watershed Hydrology

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 Mt. 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).

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).

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.

Key Habitat Availability

Following the eruption of Mt. 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).

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 Mt. 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.

Woody Debris

Low levels of LWD likely existed prior to 1980 due to extensive logging. Mud and debris flows associated with the eruption of Mt. 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).

Channel Stability

The eruption of Mt. 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.

Riparian Function

The eruption of Mt. 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.

Floodplain Function

Following the eruption of Mt. 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).

I.3.4. Stream Habitat Limitations

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, chum, coho, and steelhead. A thorough description of the EDT model, and its application to lower Columbia salmonid populations, can be found in Appendix E.

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.

Population Analysis

Population assessments that compare historical and current habitat conditions are useful for evaluating trends and establishing recovery goals. Fish population levels under current and historical 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 I-2). 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 I-2). Declines in adult productivity from historical levels range from 71% for fall Chinook to 86% for winter steelhead. Similarly, adult abundance levels have declined for all species (Table I-2). Current estimates of abundance are 42% of historical levels for fall Chinook, 17% of historical levels for winter steelhead, 12% of historical levels for coho and only 5% of historical levels for chum.

Spatial diversity has also decreased significantly for all species in the Toutle basin (Table I-2). Declines in diversity range from 37% for fall Chinook, to 65% for coho. This sharp decline in diversity may be due to a dramatic loss of available habitats compared to pre-Mt. 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 16% and 52% of historical productivity, depending on species (Table I-2). Smolt abundance numbers are similarly low, especially for chum, coho, and winter steelhead (Table I-2). Current smolt abundance estimates for chum, coho, and winter steelhead are at 13%, 12%, and 21% of historical levels, respectively.

Table I-2. Population productivity, abundance, and diversity (of both smolts and adults) based on EDT analysis of current (P or patient), historical (T or template)[1], and properly functioning (PFC) habitat conditions.

	Adult Abundance		Adult Productivity		Diversity Index		Smolt Abundance		Smolt Productivity	
Species	**P**	**T**	**P**	**T**	**P**	**T**	**P**	**T**	**P**	**T**
Fall Chinook	4,568	10,938	3.1	10.7	0.63	1.00	483,371	1,033,237	285	907
Spring Chinook	-	3,147	-	16.5	0.00	1.00	-	102,934	-	519
Chum	1,376	25,984	1.9	10.5	0.39	1.00	595,692	4,495,859	548	1,057
Coho	3,164	27,453	2.7	14.1	0.32	0.91	60,503	504,253	51	254
Winter Steelhead	603	3,558	2.7	19.3	0.38	0.96	13,403	62,722	55	337

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

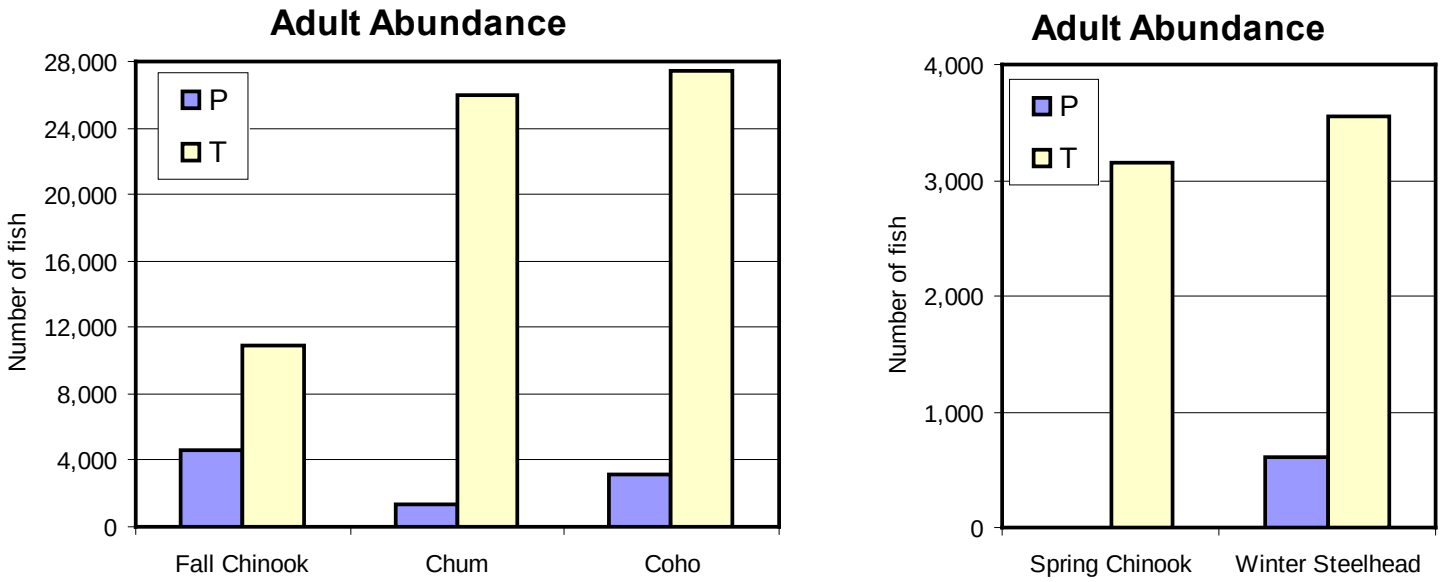


Figure I-4. Adult abundance of Toutle River fall Chinook, coho, winter steelhead and chum based on EDT analysis of current (P or patient), historical (T or template), and properly functioning (PFC) habitat conditions.

Stream 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 260 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 I-5 for a map of reaches in the Toutle River subbasin.

High priority reaches for fall Chinook include primarily SF Toutle reaches, although several mainstem reaches and Green River reaches are also important (Figure I-6). 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.

For spring Chinook, the high priority reaches are located in the middle and upper NF Toutle (NF Toutle 10-13) (Figure I-7). 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 I-8). 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. Reaches with the greatest potential benefit for coho recovery measures are located throughout the mainstem, North Fork, and lower SF Toutle (Figure I-9). All of these reaches are relatively degraded with respect to coho habitat and therefore have high restoration potential. Reaches with a high priority ranking for winter steelhead are located in the mainstem Toutle, the North Fork Toutle, the Green River, and several Green River tributaries (Elk Creek, Shultz Creek, and Miners Creek) (Figure I-10). Priority reaches show a combination of restoration and preservation emphasis.

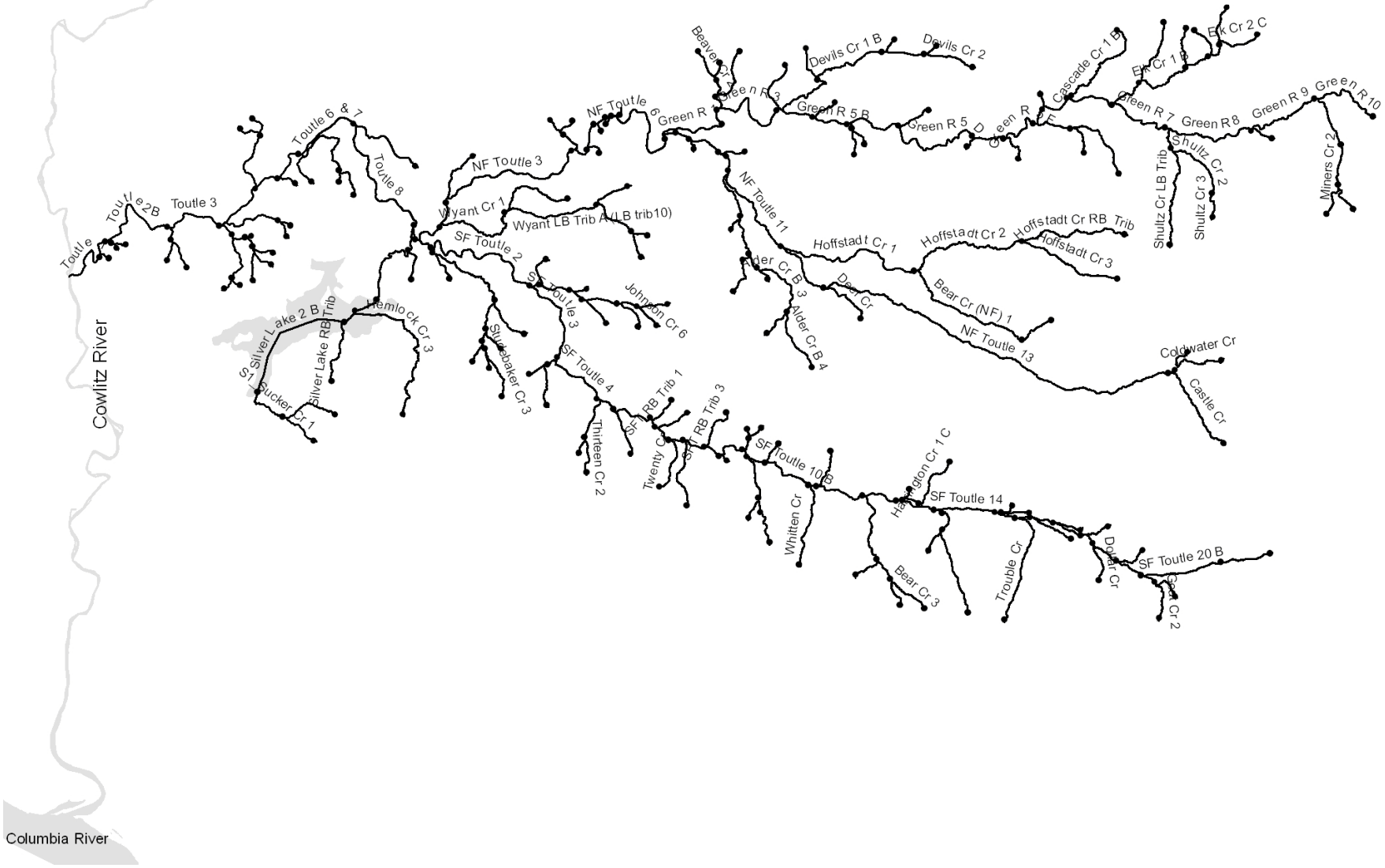


Figure I-5. Toutle subbasin with EDT reaches identified. For readability, not all reaches are labeled.

Toutle Fall Chinook

Potential Change in Population Performance with Degradation and Restoration

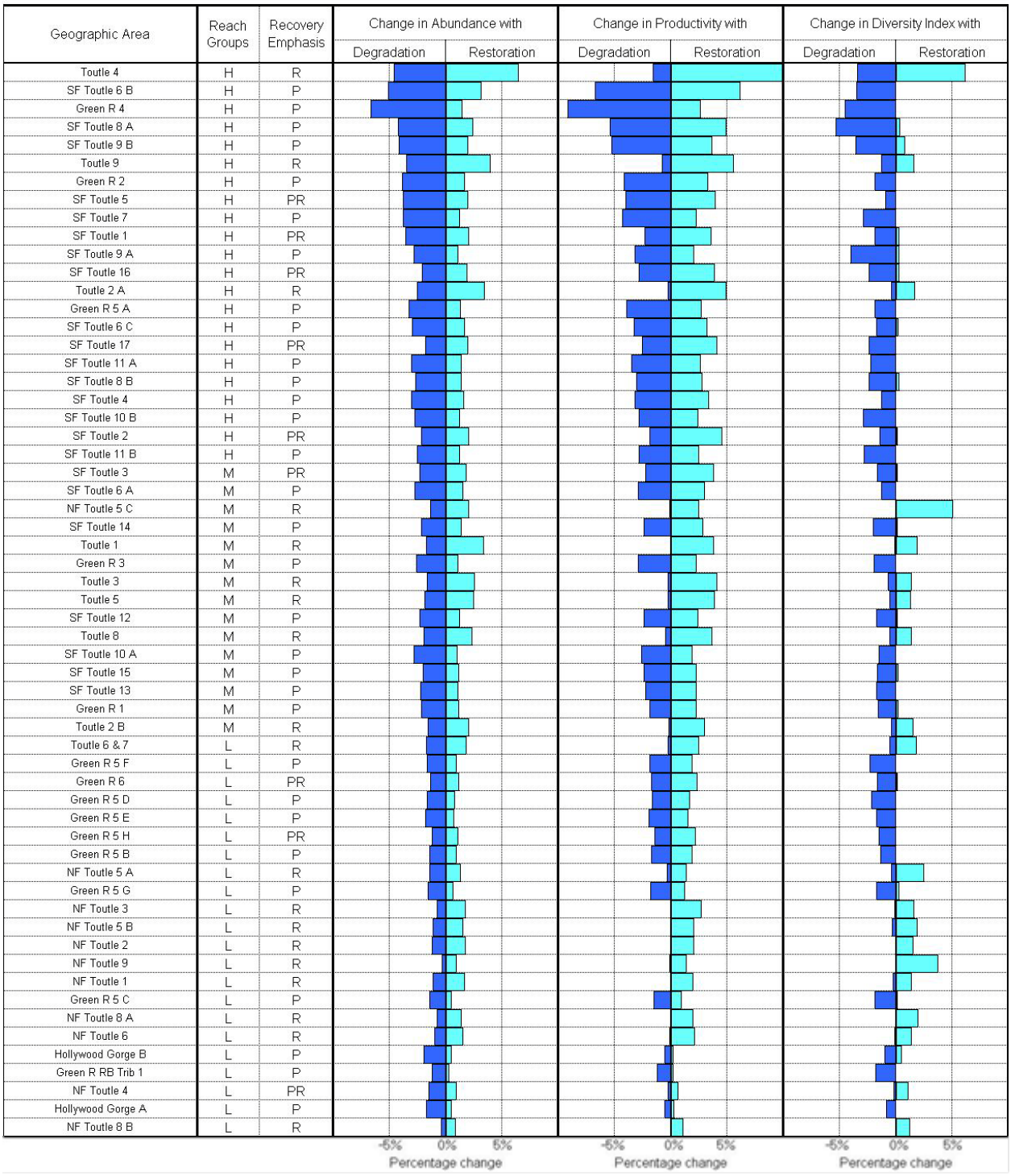


Figure I-6. **Toutle River fall Chinook ladder diagram. The rungs on the ladder represent the reaches and the three ladders contain a preservation value and restoration potential based on abundance, productivity, and diversity. The units in each rung are the percent change from the current population. 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 Appendix E Chapter 6 for more information on EDT ladder diagrams. Some low priority reaches are not included for display purposes.**

Toutle Spring Chinook

Potential Change in Population Performance with Degradation and Restoration

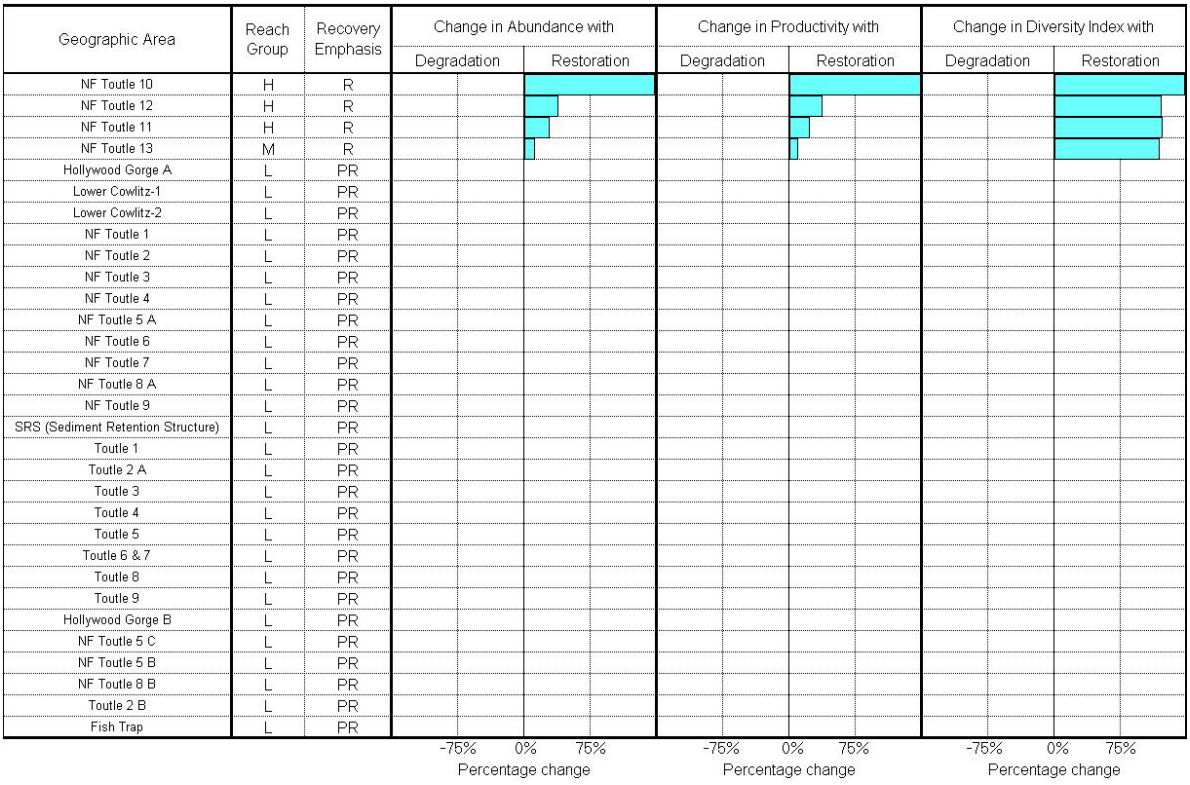


Figure I-7. **Toutle spring Chinook ladder diagram. The rungs on the ladder represent the reaches and the three ladders contain a preservation value and restoration potential based on abundance, productivity, and diversity. The units in each rung are the percent change from the current population. For 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 Appendix E Chapter 6 for more information on EDT ladder diagrams. Some low priority reaches are not included for display purposes.**

Toutle Chum

Potential change in population performance with degradation and restoration

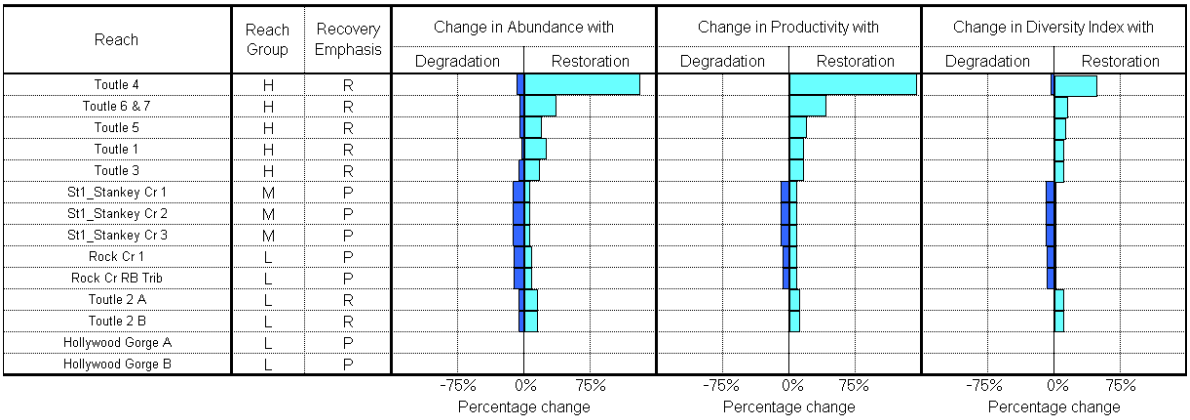


Figure I-8. **Toutle chum ladder diagram. The rungs on the ladder represent the reaches and the three ladders contain a preservation value and restoration potential based on abundance, productivity, and diversity. The units in each rung are the percent change from the current population. For each reach, 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 Appendix E Chapter 6 for more information on EDT ladder diagrams. Some low priority reaches are not included for display purposes.**

Toutle Coho

Potential Change in Population Performance with Degradation and Restoration

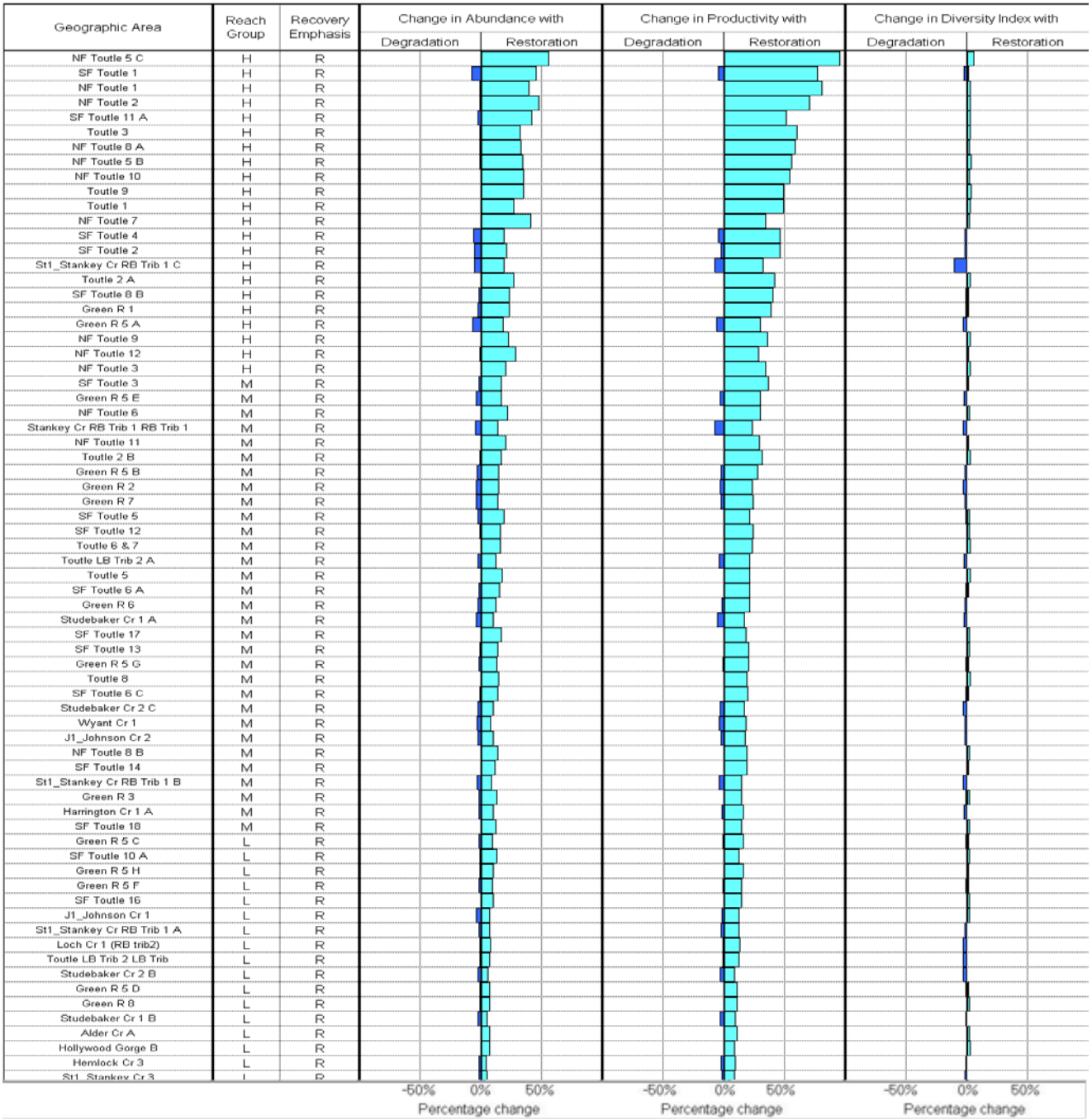


Figure I-9. **Toutle coho ladder diagram. Some low priority reaches are not included for display purposes. The rungs on the ladder represent the reaches and the three ladders contain a preservation value and restoration potential based on abundance, productivity, and diversity. The units in each rung 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 Appendix E Chapter 6 for more information on EDT ladder diagrams. Some low priority reaches are not included for display purposes.**

Toutle Winter Steelhead

Potential Change in Population Performance with Degradation and Restoration

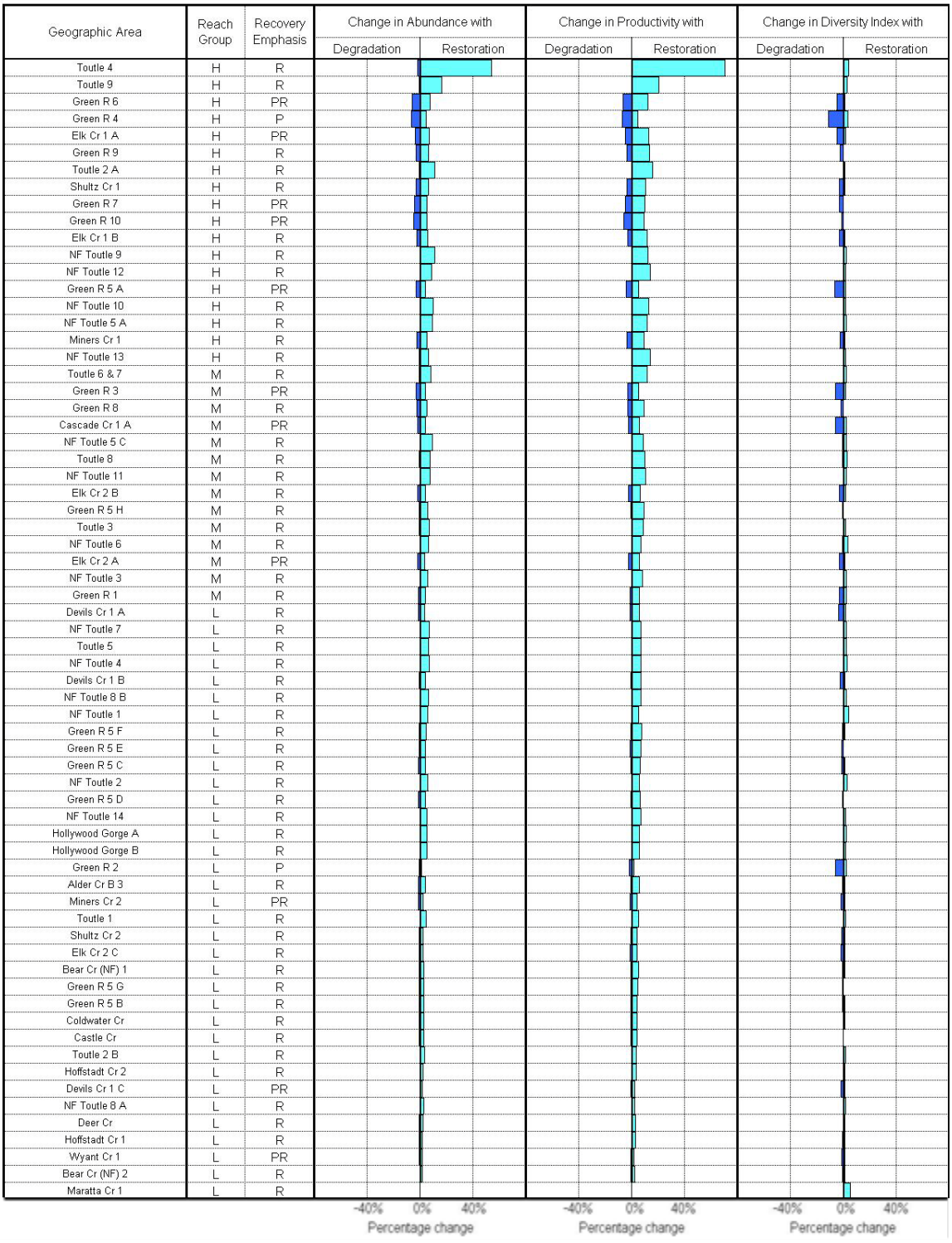


Figure I-10. **Toutle winter steelhead ladder diagram. Some low priority reaches are not included for display purposes. The rungs on the ladder represent the reaches and the three ladders contain a preservation value and restoration potential based on abundance, productivity, and diversity. The units 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 Appendix E Chapter 6 for more information on EDT ladder diagrams. Some low priority reaches are not included for display purposes.**

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 habitat factor analysis compares current/patient and historical/template habitat conditions. For each reach, EDT generates what is refered to as a "consumer reports diagram", which identifies the degree to which individual habitat factors are acting to suppress population performance. The effect of each habitat factor is identified for each life stage that occurs in the reach and the relative importance of each life stage is indicated. For additional information and examples of this analysis, see Appendix E. Inclusion of the consumer report diagram for each reach is beyond the scope of this document. A summary of the most critical life stages and the habitat factors affecting them are displayed for each species in Table I-3.

The consumer reports diagrams have also been summarized to show the relative importance of habitat factors by reach. The summary figures are referred to as habitat factor analysis diagrams and are displayed for each species below. 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 impact of habitat attributes on reach-level performance.

Key reaches for fall Chinook in the Toutle Basin area located primarily in the South Fork Toutle (Figure I-11). Sediment has had the greatest impact, followed by habitat diversity, channel stability, 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 sedimentation persists from the 1980 Mt. Saint Helens eruption, especially in the mainstem. Severe sediment aggradation has initiated bank cutting that increases sediment contribution 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 I-12). The causes of these impacts are similar to those discussed above.

For coho in the Toutle basin, many of the important reaches and the habitat factors affecting them are similar to those for fall Chinook. Impairments are related primarily to sediment, habitat diversity, and channel stability (Figure I-15). 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 Mt. 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% of their basins in 'other forest' conditions, which consists of brush, grass, or bare soil. High priority winter steelhead reaches are impacted by similar condtions as those mentioned above for coho, with a greater emphasis on sediment and temperature impacts. Competition impacts occur for both coho and winter steelhead. These impacts are related to the operations of the NF Toutle Hatchery, which produces coho, fall Chinook, and also releases juvenile summer steelhead.

In the lower Toutle mainstem, where the majority of important reaches for chum are located, habitat has been negatively impacted by fine sediment, declines in habitat diversity, and channel instability (Figure I-14). Reaches 1-2 and 6-8 have nearly 80% of riparian forests in 'other forest' condition, which indicates significant impairment. 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 instability.

Table I-3. Summary of the primary limiting factors affecting life stages of focal salmonid species. Results are summarized from EDT Analysis.

Species and Lifestage		*Primary factors*	*Secondary factors*	*Tertiary factors*
Toutle Fall Chinook				
most critical	Egg incubation	sediment	channel stability	temperature
second	Spawning	sediment	habitat diversity, temperature	harassment, predation
third	Prespawning holding	habitat diversity, flow, key habitat, sediment	temperature	
Toutle Spring Chinook				
most critical	Egg incubation	sediment	channel stability, temperature	
second	Spawning	temperature	sediment	habitat diversity
third	Prespawning holding	temperature	habitat diversity, flow, sediment, key habitat	
Toutle Chum				
most critical	Egg incubation	channel stability, sediment		
second	Prespawning holding	habitat diversity, sediment	flow, harassment, key habitat	
third	Spawning	habitat diversity, sediment	harassment	key habitat
Toutle Coho				
most critical	Egg incubation	channel stability, sediment		
second	0-age winter rearing	habitat diversity	channel stability, flow, sediment, key habitat	food
third	0-age summer rearing	habitat diversity	sediment, temperature, key habitat	channel stability, competition (hatchery), flow, food, predation
Toutle Winter Steelhead				
most critical	Egg incubation	sediment, temperature	channel stability	
second	0-age summer rearing	habitat diversity, flow, pathogens, sediment, temperature	channel stability, competition (hatchery), food, predation	
third	0,1-age winter rearing	channel stability, habitat diversity, flow, sediment		

Toutle Fall Chinook
Protection and Restoration Strategic Priority Summary

Geographic area priority	Attribute class priority for restoration															
Geographic area	*Channel stability*	*Chemicals*	*Competition (w/ hatch)*	*Competition (other sp)*	*Flow*	*Food*	*Habitat diversity*	*Harassment/poaching*	*Obstructions*	*Oxygen*	*Pathogens*	*Predation*	*Sediment load*	*Temperature*	*Withdrawals*	*Key habitat quantity*
Toutle 4	●				•	•	●						●	●		•
SF Toutle 6 B	●				•		●	•					●	•		•
Green R 4	•				•		●						●	•		•
SF Toutle 8 A	●				•		●						●	•		•
SF Toutle 9 B	●				•		●						●	•		•
Toutle 9	●				•	•	●						●	●		•
Green R 2	•				•		•	•					●	●		•
SF Toutle 5	•				•		●	•					●	•		•
SF Toutle 7	•				•		●	•					●	•		•
SF Toutle 1	●				•	•	•						●	●		•
SF Toutle 9 A	●				•		●						●	•		•
SF Toutle 16	●				•		●						●			•
Toutle 2 A	●				•	•	●						●	●		•
Green R 5 A	•				•		•						●	•		•
SF Toutle 6 C	•				•		●	•					●	•		•
SF Toutle 17	●				•		●						●			•
SF Toutle 11 A	•				•		●						●	•		•
SF Toutle 8 B	•				•		•						●	•		•
SF Toutle 4	•				•		•	•					●	•		•
SF Toutle 10 B	•				•		●						●	•		•
SF Toutle 2	●				•	•	•	•					●	●		•
SF Toutle 11 B	•				•		●						●	•		•
SF Toutle 3	•				•		●	•					●	•		•
SF Toutle 6 A	•				•		●	•					●	•		•
NF Toutle 5 C	•				•		●						●	●		•
SF Toutle 14	●				•		●						●	•		•
Toutle 1	●				•	•	●	•				•	●	•		●
Green R 3	•				•		●						●	•		•
Toutle 3	•				•	•	●						●	●		•
Toutle 5	•				•	•	●						●	●		•
SF Toutle 12	•				•		●						●	•		•
Toutle 8	●				•	•	●						●	●		•
SF Toutle 10 A	•				•		●						●	•		•
SF Toutle 15	●				•		●						●			•
SF Toutle 13	•				•		●						●			•
Green R 1	•				•		•	•					●	●		•
Toutle 2 B	●				•	•	•						●	●		•
Toutle 6 & 7	●				•	•	●						●	●		•
Green R 5 F	•				•		●						●	•		•
Green R 6	•				•		●						●	•		•

1/ "Channel stability" applies to freshwater areas only.

Key to strategic priority (corresponding Benefit Category letter also shown)

A ● High B ● Medium C • Low D & E ○ Indirect or General

Figure I-11. Toutle subbasin fall Chinook 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 impact of habitat attributes on reach-level performance. See Appendix E Chapter 6 for more information on habitat factor analysis diagrams. Some low priority reaches may not be included for display purposes.

Toutle Spring Chinook
Protection and Restoration Strategic Priority Summary

Geographic area priority	Attribute class priority for restoration															
Geographic area	*Channel stability*	*Chemicals*	*Competition (w/ hatch)*	*Competition (other sp)*	*Flow*	*Food*	*Habitat diversity*	*Harassment/poaching*	*Obstructions*	*Oxygen*	*Pathogens*	*Predation*	*Sediment load*	*Temperature*	*Withdrawals*	*Key habitat quantity*
NF Toutle 10	●				•	•	●						●	●		•
NF Toutle 12	●				•	•	●						●	●		•
NF Toutle 11	●				•	•	●						●	●		•
NF Toutle 13	●				•	•	●						●	●		•
Hollywood Gorge A					•		•						●	•		•
Lower Cowlitz-1			•				•				•			•		
Lower Cowlitz-2			•			•	•				•			•		•
NF Toutle 1	•				•	•	•						●	•		•
NF Toutle 2	•				•	•	●						●	•		•
NF Toutle 3	•				•	•	●						●	•		•
NF Toutle 4	•				•		●						●	•		•
NF Toutle 5 A	•				•		●						●	•		•
NF Toutle 6	•				•		●						●	•		•
NF Toutle 7	•				•	•	●						●	•		•
NF Toutle 8 A	•				•		●						●	●		•
NF Toutle 9	•				•	•	●						●	●		•
SRS (Sediment Retention Structure)																
Toutle 1	•				•	•	●					•	●			•
Toutle 2 A	•				•	•	●						●	•		•
Toutle 3	•				•	•	•						●	•		•
Toutle 4	•				•	•	●						●	•		•
Toutle 5	•				•	•	●						●	•		•
Toutle 6 & 7	•				•	•	●						●	•		•
Toutle 8	•				•	•	●						●	•		•
Toutle 9	•				•	•	●						●	•		•
Hollywood Gorge B					•		•						●	•		•
NF Toutle 5 C	•				•		●						●	•		•
NF Toutle 5 B	•				•		•						●	•		•
NF Toutle 8 B	•				•	•	●						●	●		•
Toutle 2 B	•				•	•	•						●	•		•
Fish Trap																

1/ "Channel stability" applies to freshwater areas only.

Key to strategic priority (corresponding Benefit Category letter also shown)

A ● High B • Medium C • Low D & E ☐ Indirect or General

Figure I-12. Toutle spring Chinook habitat factor analysis diagram. Some low priority reaches may not be included for display purposes. 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 impact of habitat attributes on reach-level performance. See Appendix E Chapter 6 for more information on habitat factor analysis diagrams. Some low priority reaches may not be included for display purposes.

Toutle Coho
Protection and Restoration Strategic Priority Summary

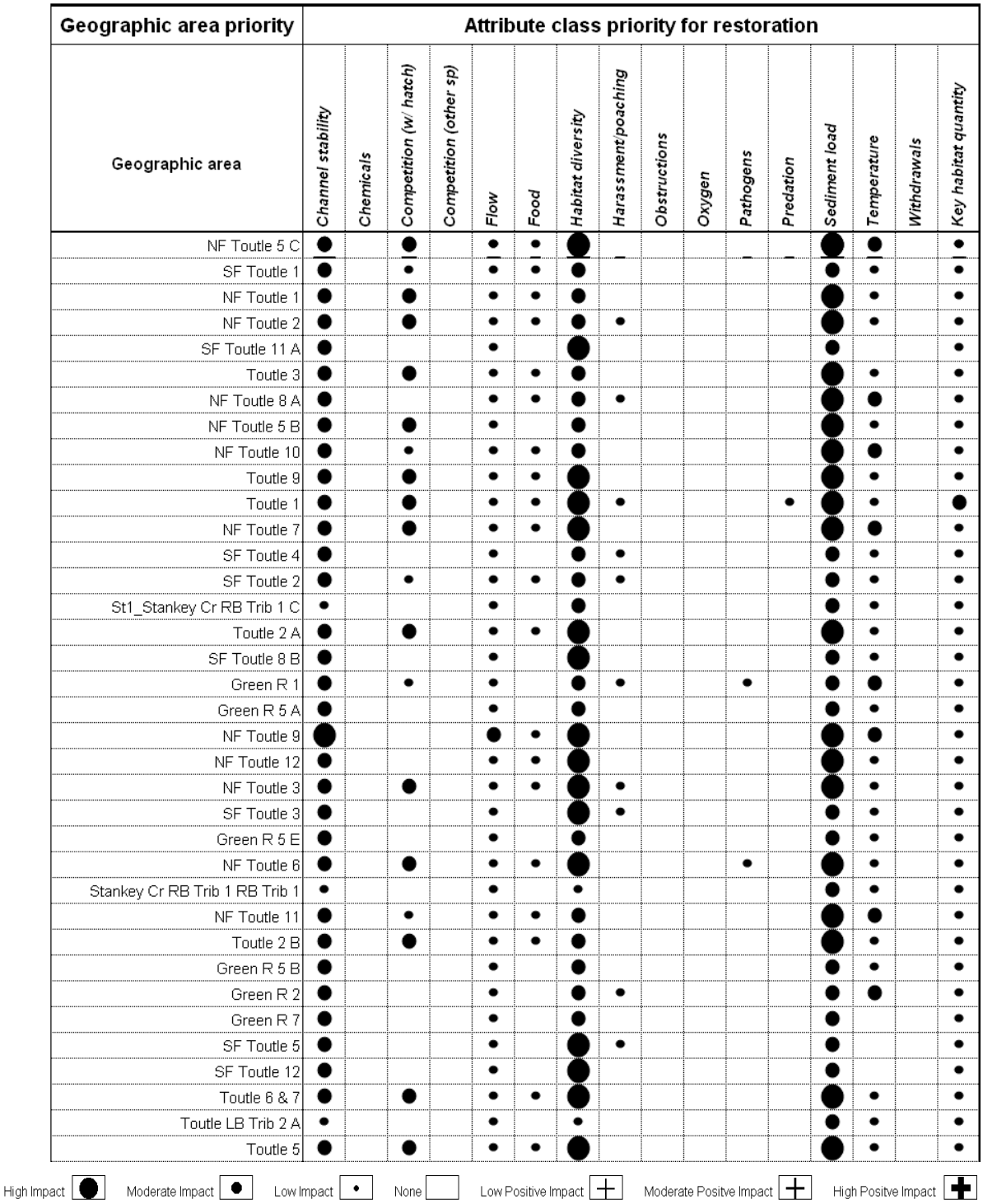


Figure I-13. Toutle coho habitat factor analysis diagram. Some low priority reaches may not be included for display purposes. Diagram displays the relative impact of habitat factors in specific reaches. The reaches are ordered according to their restoration and preservation rank, which factors in their 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 impact of habitat attributes on reach-level performance. See Appendix E Chapter 6 for more information on habitat factor analysis diagrams. Some low priority reaches may not be included for display purposes.

Toutle Winter Steelhead
Protection and Restoration Strategic Priority Summary

Geographic area priority	Attribute class priority for restoration															
Geographic area	*Channel stability*	*Chemicals*	*Competition (w/ hatch)*	*Competition (other sp)*	*Flow*	*Food*	*Habitat diversity*	*Harassment/poaching*	*Obstructions*	*Oxygen*	*Pathogens*	*Predation*	*Sediment load*	*Temperature*	*Withdrawals*	*Key habitat quantity*
Toutle 4	●		●		●		●				●	●	●	●		●
Toutle 9	●		●		●		●				●	●	●	●		●
Green R 6	●				●		●						●	●		●
Green R 4	●				●		●						●	●		●
Elk Cr 1 A	●				●		●						●	●		●
Green R 9	●				●		●						●	●		●
Toutle 2 A	●		●		●	●	●				●	●	●	●		●
Shultz Cr 1	●				●								●	●		●
Green R 7	●				●		●						●	●		●
Green R 10	●				●		●						●	●		●
Elk Cr 1 B	●				●		●						●	●		●
NF Toutle 9	●				●		●				●		●	●		●
NF Toutle 12	●				●	●	●				●		●	●		●
Green R 5 A	●				●		●						●	●		●
NF Toutle 10	●		●		●	●	●				●		●	●		●
NF Toutle 5 A	●		●		●		●				●	●	●	●		●
Miners Cr 1	●				●	●	●						●	●		●
NF Toutle 13	●				●	●	●						●	●		●
Toutle 6 & 7	●		●		●		●				●	●	●	●		●
Green R 3	●				●		●						●	●		●
Green R 8	●				●		●						●	●		●
Cascade Cr 1 A	●				●		●						●	●		●
NF Toutle 5 C	●		●		●		●				●	●	●	●		●
Toutle 8	●		●		●		●				●	●	●	●		●
NF Toutle 11	●		●		●	●	●				●		●	●		●
Elk Cr 2 B	●				●		●						●	●		●
Green R 5 H	●				●		●						●	●		●
Toutle 3	●		●		●		●				●	●	●	●		●
NF Toutle 6	●		●		●		●				●	●	●	●		●
Elk Cr 2 A	●				●		●						●	●		●
NF Toutle 3	●		●		●		●	●			●	●	●	●		●
Green R 1	●		●		●		●	●			●	●	●	●		●
Devils Cr 1 A	●				●		●						●	●		●
NF Toutle 7	●		●		●		●	●			●	●	●	●		●
Toutle 5	●		●		●		●				●	●	●	●		●
NF Toutle 4	●		●		●		●				●	●	●	●		●
Devils Cr 1 B	●				●		●						●	●		●

1/ "Channel stability" applies to freshwater areas only.

Key to strategic priority (corresponding Benefit Category letter also shown)

A ● High B ● Medium C ● Low D & E ☐ Indirect or General

Figure I-14. Toutle winter steelhead habitat factor analysis diagram. Some low priority reaches may not be included for display purposes. 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 impact of habitat attributes on reach-level performance. See Appendix E Chapter 6 for more information on habitat factor analysis diagrams. Some low priority reaches may not be included for display purposes.

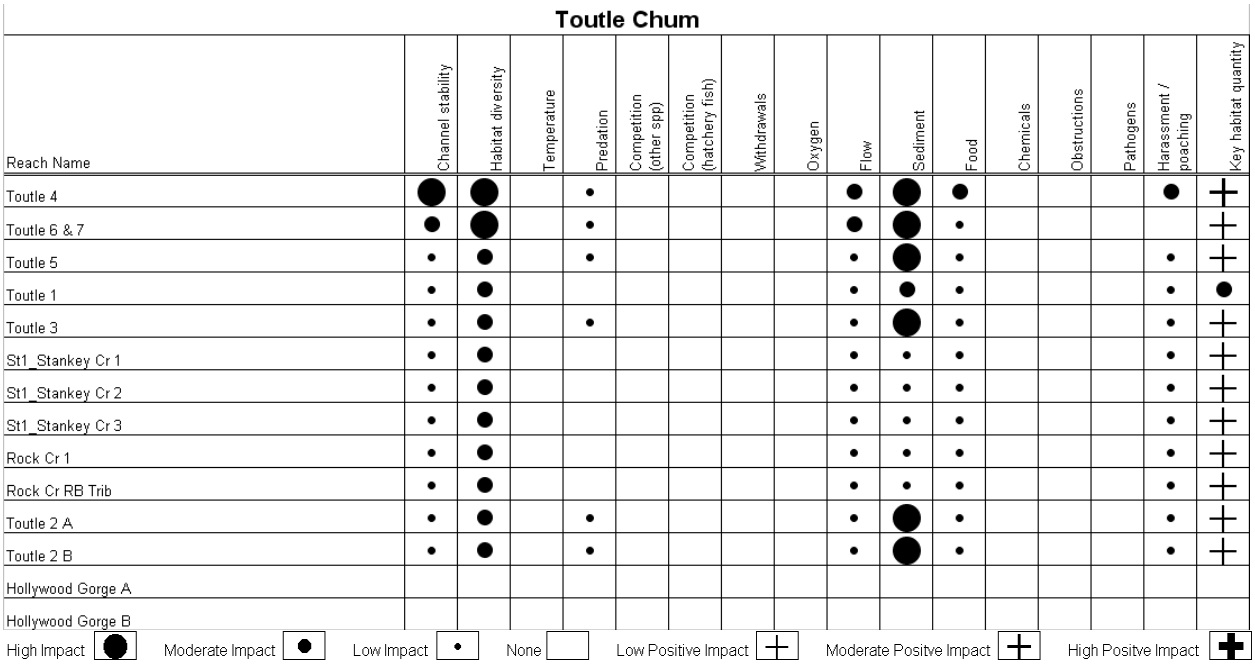


Figure I-15. Toutle subbasin chum habitat factor analysis diagram. This chum habitat factor analysis diagram differs from the others in that the dot size represents not only the relative within-reach impact of the habitat attributes, but also the relative contribution of each reach's impact on total population performance. The dots therefore decrease in size towards the bottom of the chart.

I.3.5. Watershed Process Limitations

This section describes watershed process limitations that contribute to stream habitat conditions significant to focal fish species. Reach level stream habitat conditions are influenced by systemic watershed processes. Limiting factors such as temperature, high and low flows, sediment input, and large woody debris recruitment are often affected by upstream conditions and by contributing landscape factors. Accordingly, restoration of degraded channel habitat may require action outside the targeted reach, often extending into riparian and hillslope (upland) areas that are believed to influence the condition of aquatic habitats.

Watershed process impairments that affect stream habitat conditions were evaluated using a watershed process screening tool termed the Integrated Watershed Assessment (IWA). The IWA is a GIS-based assessment that evaluates watershed impairments at the subwatershed scale (3,000 to 12,000 acres). The tool uses landscape conditions (i.e. road density, impervious surfaces, vegetation, soil erodability, and topography) to identify the level of impairment of 1) riparian function, 2) sediment supply conditions, and 3) hydrology (runoff) conditions. For sediment and hydrology, the level of impairment is determined for local conditions (i.e. within subwatersheds, not including upstream drainage area) and at the watershed level (i.e. integrating the entire drainage area upstream of each subwatershed). See Appendix E for additional information on the IWA.

The Toutle River watershed contains 46 planning subwatersheds, ranging from approximately 3,000 to 12,000 acres. IWA results for the Toutle River watershed are shown in Table I-4. A reference map showing the location of each subwatershed in the basin is presented in Figure I-16. Maps of the distribution of local and watershed level IWA results are displayed in Figure I-17.

Hydrology

Current Conditions— 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).

Predicted Future Trends— 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 Mt. 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.

Table I-4. 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
40404						40101, 40102, 40201, 40202, 40203, 40301, 40302, 40401
50101	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	
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, 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

[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 I-16. Map of the Toutle basin showing the location of the IWA subwatersheds.

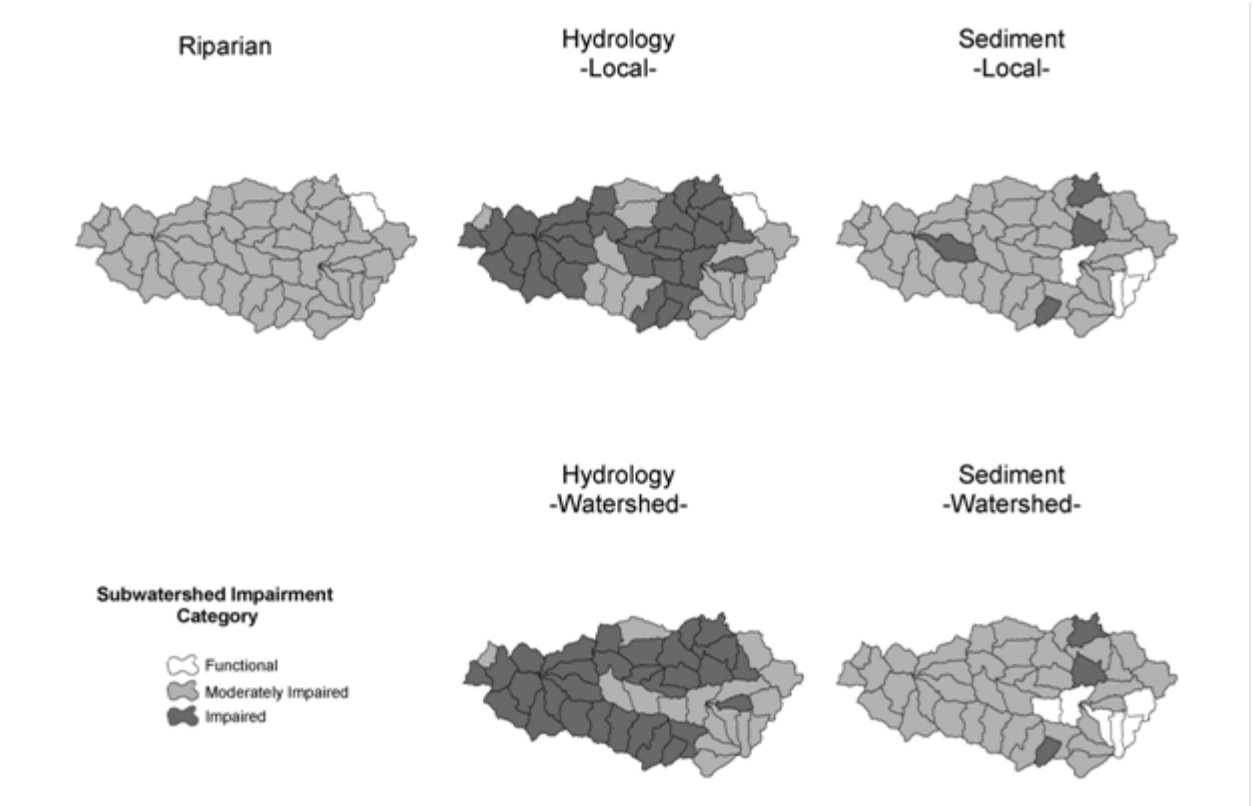


Figure I-17. IWA subwatershed impairment ratings by category for the Toutle basin

Sediment Supply

Current Conditions— 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.

Predicted Future Trends— 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 Mt. 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.

Riparian Condition

Current Conditions— 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 Mt. St. Helens eruption. Riparian conditions in all important anadromous subwatersheds are uniformly rated as moderately impaired.

Predicted Future Trends— In general, riparian conditions are likely to improve over time with improved forestry practices and recovery of vegetation destroyed by the Mt. 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.

I.3.6. Other Factors and Limitations

Hatcheries

Hatcheries currently release over 50 million salmon and steelhead per year in Washington lower Columbia River subbasins. Many of these fish are released to mitigate for loss of habitat. Hatcheries can provide valuable mitigation and conservation benefits but may also cause significant adverse impacts if not prudently and properly employed. Risks to wild fish include genetic deterioration, reduced fitness and survival, ecological effects such as competition or predation, facility effects on passage and water quality, mixed stock fishery effects, and confounding the accuracy of wild population status estimates. This section describes hatchery programs in the Toutle subbasin and discusses their potential effects.

The North Toutle Hatchery (since 1952) produces fall Chinook and coho, and releases summer steelhead for harvest opportunity. The hatchery is located on the lower Green River near the confluence with the NF Toutle River. The hatchery was destroyed in the 1980 eruption of Mt. St. Helens, but was renovated in 1990. The steelhead are transferred in from Skamania Hatchery as pre-smolts. Skamania Hatchery steelhead are a composite stock and are genetically different from the naturally-produced winter steelhead in the Toutle Basin. The main threats from hatchery steelhead are potential domestication of the naturally-produced steelhead as a result of adult interactions or ecological interactions between natural juvenile salmon and hatchery released juvenile steelhead. The main hatchery threats from the North Toutle Hatchery salmon programs are domestication of natural fall Chinook and coho and potential ecological interactions between hatchery and natural juvenile salmon.

Table I-5. Current Toutle subbasin hatchery production.

Hatchery	Release Location	Fall Chinook	Early Coho	Summer Steelhead
North Toutle	Green River	2,500,000[1]	800,000	25,000
Skamania	South Toutle			25,000

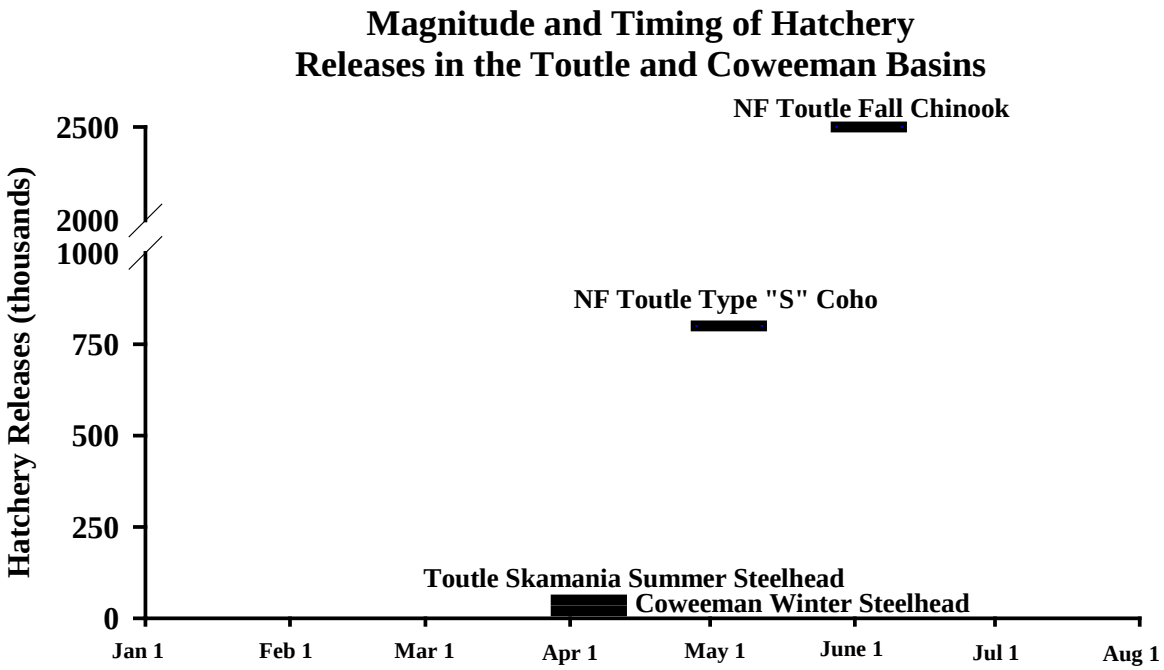


Figure I-18. Magnitude and timing of hatchery releases in the Toutle and Coweeman River basins by species, based on 2003 brood production goals.

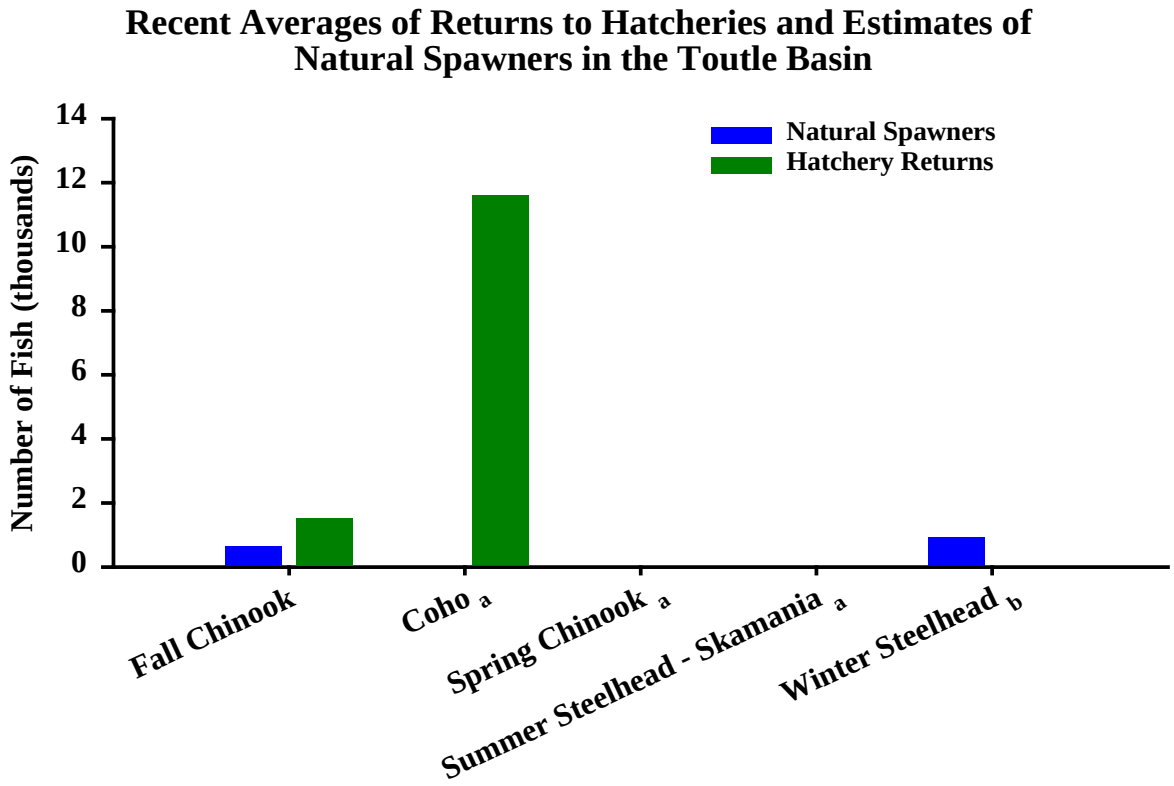


Figure I-19. Recent average hatchery returns and estimates of natural spawning escapement in the Toutle River basins by species. The years used to calculate averages varied by species, based on available data. The data used to calculate average hatchery returns and natural escapement for a particular species and basin were derived from the same years in all cases. All data were from 1992 to the present. Calculation of each average utilized a minimum of 5 years of data.

Hatchery Effects

Genetics

Fall Chinook broodstock at the North Toutle Hatchery have been primarily collected from the Toutle River although there have been been significant transfers made from lower Columbia ESU hatchery stocks, most significantly Spring Creek Hatchery and Kalama Hatchery fall Chinook. Specific genetic data is not available for Toutle Fall Chinook.

Broodstock for the coho salmon hatchery programs in the Cowlitz Basin has come from native Cowlitz River (Cowlitz Salmon Hatchery) and Toutle River (North Toutle Hatchery) stocks. These stocks also have been used as broodstock for other lower Columbia River coho hatchery programs. Late stock coho salmon (Type N) and early coho salmon (Type S) are informally considered synonymous with Cowlitz River and Toutle River coho stocks, respectively. Columbia River early and late stock coho salmon produced from Washington hatcheries have not been found to be genetically different.

Broodstock for the summer steelhead hatchery program at the North Toutle Hatchery and the Cowlitz Trout Hatchery originated from Skamania stock. The North Toutle Hatchery continues to receive broodstock from the Skamania Hatchery, while summer steelhead broodstock for the Cowlitz program is collected at the Cowlitz Trout and Salmon hatcheries.

Interactions— Hatchery fall Chinook account for most adults returning to the Cowlitz, Toutle, and Green rivers (Figure I-19). Hatchery returns are approximately double the natural escapement in the Cowlitz basin. Many natural spawners are expected to be first generation hatchery fish; wild fish abundance is likely low. The Toutle and Green River fall Chinook populations are re-establishing after the 1980 Mt. St. Helens eruption. Depending on the rebuilding success of these populations, the potential for wild/hatchery fish interactions may increase.

Hatchery coho salmon, account for most adults returning to the Cowlitz and Toutle rivers. Significant coho production can occur in the upper Cowlitz basin from adults transplanted from the lower river; these fish are usually first generation hatchery fish (Figure I-19). Natural coho production in the Toutle basin primarily occurs in tributaries of the South Fork Toutle and Green rivers, as well as tributaries of the North Fork Toutle River upstream of the Sediment Retention Dam. Hatchery smolts released in the lower Cowlitz River potentially compete with wild fall Chinook, steelhead, and chum salmon for food and space, but competition is limited to smolt migration time through the basin. Migration time is minimized by releasing smolts (in May) when they are prepared to move towards the Columbia estuary

In the Toutle River system, the winter steelhead annual return is thought to be primarily comprised of naturally produced fish (Figure I-19). Potential for interaction between wild and hatchery adults is expected to be low because of relative numbers of natural and hatchery fish and temporal and spatial segregation.

Water Quality/Disease— Water for the North Toutle Hatchery comes from the Green River; the hatchery has a water right totaling 26,031 gpm. A rearing site associated on the South Fork Toutle River utilizes 3-4 cfs directly from the river. Rearing ponds at the facility are sanitized with chlorine at 20 parts per million before being stocked with fry. Equipment used at the rearing ponds is routinely disinfected with an iodine solution. Fish are monitored throughout the rearing phase by WDFW pathologists.

Mixed Harvest— The purpose of the fall Chinook hatchery program at the North Toutle Hatchery is to mitigate for losses resulting from hydroelectric development in the lower Columbia basin. Historically, exploitation rates of hatchery and wild fall Chinook likely were similar. Fall Chinook are an important target species in ocean and Columbia River commercial and recreational fisheries, as well as in Cowlitz River recreational fisheries. CWT data analysis of the fall Chinook 1989–1994 brood years from the

Cowlitz Salmon and North Toutle hatcheries indicate a 33% and 41% exploitation rate, respectively, leaving 67% and 59% of the respective adult return for escapement. Exploitation of wild fish during the same period likely was similar. Hatchery and wild fall Chinook harvest rates remain similar and are now constrained by ESA harvest limitations.

Mitigating for early run coho salmon lost as a result of hydroelectric development in the lower Columbia basin is the goal of the North Toutle Hatchery coho salmon program. The program provides fish for harvest while minimizing adverse effects on ESA-listed fish. All hatchery smolts are adipose fin-clipped to allow for selective harvest. Ocean and Columbia River sport and commercial fisheries and Cowlitz basin sport fisheries benefit from this program. Historically, naturally produced coho from the Columbia River were managed like hatchery fish and subjected to similar exploitation rates. Ocean and Columbia River combined harvest of Columbia River-produced coho ranged from 70% to over 90% during 1970–1983. To protect several wild coho stocks, ocean fisheries were limited beginning in the mid-1980s and Columbia River commercial fisheries were temporally adjusted in the early 1990s. With the advent of selective fisheries for marked hatchery fish, exploitation of wild coho has been reduced, while hatchery fish can be harvested at higher rates. Currently, Toutle wild coho benefit from ESA harvest restrictions placed on Oregon Coastal natural coho (federal listing) in ocean fisheries and Oregon Lower Columbia natural coho (state listing) in Columbia River fisheries.

At the Cowlitz Trout Hatchery and the North Toutle Hatchery, the summer steelhead hatchery programs mitigate for steelhead lost as a result of hydroelectric development in the basin and provide harvest opportunity. Summer steelhead are introduced to the basin; there is no intention of trying to develop a self-sustaining population of summer steelhead. Fisheries that benefit include tributary and lower Columbia River recreational fisheries. Selective fishing regulations and the differences in the timing of runs focus harvest on hatchery summer steelhead and minimize effects to wild steelhead.

Passage— At the North Toutle Hatchery, the adult collection facility is a temporary weir for collecting coho salmon and fall Chinook. The weir is installed and removed annually and only effects fish passage during the time of adult coho and fall Chinook collection.

Supplementation— The Cowlitz Trout Hatchery has an annual goal of restoring natural spawning late-run winter steelhead populations in the upper Cowlitz and Tilton River basins. Current annual release goals are 350,000 fingerlings and 37,500 smolts in the upper watershed. Juvenile downstream migrant passage is better at the hydro-facility then for Chinook, and similar to coho.

Biological Risk Assessment: The evaluation of hatchery programs and implementation of hatchery reform in the Lower Columbia is occurring through several processes. These include: 1) the LCFRB recovery planning process; 2) Hatchery Genetic Management Plan (HGMP) preparation for ESA permitting; 3) FERC related plans on the Cowlitz River and Lewis River; 4) the federally mandated Artificial Production Review and Evaluation (APRE) process, and 5) the congressionally mandated, Hatchery Scientific Review Group (HSRG) review of all state, tribal and federal hatchery programs in Puget Sound and Coastal Washington, and in the Columbia River Basin. Through each of these processes, WDFW is applying a consistent framework to identify the hatchery program enhancements that will maximize fishing-related economic benefits and promote attainment of regional recovery goals. Developing hatcheries into an integrated, productive, stock recovery tool requires a policy framework for considering the acceptable risks of artificial propagation, and a scientific assessment of the benefits and risks of each proposed hatchery program.

WDFW completed a Benefit-Risk Assessment Procedure (BRAP) in 2004 to provide a framework for considerations of hatchery reforms consistent with the Recovery Plan. The BRAP evaluates hatchery programs in the ecological context of the watershed, with integrated assessment and decisions for hatcheries, harvest, and habitat. The risk assessment procedure consists of five basic steps, grouped into two blocks. A policy framework assesses population status of wild populations, develops risk tolerance profiles for all stock conditions, and assign risk tolerance profiles to all stocks. A risk assessment characterizes risk assessments for each hatchery program and identifies appropriate management actions to reduce risk.

Table I-6 identifies hazards levels associated with risks involved with hatchery programs in the Toutle Basin. Table I-7 identifies preliminary strategies proposed to address risks identified in the BRAP for the same populations. The BRAP risk assessments and strategies to reduce risk have been key in providing the biological context to develop the hatchery recovery measures for lower Columbia River sub-basins.

Table I-6. Preliminary BRAP for hatchery programs affecting populations in the Toutle River Basin.

Symbol	Description
○	Risk of hazard consistent with current risk tolerance profile.
?	Magnitude of risk associated with hazard unknown.
●	Risk of hazard exceeds current risk tolerance profile.
	Hazard not relevant to population

	Hatchery Program		Risk Assessment of Hazards											
			Genetic			Ecological			Demographic		Facility			
Toutle Population	Name	Release (millions)	Effective Population Size	Domestication	Diversity	Predation	Competition	Disease	Survival Rate	Reproductive Success	Catastrophic Loss	Passage	Screening	Water Quality
Fall Chinook	NF Toutle Fall Chinook	2.500	○	○	○	○	?	○	○	?	○	●	●	○
	NF Toutle Coho Type S	0.800				?	?	○				●	●	○
	SF Toutle S. Steelhead	0.025				?	?	○				○	○	○
	NF Toutle S. Steelhead	0.025				?	?	○				○	○	○
Spring Chinook	NF Toutle Fall Chinook	2.500				?	?	○				●	●	○
	NF Toutle Coho Type S	0.800				?	?	○				●	●	○
	SF Toutle S. Steelhead	0.025				?	?	○				○	○	○
	NF Toutle S. Steelhead	0.025				?	?	○				○	○	○
Winter Steelhead South Fork	NF Toutle Fall Chinook	2.500				?	?	○				●	●	○
	NF Toutle Coho Type S	0.800				?	?	○				●	●	○
	SF Toutle S. Steelhead	0.025				?	?	○				○	○	○
	NF Toutle S. Steelhead	0.025				?	?	○				○	○	○
Winter Steelhead North Fork	NF Toutle Fall Chinook	2.500				?	?	○				●	●	○
	NF Toutle Coho Type S	0.800				?	?	○				●	●	○
	SF Toutle S. Steelhead	0.025				?	?	○				○	○	○
	NF Toutle S. Steelhead	0.025				?	?	○				○	○	○

Table I-7. Preliminary strategies proposed to address risks identified in the BRAP for Toutle River Basin populations.

	Hatchery Program		Risk Assessment of Hazards													
			Address Genetic Risks					Address Ecological Risks				Address Demographic Risks		Address Facility Risks		
Toutle Population	Name	Release (millions)	Mating Procedure	Integrated Program	Segregated Program	Research/ Monitoring	Broodstock Source	Number Released	Release Procedure	Disease Containment	Research/ Monitoring	Culture Procedure	Research/ Monitoring	Reliability	Improve Passage	Improve Screening	Pollution Abatement
Fall Chinook	N. Fork Toutle Fall Chinook	2.500											●		●	●	
	NF Toutle Coho Type S	0.800						●	●		●				●	●	
	SF Toutle S. Steelhead	0.025						●	●		●				—	—	
	NF Toutle S. Steelhead	0.025						●	●		●						
Spring Chinook	N. Fork Toutle Fall Chinook	2.500						●	●		●				●	●	
	NF Toutle Coho Type S	0.800						●	●		●				●	●	
	SF Toutle S. Steelhead	0.025						●	●		●						
	NF Toutle S. Steelhead	0.025						●	●		●						

The regional Hatchery Scientific Review Group (HSRG) completed an assessment of lower Columbia River hatcheries in 2009 (http://www.hatcheryreform.us/mfs/welcome_show.action). The HSRG is the independent scientific review panel of the Pacific Northwest Hatchery Reform Project established by Congress in 2000 in recognition that while hatcheries play a legitimate role in meeting harvest and conservation goals for Pacific Northwest salmon and steelhead, the hatchery system was in need of comprehensive reform. The HSRG has reviewed all state, tribal and federal hatchery programs in Puget Sound, Coastal Washington, and the Columbia River Basin. The HSRG concluded that hatcheries play an important role in the management of salmon and steelhead populations in the Columbia River Basin but that hatchery programs must be viewed not as surrogates or replacements for lost habitat, but as tools that can be managed as part of a coordinated strategy to meet watershed or regional resource goals, in concert with actions affecting habitat, harvest rates, water allocation and other important components of the human environment. The HSRG reached several critical, overarching conclusions regarding areas where current hatchery and harvest practices need to be reformed. Recommendation included:

- Manage hatchery broodstocks to achieve proper genetic integration with, or segregation from, natural populations;
- Promote of local adaptation of natural and hatchery populations;
- Minimize adverse ecological interactions between hatchery- and natural-origin fish;
- Minimize effects of hatchery facilities on the ecosystem in which they operate; and
- Maximize the survival of hatchery fish.

The HSRG developed a series of criteria for evaluating hatchery influence on wild populations based on Population Viability objectives identified in the Recovery Plan. Criteria are based on the proportion of effective hatchery-origin spawners (pHOS), the proportion of natural-origin adults in the broodstock (pNOB), and the proportionate natural influences (PNI) which is a product of pHOS and pNOB.

For Primary populations:

- pHOS should be less than 5% of the naturally spawning population, unless the hatchery population is integrated with the natural population.
- For integrated populations, pNOB should exceed pHOS by at least a factor of two, corresponding to a PNI (proportionate natural influence) value of 0.67 or greater and pHOS should be less than 0.30.

For Contributing populations:

- The proportion of effective hatchery-origin spawners (pHOS) should be less than 10% of the naturally spawning population, unless the hatchery population is integrated with the natural population.
- For integrated populations, pNOB should exceed pHOS, corresponding to a PNI value of 0.50 or greater and pHOS should be less than 0.30.

For Stabilizing populations:

- The current operating conditions were considered adequate to meet conservation goals. No criteria were developed for proportion of effective hatchery-origin spawners (pHOS) or PNI.

Evaluations of current hatchery programs relative to population recovery objectives and hatchery criteria led the HSRG to provide detailed recommendations for reform of specific hatchery programs for each species and programs. General recommendations are summarized below for each species. More specific recommendations for each hatchery program are detailed, along with analyses of alternatives, in the HSRG report (http://www.hatcheryreform.us/mfs/welcome_show.action). These recommendations inform the hatchery actions identified for this subbasin and hatchery reform implementation planning reflected in WDFW's Conservation and Sustainable Fisheries plans under current development.

For Chinook, the HSRG concluded that a major concern with these programs is the effect hatchery strays have on the long-term fitness of naturally spawning populations. Although programs provide significant harvest benefits, and in some cases, help preserve genetic resources in the ESU, there are many poorly segregated and poorly integrated programs. HSRG recommendations for Chinook hatchery reform included:

- In segregated programs, improve the ability to control hatchery fish on the spawning grounds so that harvest benefits can be maintained while improving natural-origin spawning abundance and productivity for instance, by installing weirs in specific drainages where straying limits the ability to meet conservation goals.
- Move production from some tributaries into larger segregated harvest programs in Select Area Fishery Evaluation areas, where excess hatchery fish can be removed by applying higher harvest rates.
- Reduce reliance of some programs on imported out-of-basin broodstock or rearing to improve homing and increase productivity.
- For integrated programs, increase the proportion of natural-origin fish used in hatchery broodstock and control the contribution of hatchery-origin fish to natural spawning areas. In some cases, meeting the criteria for the population designation requires reducing program size.

For coho, the HSRG concluded that a major concern with these programs is the effect hatchery strays have on the long-term fitness of naturally spawning populations. These programs provide significant harvest benefits, and in some cases, help preserve genetic resources in the ESU. However, the ESU is dominated by many poorly segregated and a few poorly integrated programs. HSRG recommendations for coho hatchery reform included:

- In segregated programs, improve the ability to control hatchery fish on the spawning grounds so that harvest benefits can be maintained while improving natural-origin spawning abundance and productivity for instance, by installing weirs in specific drainages where straying limits the ability to meet conservation goals.

- Move production from some tributaries into larger segregated harvest programs in Select Area Fishery Evaluation areas, where excess hatchery fish can be removed by applying higher harvest rates.
- For integrated programs, increase the proportion of natural-origin fish used in hatchery broodstock and control the contribution of hatchery-origin fish to natural spawning areas. In some cases, meeting the criteria for the population designation requires reducing program size.
- In some cases, harvest benefits could be maintained and conservation improved by developing highly integrated conservation programs with associated segregated harvest programs (stepping-stone programs).
- More emphasis on monitoring and evaluation programs to accurately estimate straying is also recommended.

For chum, the HSRG concluded that hatchery intervention can reduce demographic risk by boosting abundance and additional conservation propagation programs should be promptly initiated within each of the ESU's three geographic strata to reduce this risk. The HSRG had no recommendations to improve on single existing chum program (Grays River) and recommends its continued operation as an important safety net in the lower Columbia.

For steelhead, the HSRG concluded that all populations in this DPS meet or exceed the HSRG criteria for their population designation. No recommendations to change programs were made by the HSRG. However, due to uncertainty about the number of unharvested hatchery-origin fish from segregated programs that remain in the natural environment, the HSRG identified a need for additional monitoring to further clarify these values and to aid in assessing the ecological impacts to the natural populations.

Subbasin Specific Recommendations: The HSRG provided subbasin and population specific advice. For the Toutle subbasin, the following recommendations were made:

Toutle River – Fall Chinook

The HSRG observed that the population appears to be able to reach its conservation goal under numerous scenarios. Recommendations include:

- Consider designating this as a Primary population, given its available habitat
- Develop the capability to meet the challenge of collecting natural-origin broodstock that is representative of the entire population, including a monitoring program to estimate composition on the spawning grounds
- Implement a strategy for Bacteria Kidney Disease (BKD) control strategy

Toutle River – Coho

The HSRG recommends managing as an integrated program consistent with the Primary population designation. The adult fish collection facility at the Sediment Retention Dam could be used to manage the spawning composition and collect natural-origin fish for the integrated program.

NF Toutle River – Winter Steelhead

The HSRG noted that although there is no hatchery program for late winter steelhead, there is a straying issue due to segregated summer run steelhead plants causing a small genetic impact and possibly a significant ecological effect. The program should be modified in one of three ways including:

1. Reduce the size of the hatchery program
2. Manage to remove hatchery adults or
3. Replace with an integrated winter run program

Further recommendations include:

- Manage acclimation and reduce residualism
- Collect natural origin adults and remove at least 90% of the unharvested returning hatchery-origin adults

SF Toutle River – Winter Steelhead

The HSRG noted that due to the ecological and genetic risks from the segregated summer steelhead program on the ESA listed winter steelhead, the program should be modified in one of three ways including:

1. Reduce the size of the hatchery program
2. Manage to remove hatchery adults or
3. Replace with an integrated winter run program

Further recommendations include:

- Manage acclimation and reduce residualism
- Remove an additional 20% of returning adults, resulting in improvements in abundance and productivity
- Consider the river as a good candidate to be a wild steelhead management zone

Impacts: Impacts of hatchery fish on local wild populations are estimated in this plan, for the purposes of comparison with the relative magnitude of other factors, based on hatchery fractions and assumed fitness effects estimated by the HSRG. Detailed explanations of these impact estimates may be found in Volume I, Chapter 3 of this Recovery Plan.

Harvest

Fishing generally affects salmon populations through directed and incidental harvest, catch and release mortality, and size, age, and run timing alterations because of uneven fishing on different run components. From a population biology perspective, this results in fewer spawners and can alter age, size, run timing, fecundity, and genetic characteristics. Fewer spawners result in fewer eggs for future generations and diminish marine-derived nutrients delivered via dying adults, now known to be significant to the growth and survival of juvenile salmon in aquatic ecosystems. The degree to which harvest-related limiting factors influence productivity varies by species and location.

Most harvest of wild Columbia River salmon and steelhead occurs incidental to the harvest of hatchery fish and healthy wild stocks in the Columbia estuary, mainstem, and ocean. Fish are caught in the Canada/Alaska ocean, U.S. West Coast ocean, lower Columbia River commercial and recreational, tributary recreational, and in-river treaty Indian (including commercial, ceremonial, and subsistence) fisheries. Total exploitation rates have decreased for lower Columbia salmon and steelhead, especially since the 1970s as increasingly stringent protection measures were adopted for declining natural populations.

At the time of interim plan completion, fishing impact rates on lower Columbia River naturally-spawning salmon populations ranges from 2.5% for chum salmon to 45% for tule fall Chinook (Table I-8). These rates include estimates of direct harvest mortality as well as estimates of incidental mortality in catch and release fisheries. Fishery impact rates for hatchery produced spring Chinook, coho, and steelhead are higher than for naturally-spawning fish of the same species because of selective fishing regulations. These rates generally reflect recent year (2001-2003) fishery regulations and quotas controlled by weak stock impact limits and annual abundance of healthy targeted fish. Actual harvest rates will vary for each year dependent on annual stock status of multiple west coast salmon populations, however, these rates generally reflect expected impacts of harvest on lower Columbia naturally-spawning and hatchery salmon and steelhead under current harvest management plans.

Table I-8. Approximate annual exploitation rates (% harvested) for naturally-spawning lower Columbia salmon and steelhead under current management controls (represents 2001-2003 fishing period).

	AK./Can. Ocean	West Coast Ocean	Col. R. Comm.	Col. R. Sport	Trib. Sport	**Wild Total**	Hatchery Total	Historic Highs
Spring Chinook	13	5	1	1	2	**22**	53	65
Fall Chinook (Tule)	15	15	5	5	5	**45**	45	80
Fall Chinook (Bright)	19	3	6	2	10	**40**	Na	65
Chum	0	0	1.5	0	1	**2.5**	2.5	60
Coho	<1	9	6	2	1	**18**	51	85
Steelhead	0	<1	3	0.5	5	**8.5**	70	75

Columbia River fall Chinook are subject to freshwater and ocean fisheries from Alaska to their rivers of origin in fisheries targeting abundant Chinook stocks originating from Alaska, Canada, Washington, Oregon, and California. Columbia tule fall Chinook harvest is constrained by a Recovery Exploitation Rate (RER) developed by NMFS for management of Coweeman naturally-spawning fall Chinook. Some In-basin sport fisheries are closed to the retention of Chinook to protect natural spawning populations. Harvest of lower Columbia bright fall Chinook is managed to achieve an escapement goal of 5,700 natural spawners in the North Fork Lewis.

Rates are very low for chum salmon, which are not encountered by ocean fisheries and return to freshwater in late fall when significant Columbia River commercial fisheries no longer occur. Chum are no longer targeted in Columbia commercial seasons and retention of chum is prohibited in Columbia River and Toutle River sport fisheries. Chum are impacted incidental to fisheries directed at coho and winter steelhead.

Harvest of Toutle coho occurs in the ocean commercial and recreational fisheries off the Washington and Oregon coasts and Columbia River as well as recreational fisheries in the Toutle basin. Wild coho impacts are limited by fishery management to retain marked hatchery fish and release unmarked wild fish.

Steelhead, like chum, are not encountered by ocean fisheries and non-Indian commercial steelhead fisheries are prohibited in the Columbia River. Incidental mortality of steelhead occurs in freshwater commercial fisheries directed at Chinook and coho and freshwater sport fisheries directed at hatchery steelhead and salmon. All recreational fisheries are managed to selectively harvest fin-marked hatchery steelhead and commercial fisheries cannot retain hatchery or wild steelhead. Toutle basin sport fisheries are open to selective harvest of hatchery summer steelhead and closed during the winter when wild winter steelhead return.

Access to harvestable surpluses of strong stocks in the Columbia River and ocean is regulated by impact limits on weak populations mixed with the strong. Weak stock management of Columbia River fisheries became increasingly prevalent in the 1960s and 1970s in response to continuing declines of upriver runs affected by mainstem dam construction. In the 1980s coordinated ocean and freshwater weak stock management commenced. More fishery restrictions followed ESA listings in the 1990s. Each fishery is controlled by a series of regulating factors. Many of the regulating factors that affect harvest impacts on Columbia River stocks are associated with treaties, laws, policies, or guidelines established for the management of other stocks or combined stocks, but indirectly control impacts of Columbia River fish as well. Listed fish generally comprise a small percentage of the total fish caught by any fishery. Every listed fish may correspond to tens, hundreds, or thousands of other stocks in the total catch. As a result of weak stock constraints, surpluses of hatchery and strong naturally-spawning runs often go unharvested. Small reductions in fishing rates on listed populations can translate to large reductions in catch of other stocks and recreational trips to communities which provide access to fishing, with significant economic consequences.

Selective fisheries for adipose fin-clipped hatchery spring Chinook (since 2001), coho (since 1999), and steelhead (since 1984) have substantially reduced fishing mortality rates for naturally-spawning populations and allowed concentration of fisheries on abundant hatchery fish. Selective fisheries occur in the Columbia River and tributaries, for spring Chinook and steelhead, and in the ocean, Columbia River, and tributaries for coho. Columbia River hatchery fall Chinook are not marked for selective fisheries, but likely will be in the future because of recent legislation enacted by Congress.

Mainstem and Estuary Habitat

Conditions in the Columbia River mainstem, estuary, and plume affect all anadromous salmonid populations within the Columbia Basin. Juvenile and adult salmon may be found in the mainstem and estuary at all times of the year, as different species, life history strategies and size classes continually rear or move through these waters. A variety of human activities in the mainstem and estuary have decreased both the quantity and quality of habitat used by juvenile salmonids. These include floodplain development; loss of side channel habitat, wetlands and marshes; and alteration of flows due to upstream hydro operations and irrigation withdrawals.

Effects on salmonids of habitat changes in the mainstem and estuary are complex and poorly understood. Effects are similar for Toutle populations to those of most other subbasin salmonid populations. Effects are likely to be greater for chum and fall Chinook which rear for extended periods in the mainstem and estuary than for steelhead and coho which move through more quickly. Estimates of the impacts of human-caused changes in mainstem and estuary habitat conditions are available based on changes in river flow, temperature, and predation as represented by EDT analyses for the NPCC Multispecies Framework Approach (Marcot et al. 2002). These estimates generally translate into a 10-60% reduction in salmonid productivity depending on species (Appendix E). Estuary effects are described more fully in the estuary subbasin volume of this plan (Volume II-A).

Hydropower Construction and Operation

There are no hydro-electric dams in the Toutle River Basin. However, Toutle species are affected by changes in Columbia River mainstem and estuary related to Columbia basin hydropower development and operation. The mainstem Columbia River and estuary provide important habitats for anadromous species during juvenile and adult migrations between spawning and rearing streams and the ocean where they grow and mature. These habitats are particularly important for fall Chinook and chum which rear extensively in the Columbia mainstem and estuary. Aquatic habitats have been fundamentally altered throughout the Columbia River basin by the construction and operation of a complex of tributary and mainstem dams and reservoirs for power generation, navigation, and flood control.

The hydropower infrastructure and flow regulation affects adult migration, juvenile migration, mainstem spawning success, estuarine rearing, water temperature, water clarity, gas supersaturation, and predation. Dams block or impede passage of anadromous juveniles and adults. Columbia River spring flows are greatly reduced from historical levels as water is stored for power generation and irrigation, while summer and winter flows have increased. These flow changes affect juvenile and adult migration, and have radically altered habitat forming processes. Flow regulation and reservoir construction have increased average water temperature in the Columbia River mainstem and summer temperatures regularly exceed optimums for salmon. Supersaturation of water with atmospheric gases, primarily nitrogen, when water is spilled over high dams causes gas bubble disease. Predation by fish, bird, and marine mammals has been exacerbated by habitat changes. The net effect of these direct and indirect effects is difficult to quantify but is expected to be less significant for populations

originating from lower Columbia River subbasins than for upriver salmonid populations. Additional information on hydropower effects can be found in Volume I.

Ecological Interactions

Ecological interactions focus on how salmon and steelhead, other fish species, and wildlife interact with each other and the subbasin ecosystem. Salmon and steelhead are affected throughout their lifecycle by ecological interactions with non native species, food web components, and predators. Each of these factors can be exacerbated by human activities either by direct actions or indirect effects of habitat alternation. Effects of non-native species on salmon, effects of salmon on system productivity, and effects of native predators on salmon are difficult to quantify. Strong evidence exists in the scientific literature on the potential for significant interactions but effects are often context- or case-specific.

Predation is one interaction where effects can be estimated although interpretation can be complicated. In the lower Columbia River, northern pikeminnow, Caspian tern, and marine mammal predation on salmon has been estimated at approximately 5%, 10-30%, and 3-12%, respectively of total salmon numbers (see Appendix E for additional details). Predation has always been a source of salmon mortality but predation rates by some species have been exacerbated by human activities.

Ocean Conditions

Salmonid numbers and survival rates in the ocean vary with ocean conditions and low productivity periods increase extinction risks of populations stressed by human impacts. The ocean is subject to annual and longer-term climate cycles just as the land is subject to periodic droughts and floods. The El Niño weather pattern produces warm ocean temperatures and warm, dry conditions throughout the Pacific Northwest. The La Niña weather pattern is typified by cool ocean temperatures and cool/wet weather patterns on land. Recent history is dominated by a high frequency of warm dry years, along with some of the largest El Niños on record—particularly in 1982-83 and 1997-98. In contrast, the 1960s and early 1970s were dominated by a cool, wet regime. Many climatologists suspect that the conditions observed since 1998 may herald a return to the cool wet regime that prevailed during the 1960s and early 1970s.

Abrupt declines in salmon populations throughout the Pacific Northwest coincided with a regime shift to predominantly warm dry conditions from 1975 to 1998 (Beamish and Bouillon 1993, Hare et al 1999, McKinnell et al. 2001, Pyper et al. 2001). Warm dry regimes result in generally lower survival rates and abundance, and they also increase variability in survival and wide swings in salmon abundance. Some of the largest Columbia River fish runs in recorded history occurred during 1985–1987 and 2001–2002 after strong El Niño conditions in 1982–83 and 1997–98 were followed by several years of cool wet conditions.

The reduced productivity that accompanied an extended series of warm dry conditions after 1975 has, together with numerous anthropogenic impacts, brought many weak Pacific Northwest salmon stocks to the brink of extinction and precipitated widespread ESA listings. Salmon numbers naturally ebb and flow as ocean conditions vary. Healthy salmon populations are productive enough to withstand these natural fluctuations. Weak salmon populations may disappear or lose the genetic diversity needed to withstand the next cycle of low ocean productivity (Lawson 1993).

Recent improvements in ocean survival may portend a regime shift to generally more favorable conditions for salmon. The large spike in recent runs and a cool, wet climate would provide a respite for many salmon populations driven to critical low levels by recent conditions. The National Research Council (1996) concluded: "*Any favorable changes in ocean conditions—which could occur and could increase the productivity of some salmon populations for a time—should be regarded as opportunities*

for improving management techniques. They should not be regarded as reasons to abandon or reduce rehabilitation efforts, because conditions will change again". Additional details on the nature and effects of variable ocean conditions on salmonids can be found in Volume I.

I.3.7. Summary of Human Impacts on Salmon and Steelhead

Stream habitat, estuary/mainstem habitat, harvest, hatchery and ecological interactions have all contributed to reductions in productivity, numbers, and population viability. Pie charts in Figure I-20 describe the relative magnitude of potentially-manageable human impacts in each category of limiting factor for Toutle Basin salmon and steelhead. Impact values were developed for a base period corresponding to species listing dates. This depiction is useful for identifying which factors are most significant for each species and where improvements might be expected to provide substantial benefits. Larger pie slices indicate greater significance and scope for improvement in an impact for a given species. These numbers also serve as a working hypothesis for factors limiting salmonid numbers and viability.

This assessment indicates that current salmonid status is the result of large impacts distributed among several factors. No single factor accounts for a majority of effects on all species. Thus, substantial improvements in salmonid numbers and viability will require significant improvements in several factors. Loss of tributary habitat quality and quantity accounts for the largest relative impact on all species except for fall Chinook for which fishing harvest dominates. Predation impacts are moderate for all species but relatively higher for winter steelhead. Fishing harvest has significant impacts to fall and spring Chinook and coho. Hatchery impacts are moderate for fall and spring Chinook, and coho. Loss of estuary habitat quality and quantity has relatively moderate impacts on all species. Out of basin hydrosystem impacts appear to be relatively minor for all species but more so for fall Chinook.

Impacts were defined as the proportional reduction in average numbers or productivity associated with each effect. Tributary and estuary habitat impacts are the differences between the pre-development historical baseline and current conditions. Hydro impacts identify the percentage of historical habitat blocked by impassable dams and the mortality associated with juvenile and adult passage of other dams. Fishing impacts are the direct and indirect mortality in ocean and freshwater fisheries. Hatchery impacts include the equilibrium effects of reduced natural population productivity caused by natural spawning of less-fit hatchery fish and also effects of inter-specific predation by larger hatchery smolts on smaller wild juveniles. Hatchery impacts do not include other potentially negative indirect effects or potentially beneficial effects of augmentation of natural production. Predation includes mortality from northern pikeminnow, Caspian terns, and marine mammals in the Columbia River mainstem and estuary. Predation is not a direct human impact but was included because of widespread interest in its relative significance. Methods and data for these analyses are detailed in Appendix E.

Potentially-manageable human impacts were estimated for each factor based on the best available scientific information. Proportions are standardized to a total of 1.0 for plotting purposes. The index is intended to illustrate order-of-magnitude rather than fine-scale differences. Only the subset of factors we can potentially manage were included in this index – natural mortality factors beyond our control (e.g. naturally-occuring ocean mortality) are excluded. Not every factor of interest is included in this index – only readily-quantifiable impacts are included.

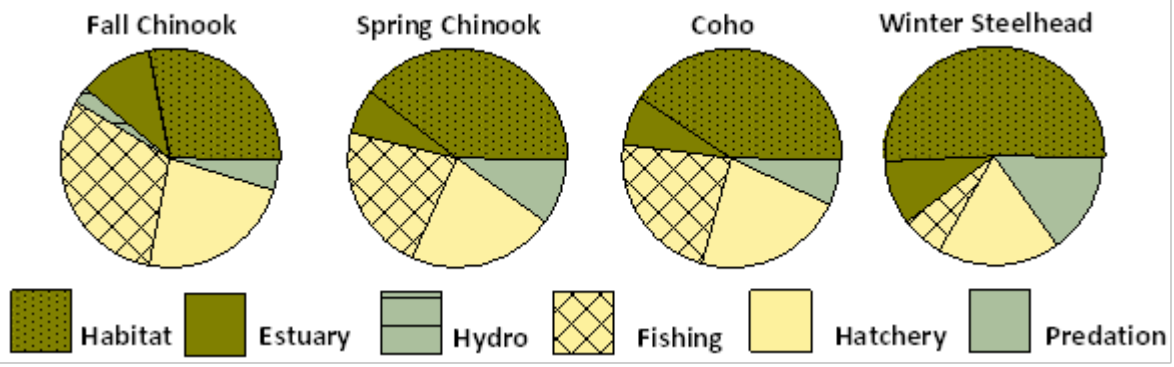


Figure I-20. Relative contribution of potentially manageable impacts on Toutle River salmonid populations.

I.4. Key Programs and Projects

This section provides brief summaries of current federal, state, local, and non-governmental programs and projects pertinent to recovery, management, and mitigation measures and actions in this basin. These decriptions provide a context for descriptions of specific actions and responsibilities in the management plan portion of this subbasin plan. More detailed descriptions of these programs and projects can be found in the Comprehensive Program Directory (Appendix C).

I.4.1. Federal Programs

NMFS

NMFS is responsible for conserving, protecting and managing pacific salmon, ground fish, halibut, marine mammals and habitats under the Endangered Species Act, the Marine Mammal Protection Act, the Magnuson-Stevens Act, and enforcement authorities. NMFS administers the ESA under Section 4 (listing requirements), Section 7 (federal actions), and Section 10 (non-federal actions).

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) is the Federal government's largest water resources development and management agency. USACE programs applicable to Lower Columbia Fish & Wildlife include: 1) Section 1135 – provides for the modification of the structure or operation of a past USACE project, 2) Section 206 – authorizes the implementation of aquatic ecosystem restoration and protection projects, 3) Hydroelectric Program – applies to the construction and operation of power facilities and their environmental impact, 4) Regulatory Program – administration of Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.

Environmental Protection Agency

The Environmental Protection Agency (EPA) is responsible for the implementation of the Clean Water Act (CWA). The broad goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters so that they can support the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water. The CWA requires that water quality standards (WQS) be set for surface waters. WQS are aimed at translating the broad goals of the CWA into waterbody-specific objectives and apply only to the surface waters (rivers, lakes, estuaries, coastal waters, and wetlands) of the United States.

United States Forest Service

The Unites States Forest Service (USFS) manages federal forest lands within the Gifford Pinchot National Forest (GPNF) and the Mt. Saint Helens National Volcanic Monument. The GPNF operates under the Gifford Pinchot Forest Plan (GPFP). Management prescriptions within the GPFP have been guided by the 1994 Northwest Forest Plan, which calls for management of forests according to a suite of management designations including Reserves (e.g. late successional forests, riparian forests), Adaptively-Managed Areas, and Matrix Lands. Most timber harvest occurs in Matrix Lands. The GPNF implements a wide range of ecosystem restoration activities. Lands within the Mt. St. Helens National Volcanic Monument are managed for protection and passive restoration of ecosystem processes.

Natural Resources Conservation Service

Formerly the Soil Conservation Service, the USDA Natural Resources Conservation Service (NRCS) works with landowners to conserve natural resources on private lands. The NRCS accomplishes this through various programs including, but not limited to, the Conservation Technical Assistance Program, Soil Survey Program, Conservation Reserve Enhancement Program, and the Wetlands Reserve Program. The NRCS works closely with local Conservation Districts; providing technical assistance and support.

Northwest Power and Conservation Council

The Northwest Power and Conservation Council, an interstate compact of Idaho, Montana, Oregon, and Washington, has specific responsibility in the Northwest Power Act of 1980 to mitigate the effects of the hydropower system on fish and wildlife of the Columbia River Basin. The Council does this through its Columbia River Basin Fish and Wildlife Program, which is funded by the Bonneville Power Administration. Beginning in Fiscal Year 2006, funding is guided by locally developed subbasin plans that are expected to be formally adopted in the Council's Fish and Wildlife Program in December 2004.

I.4.2. State Programs

Washington Department of Natural Resources

The Washington Department of Natural Resources governs forest practices on non-federal lands and is steward to state owned aquatic lands. Management of DNR public forest lands is governed by tenets of their proposed Habitat Conservation Plan (HCP). Management of private industrial forestlands is subject to Forest Practices regulations that include both protective and restorative measures.

Washington Department of Fish & Wildlife

WDFW's Habitat Division supports a variety of programs that address salmonids and other wildlife and resident fish species. These programs are organized around habitat conditions (Science Division, Priority Habitats and Species, and the Salmon and Steelhead Habitat Inventory and Assessment Program); habitat restoration (Landowner Incentive Program, Lead Entity Program, and the Conservation and Reinvestment Act Program, as well as technical assistance in the form of publications and technical resources); and habitat protection (Landowner Assistance, GMA, SEPA planning, Hydraulic Project Approval, and Joint Aquatic Resource Permit Applications).

Washington Department of Ecology

The Department of Ecology (Ecology) oversees: the Water Resources program to manage water resources to meet current and future needs of the natural environment and Washington's communities; the Water Quality program to restore and protect Washington's water supplies by preventing and reducing pollution; and Shoreline and the Environmental Assistance program for implementing the Shorelines Management Act, the State Environmental Protection Act, the Watershed Planning Act, and 401 Certification of USACE Permits.

Washington Department of Transportation

The Washington State Department of Transportation (WSDOT) must ensure compliance with environmental laws and statutes when designing and executing transportation projects. Programs that consider and mitigate for impacts to salmonid habitat include: the Fish Passage Barrier Removal

program; the Regional Road Maintenance ESA Section 4d Program, the Integrated Vegetation Management & Roadside Development Program; Environmental Mitigation Program; the Stormwater Retrofit Program; and the Chronic Environmental Deficiency Program.

Washington Recreation and Conservation Office

Created through the enactment of the Salmon Recovery Act (Washington State Legislature, 1999), the Salmon Recovery Funding Board provides grant funds to protect or restore salmon habitat and assist related activities with local watershed groups known as lead entities. SRFB has helped finance over 500 salmon recovery projects statewide. The Aquatic Lands Enhancement Account (ALEA) was established in 1984 and is used to provide grant support for the purchase, improvement, or protection of aquatic lands for public purposes, and for providing and improving access to such lands. The Washington Wildlife and Recreation Program (WWRP), established in 1990 and administered by RCO, provides funding assistance for a broad range of land protection, park development, preservation/conservation, and outdoor recreation facilities.

Lower Columbia Fish Recovery Board

The Lower Columbia Fish Recovery Board encompasses five counties in the Lower Columbia River Region. The 15-member board has four main programs, including habitat protection and restoration activities, watershed planning for water quantity, quality, habitat, and instream flows, facilitating the development of an integrated recovery plan for the Washington portion of the lower Columbia Evolutionarily Significant Units, and conducting public outreach activities.

I.4.3. Local Government Programs

Cowlitz County

Cowlitz County updated its Comprehensive Plan to the minimum requirements of the Growth Management Act (GMA) by adding a Critical Areas Ordinance (CAO) in 1996, but it is not fully planning under the GMA. Cowlitz County manages natural resources primarily through its CAO.

Cowlitz / Wahkiakum Conservation District

The Cowlitz/Wahkiakum CD provides technical assistance, cost-share assistance, project and water quality monitoring, community involvement and education, and support of local stakeholder groups within the two county service area. The CD is involved in a variety of projects, including fish passage, landowner assistance an environmental incentive program an education program, and water quality monitoring.

I.4.4. Non-governmental Programs

Columbia Land Trust

The Columbia Land Trust is a private, non-profit organization founded in 1990 to work exclusively with willing landowners to find ways to conserve the scenic and natural values of the land and water. Landowners donate the development rights or full ownership of their land to the Land Trust. CLT manages the land under a stewardship plan and, if necessary, will legally defend its conservation values.

Lower Columbia Fish Enhancement Group

The Washington State Legislature created the Regional Fisheries Enhancement Group Program in 1990 to involve local communities, citizen volunteers, and landowners in the state's salmon recovery efforts. RFEGs help lead their communities in successful restoration, education and monitoring projects. Every group is a separate, nonprofit organization led by their own board of directors and operational funding from a portion of commercial and recreational fishing license fees administered by the WDFW, and other sources. The mission of the Lower Columbia RFEG (LCFEG) is to restore salmon runs in the lower Columbia River region through habitat restoration, education and outreach, and developing regional and local partnerships.

I.4.5. Tribal Programs

Cowlitz Indian Tribe

The Cowlitz Indian Tribe's Natural Resources program participates in research and restoration efforts in the lower Columbia region. The focus of their fish research and restoration efforts includes salmon, steelhead, eulachon, and lamprey.

I.4.6. NPCC Fish & Wildlife Program Projects

There are no NPCC Fish & Wildlife Program Projects in the Toutle River Basin.

I.4.7. Washington Salmon Recovery Funding Board Projects

Type	Project Name	Subbasin
Acquisition	So. Fork Toutle	Toutle
Restoration	SF Toutle Restoration	Toutle
Restoration	North Fork Toutle River Reach 13 Restoration	Toutle

I.5. Management Plan

I.5.1. Vision

Washington lower Columbia salmon, steelhead, and bull trout are recovered to healthy, harvestable levels that will sustain productive sport, commercial, and tribal fisheries through the restoration and protection of the ecosystems upon which they depend and the implementation of supportive hatchery and harvest practices.

The health of other native fish and wildlife species in the lower Columbia will be enhanced and sustained through the protection of the ecosystems upon which they depend, the control of non-native species, and the restoration of balanced predator/prey relationships.

The Toutle Subbasin will play a key role in the regional recovery of salmon and steelhead. Salmonid recovery efforts will provide broad ecosystem benefits to a variety of subbasin fish and wildlife species. Recovery will be accomplished through a combination of improvements in subbasin, Columbia River mainstem, and estuary habitat conditions as well as careful management of hatcheries, fisheries, and ecological interations among species.

Habitat protection or restoration will involve a wide range of Federal, State, Local, and non-governmental programs and projects. Success will depend on effective programs as well as a dedicated commitment to salmon recovery across a broad section of society.

Some hatchery programs will be realigned to focus on protection, conservation, and recovery of native fish. The need for hatchery measures will decrease as productive natural habitats are restored. Where consistent with recovery, other hatchery programs will continue to provide fish for fishery benefits for mitigation purposes in the interim until habitat conditions are restored to levels adequate to sustain healthy, harvestable natural populations.

Directed fishing on sensitive wild populations will be eliminated and incidental impacts of mixed stock fisheries in the Columbia River and ocean will be regulated and limited consistent with wild fish recovery needs. Until recovery is achieved, fishery opportunities will be focused on hatchery fish and harvestabable surpluses of healthy wild stocks.

Columbia basin hydropower effects on Toutle subbasin salmonids will be addressed by mainstem Columbia and estuary habitat restoration measures. Hatchery facilities in the Toutle River will also be called upon to produce fish to help mitigate for hydropower impacts on upriver stocks where compatible with wild fish recovery.

This plan uses a planning period or horizon of 25 years. The goal is to achieve recovery of the listed salmon species and the biological objectives for other fish and wildlife species of interest within this time period. It is recognized, however, that sufficient restoration of habitat conditions and watershed processes for all species of interest will likely take 75 years or more.

I.5.2. Biological Objectives

Biological objectives for Toutle subbasin salmonid populations are based on recovery criteria developed by scientists on the Willamette/Lower Columbia Technical Recovery Team convened by NMFS. Criteria involve a hierarchy of ESU, Strata (i.e. ecosystem areas within the ESU – Coast, Cascade, and Gorge),

and Population standards. A recovery scenario describing population-scale biological objectives for all species in all three strata in the lower Columbia ESUs was developed through a collaborative process with stakeholders based on biological significance, expected progress as a result of existing programs, the absence of apparent impediments, and the existence of other management opportunities. Under the preferred alternative, individual populations will variously contribute to recovery according to habitat quality and the population's perceived capacity to rebuild. Criteria, objectives, and the regional recovery scenario are described in greater detail in Volume I.

Focal populations in the Toutle subbasin are targeted to improve to a level that contributes to recovery of the species. The scenario differentiates the role of populations by designating primary, contributing, and stabilizing categories. Primary populations are those that would be restored to high or better probabilities of persistence. Contributing populations are those where low to medium improvements will be needed to achieve stratum-wide average of moderate persistence probability. Stabilizing populations are those maintained at current levels.

Recovery goals call for restoring fall Chinook, coho and winter steelhead to a high or better level of viability in both the NF & SF Toutle River. And spring Chinook and chum (as part of the Cowlitz population) to a medium level of viability (Table I-9). The high target level will provide for a 95% or better probability of fall Chinook, coho, and winter steelhead population survival over 100 years The medium target level for chum and spring Chinook will provide for a 75-95% probability of survival over 100 years. Cutthroat will benefit from improvements in stream habitat conditions for anadromous species. Lamprey are also expected to benefit from habitat improvements in the estuary, Columbia River mainstem, and Toutle subbasin although specific spawning and rearing habitat requirements are not well known. Bull trout do not occur in the subbasin.

Table I-9. Current viability status of Toutle populations and the biological objective status that is necessary to meet the recovery criteria for the Cascade strata and the lower Columbia ESU.

Species	Population	Recovery Priority[1]	Viability Status[2]	Viability Obj.[3]	Improvement[4]	Abundance Historic[5]	Abundance Current[6]	Abundance Target[7]
Fall Chinook (Tule)	NF Toutle	Primary	VL	H+	265%	11,000	<50	3,000
Spring Chinook	SF Toutle	Contributing	VL	M	>500%	3,100	100	1,100
Winter Steelhead	NF Toutle	Primary	VL	H	125%	3,600	120	600
Winter Steelhead	SF Toutle	Primary	M	H+	35%	--[8]	350	600
Coho	NF Toutle	Primary	VL	H	180%	27,000	<50	3,800
Coho	SF Toutle	Primary	VL	H	180%	--[9]	<50	3,800
Chum	L. Cowlitz	Contributing	VL	M	>500%	195,000	<300	900

[1] Primary, Contributing, and Stabilizing designations reflect the relative contribution of a population to major population group recovery goals.
[2] Baseline viability is based on Technical Recovery Team viability rating approach.
[3] Viability objective is based on the scenario contribution.
[4] Improvement is the relative increase in population production required to reach the prescribed viability goal
[5] Historical population size inferred from presumed habitat conditions using Ecosystem Diagnosis and Treatment Model and NMFS back-of-envelope calculations.
[6] Approximate current annual range in number of naturally-produced fish returning to the watershed.
[7] Abundance targets were estimated by population viability simulations based on viability goals.
[8] The estimated historical abundance for both the NF and SF Toutle winter steelhead population is 3,600
[9] The estimated historical abundance for both the NF and SF Toutle coho population is 27,000

I.5.3. Integrated Strategy

An Integrated Regional Strategy for recovery emphasizes that 1) it is feasible to recover Washington lower Columbia natural salmon and steelhead to healthy and harvestable levels; 2) substantial improvements in salmon and steelhead numbers, productivity, distribution, and diversity will be required; 3) recovery cannot be achieved based solely on improvements in any one factor; 4) existing programs are insufficient to reach recovery goals, 5) all manageable effects on fish and habitat conditions must contribute to recovery, 6) actions needed for salmon recovery will have broader ecosystem benefits for all fish and wildlife species of interest, and 7) strategies and measures likely to contribute to recovery can be identified but estimates of the incremental improvements resulting from each specific action are highly uncertain. The strategy is described in greater detail in Volume I.

The Integrated Strategy recognizes the importance of implementing measures and actions that address each limiting factor and risk category, prescribing improvements in each factor/threat category in proportion to its magnitude of contribution to salmon declines, identifying an appropriate balance of strategies and measures that address regional, upstream, and downstream threats, and focusing near term actions on species at-risk of extinction while also ensuring a long term balance with other species and the ecosystem.

Population productivity improvement increments identify proportional improvements in productivity needed to recover populations from current status to medium, high, and very high levels of population viability consistent with the role of the population in the recovery scenario. Productivity is defined as the inherent population replacement rate and is typically expressed by models as a median rate of population increase (PCC model) or a recruit per spawner rate (EDT model). Corresponding improvements in spawner numbers, juvenile outmigrants, population spatial structure, genetic and life history diversity, and habitat are implicit in productivity improvements.

Improvement targets were developed for each impact factor based on desired population productivity improvements and estimates of potentially manageable impacts (see Section 3.7). Impacts are estimates of the proportional reduction in population productivity associated with human-caused and other potentially manageable impacts from stream habitats, estuary/mainstem habitats, hydropower, harvest, hatcheries, and selected predators. Reduction targets were driven by the regional strategy of equitably allocating recovery responsibilities among the six manageable impact factors. Given the ultimate uncertainty in the effects of recovery actions and the need to implement an adaptive recovery program, this approximation should be adequate for developing order-of-magnitude estimates to which recovery actions can be scaled consistent with the current best available science and data. Objectives and targets will need to be confirmed or refined during plan implementation based on new information and refinements in methodology.

The following table identifies population and factor-specific improvements consistent with the biological objectives for this subbasin. Per factor increments are less than the population net because factor affects are compounded at different life stages and density dependence is largely limited to freshwater tributary habitat. For example, productivity of SF Toutle River winter steelhead must increase by 125% to reach population viability goals. This requires impact reductions equivalent to a 7% improvement in productivity or survival for each of six factor categories. Thus, tributary habitat impacts on fall Chinook must decrease from 80% to 74% impact in order to achieve the required 7% increase in tributary habitat productivity potential from the current 20% of the historical potential to 26% of the historical potential.

Table I-10. Productivity improvements consistent with biological objectives for the Toutle subbasin.

Species	Net increase	Per factor	Baseline impacts					
			Hab	Estuary	Dams	Pred.	Fishery	Hatch.
Fall Chinook	265%	32%	0.60	0.23	0.05	0.10	0.65	0.50
Spring Chinook	>500%	50%	0.90	0.15	0.00	0.22	0.50	0.50
Chum [1]	>500%	50%	0.96	0.25	0.00	0.03	0.05	0.02
Coho (SF and NF)	180%	12%	0.90	0.16	0.00	0.15	0.50	0.29
Winter Steelhead								
South Fork	35%	7%	0.80	0.15	0.00	0.24	0.10	0.24
North Fork	125%	20%	0.80	0.15	0.00	0.24	0.10	0.33

[1] data is from lower Cowlitz River

I.5.4. Tributary Habitat

Habitat assessment results were synthesized in order to develop specific prioritized measures and actions that are believed to offer the greatest opportunity for species recovery in the subbasin. As a first step toward measure and action development, habitat assessment results were integrated to develop a multi-species view of 1) priority areas, 2) factors limiting recovery, and 3) contributing land-use threats. For the purpose of this assessment, limiting factors are defined as the biological and physical conditions serving to suppress salmonid population performance, whereas threats are the land-use activities contributing to those factors. Limiting Factors refer to local (reach-scale) conditions believed to be directly impacting fish. Threats, on the other hand, may be local or non-local. Non-local threats may impact instream limiting factors in a number of ways, including: 1) through their effects on habitat-forming processes – such as the case of forest road impacts on reach-scale fine sediment loads, 2) due to an impact in a contributing stream reach – such as riparian degradation reducing wood recruitment to a downstream reach, or 3) by blocking fish passage to an upstream reach.

Priority areas and limiting factors were determined through the technical assessment, including primarily EDT analysis and the Integrated Watershed Assessment (IWA). As described later in this section, priority areas are also determined by the relative importance of subbasin focal fish populations to regional recovery objectives. This information allows for scaling of subbasin recovery effort in order to best accomplish recovery at the regional scale. Land-use threats were determined from a variety of sources including Washington Conservation Commission Limiting Factors Analyses, the IWA, the State 303(d) list, air photo analysis, the Barrier Assessment, personal knowledge of investigators, or known cause-effect relationships between stream conditions and land-uses.

Priority areas, limiting factors and threats were used to develop a prioritized suite of habitat measures. Measures are based solely on biological and physical conditions. For each measure, the key programs that address the measure are identified and the sufficiency of existing programs to satisfy the measure is discussed. The measures, in conjunction with the program sufficiency considerations, were then used to identify specific actions necessary to fill gaps in measure implementation. Actions differ from measures in that they address program deficiencies as well as biophysical habitat conditions. The process for developing measures and actions is illustrated in

Figure I-21 and each component is presented in detail in the sections that follow.

Priority Areas, Limiting Factors and Threats

Priority habitat areas and factors in the subbasin are discussed below in two sections. The first section contains a generalized (coarse-scale) summary of conditions throughout the basin. The second section is a more detailed summary that presents specific reach and subwatershed priorities.

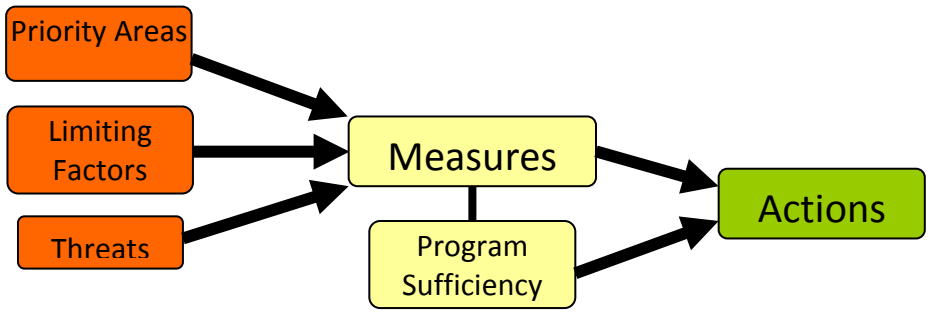


Figure I-21. Flow chart illustrating the development of subbasin measures and actions.

Summary

Decades of natural processes and human activity in the Toutle River Basin have significantly altered watershed processes and reduced both the quality and quantity of habitat needed to sustain viable populations of salmon and steelhead. Moreover, with the exception of fall Chinook, stream habitat conditions within the Toutle Basin have a high impact on the health and viability of salmon and steelhead relative to other limiting factors. The following bullets provide a brief overview of each of the priority areas in the basin. These descriptions are a summary of the reach-scale priorities that are presented in the next section. These descriptions summarize the species most affected, the primary limiting factors, the contributing land-use threats, and the general type of measures that will be necessary for recovery. A tabular summary of the key limiting factors and land-use threats can be found in Table I-11.

- **Toutle Mainstem and lower NF Toutle** *(reaches Toutle 1-9; NF Toutle 1-9)* – Potentially productive habitats for fall Chinook, chum, and coho exist in the Toutle mainstem and the lower NF Toutle below the Sediment Retention Structure. These reaches were heavily impacted by mud and debris flows during the 1980 eruption. Channel dredging and spoils placement, conducted to increase flow conveyance following the eruption, further degraded channel, riparian, and floodplain conditions. Effective recovery measures entail reducing channel confinement and restoring riparian areas. Emphasis should also be placed on addressing the chronic sediment supply from the SRS, which has become a persistent limiting factor for fish in downstream reaches.
- **South Fork Toutle** *(all SF Toutle reaches)* – The SF Toutle provides important habitat for coho and fall Chinook. The SF was heavily impacted by the 1980 eruption, but less so than the NF. These reaches have experienced rapid recovery since the eruption and subsequent heavy timber harvests. They have strong preservation and restoration value.
- **North Fork Toutle** *(reaches NF Toutle 10-13)* – The NF Toutle historically provided productive habitat for winter steelhead, spring Chinook, and coho. Fall Chinook may also have utilized these reaches to some degree. Volitional passage is currently blocked just upstream of the Green River confluence by the SRS, created to retain eruption-related sediments following the

1980 eruption. NF Toutle reaches were severely impacted by mud and debris flows during the 1980 eruption, followed by intensive road building and timber harvests. The recovery emphasis is for restoration of watershed processes throughout the NF basin including addressing the dense road network and heavy harvests.

- **Green River & Tributaries** *(reaches Green River 1-10; Elk Creek; Miners Creek; Cascade Creek)* – Green River reaches contain important current and potential production for winter steelhead, fall Chinook, and coho. These reaches were spared the severe impacts from the 1980 eruption that most of the Toutle system experienced. These reaches are most impacted by forestry practices. The recovery emphasis here is for restoration as well as preservation of watershed process conditions.

Table I-11. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the lower mainstem (LM), lower NF & SF (NS), upper SF (SF), upper NF (NF), and the Green River (GR) portions of the Toutle Basin. Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.

Limiting Factors	LM	NS	SF	NF	GR
Habitat connectivity					
Blockages to off-channel habitats	✓	✓			
Blockages to channel habitats				✓	
Habitat diversity					
Lack of stable instream woody debris	✓	✓	✓	✓	✓
Altered habitat unit composition	✓	✓	✓	✓	✓
Loss of off-channel/side-channel habitat	✓	✓			
Channel stability					
Bed and bank erosion	✓	✓	✓	✓	
Channel down-cutting (incision)	✓	✓	✓	✓	
Mass wasting	✓	✓	✓	✓	
Riparian function					
Reduced stream canopy cover	✓	✓		✓	
Reduced bank/soil stability	✓	✓	✓	✓	✓
Exotic and/or noxious species					
Reduced wood recruitment	✓	✓	✓	✓	✓
Floodplain function					
Altered nutrient exchange processes	✓				
Reduced flood flow dampening	✓				
Restricted channel migration	✓				
Disrupted hyporheic processes	✓				
Stream flow					
Altered magnitude, duration, rate of chg	✓	✓	✓	✓	✓
Water quality					
Altered stream temperature regime	✓	✓		✓	
Excessive turbidity	✓	✓		✓	
Substrate and sediment					
Lack of adequate spawning substrate	✓	✓	✓	✓	
Excessive fine sediment	✓	✓	✓	✓	✓
Embedded substrates	✓	✓	✓	✓	

Threats	LM	NS	SF	NF	GR
Agriculture/ grazing					
Clearing of vegetation		✓			
Floodplain filling		✓			
Forest practices					
Timber harvest –sediment supply impacts	✓	✓	✓	✓	✓
Timber harvests – impacts to runoff	✓	✓	✓	✓	✓
Riparian harvests (historical)		✓	✓	✓	✓
Forest roads – sediment supply impacts	✓	✓	✓	✓	✓
Forest roads – impacts to runoff	✓	✓	✓	✓	✓
Forest roads – riparian/floodplain impact		✓	✓	✓	✓
Channel manipulations					
Bank hardening	✓	✓			
Channel straightening	✓	✓			
Artificial confinement	✓	✓			
Clearing and snagging	✓	✓		✓	
Dredge and fill activities	✓	✓		✓	
Passage obstruction (SRS)				✓	

Specific Reach and Subwatershed Priorities

Specific reaches and subwatersheds have been prioritized based on the plan's biological objectives, fish distribution, critical life history stages, current habitat conditions, and potential fish population performance. Reaches have been placed into Tiers (1-4), with Tier 1 reaches representing the areas where recovery measures would yield the greatest benefits towards accomplishing the biological objectives. The reach tiering factors in each fish population's importance relative to regional recovery objectives, as well as the relative importance of reaches within the populations themselves. Reach tiers are most useful for identifying habitat recovery measures in channels, floodplains, and riparian areas. Reach-scale priorities were initially identified within individual populations (species) through the EDT Restoration and Preservation Analysis. This resulted in reaches grouped into categories of high, medium, and low priority for each population (see Stream Habitat Limitations section). Within a subbasin, reach rankings for all of the modeled populations were combined, using population designations as a weighting factor. Population designations for this subbasin are described in the Biological Objectives section. The population designations are 'primary', 'contributing', and 'stabilizing'; reflecting the level of emphasis that needs to be placed on population recovery in order to meet ESA recovery criteria.

Spatial priorities were also identified at the subwatershed scale. Subwatershed-scale priorities were directly determined by reach-scale priorities, such that a Group A subwatershed contains one or more Tier 1 reaches. Scaling up from reaches to the subwatershed level was done in recognition that actions to protect and restore critical reaches might need to occur in adjacent and/or upstream upland areas. For example, high sediment loads in a Tier 1 reach may originate in an upstream contributing subwatershed where sediment supply conditions are impaired because of current land use practices. Subwatershed-scale priorities can be used in conjunction with the IWA to identify watershed process restoration and preservation opportunities. The specific rules for designating reach tiers and subwatershed groups are presented in Table I-12. Reach tier designations for this basin are included in Table I-13. Reach tiers and subwatershed groups are displayed on a map in Figure I-22.

Table I-12. Rules for designating reach tier and subwatershed group priorities. See Biological Objectives section for information on population designations.

Designation	Rule
Reaches	
Tier 1:	All high priority reaches (based on EDT) for one or more primary populations.
Tier 2:	All reaches not included in Tier 1 and which are medium priority reaches for one or more primary species and/or all high priority reaches for one or more contributing populations.
Tier 3:	All reaches not included in Tiers 1 and 2 and which are medium priority reaches for contributing populations and/or high priority reaches for stabilizing populations.
Tier 4:	Reaches not included in Tiers 1, 2, and 3 and which are medium priority reaches for stabilizing populations and/or low priority reaches for all populations.
Subwatersheds	
Group A:	Includes one or more Tier 1 reaches.
Group B:	Includes one or more Tier 2 reaches, but no Tier 1 reaches.
Group C:	Includes one or more Tier 3 reaches, but no Tier 1 or 2 reaches.
Group D:	Includes only Tier 4 reaches.

Table I-13. Reach Tiers in the Toutle River Basin

Tier 1	Elk Cr 1 A	NF Toutle 2	SF Toutle 2	SF Toutle 11 B
	Elk Cr 1 B	NF Toutle 3	SF Toutle 4	SF Toutle 16
	Green R 1	NF Toutle 5 A	SF Toutle 5	SF Toutle 17
	Green R 2	NF Toutle 5 B	SF Toutle 6 B	Shultz Cr 1
	Green R 4	NF Toutle 5 C	SF Toutle 6 C	St1_Stankey Cr RB Trib 1 C
	Green R 5 A	NF Toutle 7	SF Toutle 7	Toutle 1
	Green R 6	NF Toutle 8 A	SF Toutle 8 A	Toutle 2 A
	Green R 7	NF Toutle 9	SF Toutle 8 B	Toutle 3
	Green R 9	NF Toutle 10	SF Toutle 9 A	Toutle 4
	Green R 10	NF Toutle 12	SF Toutle 9 B	Toutle 5
	Miners Cr 1	NF Toutle 13	SF Toutle 10 B	Toutle 6 & 7
	NF Toutle 1	SF Toutle 1	SF Toutle 11 A	Toutle 9
Tier 2	Cascade Cr 1 A	Green R 8	SF Toutle 10 A	Studebaker Cr 1 A
	Elk Cr 2 A	Harrington Cr 1 A	SF Toutle 12	Studebaker Cr 2 C
	Elk Cr 2 B	J1_Johnson Cr 2	SF Toutle 13	Toutle 2 B
	Green R 3	NF Toutle 11	SF Toutle 14	Toutle 8
	Green R 5 B	NF Toutle 6	SF Toutle 15	Toutle LB Trib 2 A
	Green R 5 E	NF Toutle 8 B	SF Toutle 18	Wyant Cr 1
	Green R 5 G	SF Toutle 3	St1_Stankey Cr RB Trib 1 B	
	Green R 5 H	SF Toutle 6 A	Stankey Cr RB Trib 1 RB Trib 1	
Tier 3	St1_Stankey Cr 1	St1_Stankey Cr 2	St1_Stankey Cr 3	
Tier 4	Alder Cr A	Goat Cr RB Trib	NFT LB Trib 1 (LB trib9)	Silver Lake RB Trib
	Alder Cr B 1	Green R 5 C	NFT LB Trib 2	SRS (Sediment Retention Structure)
	Alder Cr B 2	Green R 5 D	NFT LB Trib 3	St1_Stankey Cr RB Trib 1 A
	Alder Cr B 3	Green R 5 F	NFT LB Trib 4	St1_Stankey Cr RB Trib 1 RB Trib 2
	Alder Cr B 4	Green R LB Trib 1 A	NFT RB Trib 1 (RB trib5)	St1_Stankey Cr RB Trib 1 RB Trib 3
	Alder Cr LB Trib 1	Green R LB Trib 1 B	NFT RB Trib 2 A (RB trib6)	St1_Stankey Cr RB Trib 2
	Alder Cr LB Trib 2 A	Green R LB Trib 1 RB Trib	NFT RB Trib 2 B (RB trib6)	Stankey Cr RB Trib 1 D
	Alder Cr LB Trib 2 B	Green R LB Trib 2	NFT RB Trib 2 LB Trib (RB trib6)	Studebaker Cr 1 B
	Alder Cr LB Trib 3	Green R LB Trib 3	NFT RB Trib 3 A (RB trib7)	Studebaker Cr 2 A
	Alder Cr LB Trib 4	Green R LB Trib 4 A	NFT RB Trib 3 B (RB trib7)	Studebaker Cr 2 B
	B1_Bear Cr 1	Green R LB Trib 4 B	NFT RB Trib 4	Studebaker Cr 3
	B1_Bear Cr 2	Green R LB Trib 4 LB Trib	Rock Cr 1	Studebaker Cr LB Trib 1
	B1_Bear Cr LB Trib 1	Green R RB Trib 1	Rock Cr 2	Studebaker Cr LB Trib 2
	Bear Cr (NF) 1	Green R RB Trib 2	Rock Cr RB Trib	Studebaker Cr LB Trib 3
	Bear Cr (NF) 2	Green R RB Trib 3	S1_Sucker Cr 1	Studebaker Cr RB Trib 1 (RB trib10)
	Bear Cr LB Trib 2	Harrington Cr 1 B	S1_Sucker Cr 2	Studebaker Cr RB Trib 2
	Beaver Cr 1 A	Harrington Cr 1 C	S1_Sucker Cr LB Trib	Thirteen Cr 1
	Beaver Cr 1 B	Harrington Cr RB Trib	SF Toutle 19 A	Thirteen Cr LB Trib
	Beaver Cr 2	Hemlock Cr 1 (Outlet Cr)	SF Toutle 19 B	Toutle LB Trib 1 (LB Trib1)
	Beaver Cr LB Trib 1	Hemlock Cr 2 (Outlet Cr)	SF Toutle 20 A	Toutle LB Trib 2 B
	Beaver Cr LB Trib 2	Hemlock Cr 3	SF Toutle 20 B	Toutle LB Trib 2 LB Trib
	Big Wolf Cr	Hemlock Cr RB Trib (RBtrib9)	SF Toutle 20 C	Toutle LB Trib 3 A (LB trib2)
	Brownell Cr 1	Hoffstadt Cr 1	SFT LB Trib 1 (LB trib5)	Toutle LB Trib 3 B (LB trib2)
	Brownell Cr 2	Hoffstadt Cr 2	SFT LB Trib 2 A (LB trib6)	Toutle LB Trib 3 LB Trib
	Cascade Cr 1 B	Hoffstadt Cr 3	SFT LB Trib 2 B	Toutle LB Trib 4 A (LB trib3)
	Castle Cr	Hoffstadt Cr RB Trib	SFT LB Trib 2 C	Toutle LB Trib 4 B

Clancy Cr (RB trib4)	Hollywood Gorge A	SFT LB Trib 3 A	Toutle LB Trib 4 LB Trib
Coldwater Cr	Hollywood Gorge B	SFT LB Trib 3 B (LB trib7)	Toutle LB Trib 5
Deer Cr	J1 Johnson Cr RB Trib 1	SFT LB Trib 3 C (LB trib7)	Toutle LB Trib 6 A
Devils Cr 1 A	J1_Johnson Cr 1	SFT LB Trib 3 LB Trib (LB trib7)	Toutle LB Trib 6 B (LB trib4)
Devils Cr 1 B	J1_Johnson Cr 3	SFT LB Trib 4 (LB trib8)	Toutle LB Trib 6 C
Devils Cr 1 C	J1_Johnson Cr 4	SFT RB Trib 1	Toutle LB Trib 6 LB Trib
Devils Cr 2	J1_Johnson Cr 5	SFT RB Trib 2	Toutle LB Trib 6 RB Trib
Devils Cr RB Trib 1	J1_Johnson Cr LB Trib 1	SFT RB Trib 3	Toutle RB Trib (RB trib1)
Devils Cr RB Trib 2	J1_Johnson Cr LB Trib 2	SFT RB Trib 4 A	Tradedollar Cr
Devils Cr RB Trib 3	J1_Johnson Cr RB Trib 2	SFT RB Trib 4 B	Trouble Cr
Disappointment Cr	Jim Cr	SFT RB Trib 4 RB Trib	Twenty Cr
Eighteen Cr	Johnson Cr 6	SFT RB Trib 5	Whitten Cr
Elk Cr 2 C	Johnson Cr RB Trib 3	SFT RB Trib 6	Wyant Cr 2
Elk Cr RB Trib 1	Jordan Cr	Shultz Cr 2	Wyant LB Trib A (LB trib10)
Elk Cr RB Trib 2 (Elk Cr trib)	Loch Cr 1 (RB trib2)	Shultz Cr 3	Wyant LB Trib B (LB trib10)
Elk Cr RB Trib 3	Loch Cr 2 (RB trib2)	Shultz Cr LB Trib	Wyant LB Trib C
Elk Cr RB Trib 4	Loch Cr RB Trib (RB trib2)	Silver Lake 1	Wyant LB Trib RB Trib 1 (LB trib10)
Fish Trap	Maratta Cr 1	Silver Lake 2 A	Wyant LB Trib RB Trib 2
Flye Cr (RB trib3)	Miners Cr 2	Silver Lake 2 B	
Goat Cr 1	NF Toutle 14		
Goat Cr 2	NF Toutle 4		

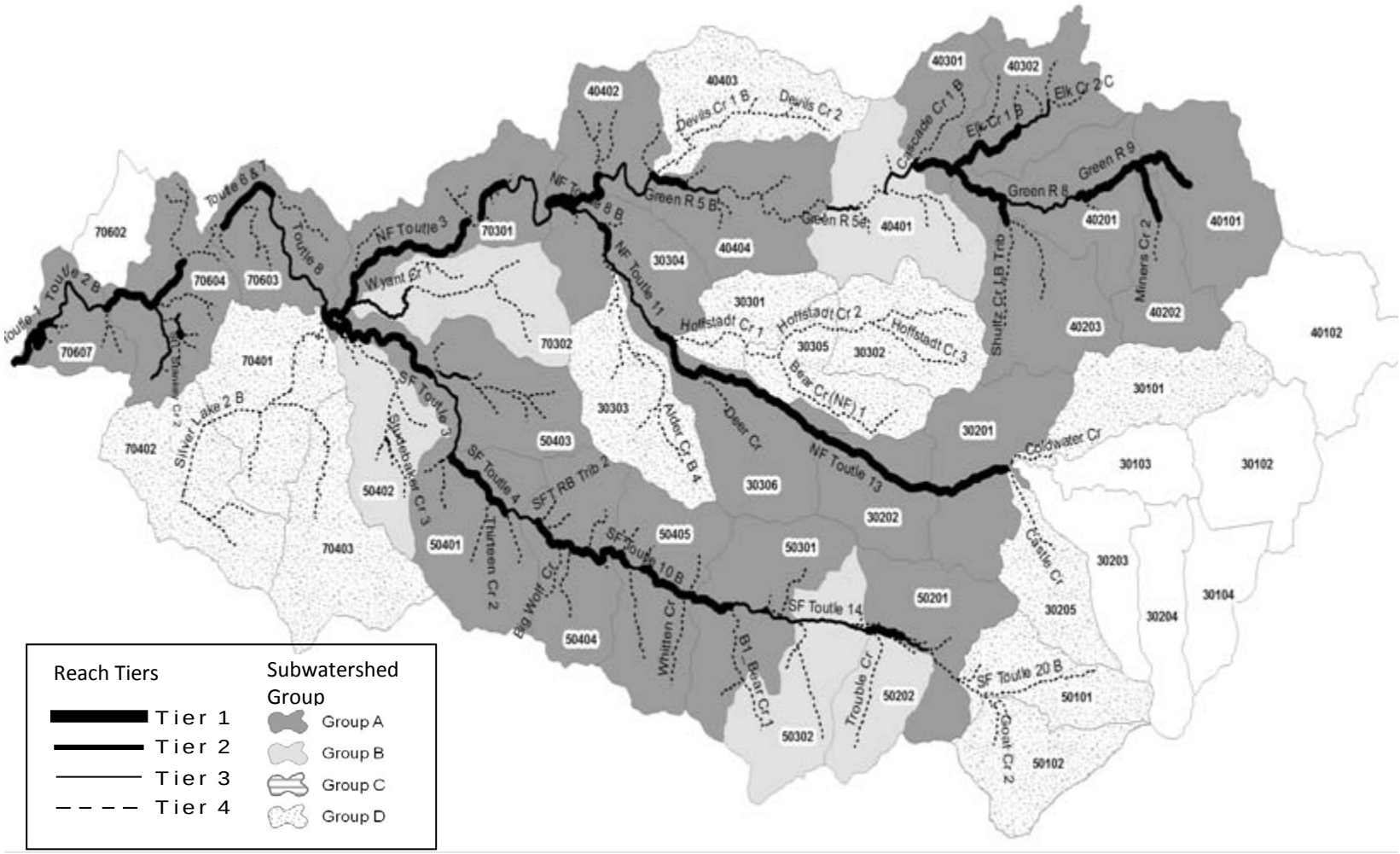


Figure I-22. Reach tiers and subwatershed groups in the Toutle Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at the reach scale are useful for identifying stream corridor recovery measures. Priorities at the subwatershed scale are useful for identifying watershed process recovery measures. Watershed process recovery measures for stream reaches will need to occur within the surrounding (local) subwatershed as well as in upstream contributing subwatersheds.

Habitat Measures

Measures are means to achieve the regional strategies that are applicable to the Toutle subbasin and necessary to accomplish the biological objectives for focal fish species. Measures are based on the technical assessments for this subbasin (Section 3.0) as well as on the synthesis of priority areas, limiting factors, and threats presented earlier in this section. The measures applicable to the Toutle Basin are presented in priority order in Table I-14. Each measure has a set of submeasures that define the measure in greater detail and add specificity to the particular circumstances occurring within the subbasin. The table for each measure and associated submeasures indicates the limiting factors that are addressed, the contributing threats that are addressed, the species that would be most affected, and a short discussion. Priority locations are given for some measures. Priority locations typically refer to either stream reaches or subwatersheds, depending on the measure. Addressing measures in the highest priority areas first will provide the greatest opportunity for effectively accomplishing the biological objectives.

Following the list of priority locations is a list of the programs that are the most relevant to the measure. Each program is qualitatively evaluated as to whether it is sufficient or needs expansion with respect to the measure. This exercise provides an indication of how effectively the measure is already covered by existing programs, policy, or projects; and therefore indicates where there is a gap in measure implementation. This information is summarized in a discussion of Program Sufficiency and Gaps.

The measures themselves are prioritized based on the results of the technical assessment and in consideration of principles of ecosystem restoration (e.g. NRC 1992, Roni et al. 2002). These principles include the hypothesis that the most efficient way to achieve ecosystem recovery in the face of uncertainty is to focus on the following prioritiies for approaches: 1) protect existing functional habitats and the processes that sustain them, 2) allow no further degradation of habitat or supporting processes, 3) re-connect isolated habitat, 4) restore watershed processes (ecosystem function), 5) restore habitat structure, and 6) create new habitat where it is not recoverable. These priorities have been adjusted for the specific circumstances occurring in the Toutle Basin. These priorities are adjusted depending on the results of the technical assessment and on the specific circumstances occurring in the basin. For example, re-connecting isolated habitat could be adjusted to a lower priority if there is little impact to the population created from passage barriers.

Habitat Actions

The prioritized measures and associated gaps are used to develop specific Actions for the subbasin. These are presented in Table I-15. Actions are different than the measures in a number of ways: 1) actions have a greater degree of specificity than measures, 2) actions consider existing programs and are therefore not based strictly on biophysical conditions, 3) actions refer to the agency or entity that would be responsible for carrying out the action, and 4) actions are related to an expected outcome with respect to the biological objectives. Actions are not presented in priority order but instead represent the suite of activities that are all necessary for recovery of listed species. The priority for implementation of these actions must consider the priority of the measures they relate to, the “size” of the gap they are intended to fill, and feasibility considerations.

Table I-14. Prioritized measures for the Toutle River Basin

#1 – Protect stream corridor structure and function

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Protect floodplain function and channel migration processes B. Protect riparian function C. Protect access to habitats D. Protect instream flows through management of water withdrawals E. Protect channel structure and stability F. Protect water quality G. Protect the natural stream flow regime	Potentially addresses many limiting factors	Potentially addresses many threats related to limiting factors	All Species	The mainstem Toutle, lower NF Toutle, and lower SF Toutle were heavily dredged, rip rapped and confined shortly following the 1980 Mt. St. Helens eruption, seriously compromising floodplain function (Wade 2000). The upper SF Toutle and upper NF Toutle (above the SRS) contain functioning floodplains but remain heavily aggraded with eruption sediments. The upper Green River (upstream of the hatchery) also contains functioning floodplains. Riparian areas were severely impacted by the eruption and subsequent timber harvests. Protecting floodplains, channel migration processes, and riparian areas from further degradation will be an important component of recovery.

Priority Locations

1st- Tier 1 or 2 reaches in mixed-use lands at risk of further degradation
2nd- Remaining Tier 1 and 2 reaches
3rd- All remaining reaches

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
NMFS	ESA Section 7 and Section 10	✓	
USFS	Northwest Forest Plan	✓	
U.S. Army Corps of Engineers (USACE)	Dredge & fill permitting (Clean Water Act sect. 404); Navigable waterways protection (Rivers & Harbors Act Sect, 10)	✓	
WA Department of Natural Resources (WDNR)	State Lands HCP, Forest Practices Rules, Riparian Easement Program	✓	
WA Department of Fish and Wildlife (WDFW)	Hydraulics Projects Approval	✓	
Cowlitz County	Comprehensive Planning		✓
Cowlitz/Wahkiakum Conservation District / NRCS	Landowner technical assistance, conservation programs		✓
Noxious Weed Control Boards (State and County level)	Noxious Weed Education, Enforcement, Control		✓
Non-Governmental Organizations (NGOs) (e.g. Columbia Land Trust) and public agencies	Land acquisition and easements		✓

Program Sufficiency and Gaps

Alterations to stream corridor structure that may impact aquatic habitats are regulated through the WDFW Hydraulics Project Approval (HPA) permitting program. Other regulatory protections are provided through USACE permitting, ESA consultations, HCPs, and County regulations. Riparian areas within private timberlands are protected through the Forest Practices Rules (FPR) administered by WDNR. The FPRs came out of an extensive review process and are believed to adequately protect riparian areas with respect to stream shading, bank stability, and LWD recruitment. The program is new and careful monitoring of the effect of the regulations is necessary. Land-use conversion is increasing in the lower basin and County ordinances must ensure that new development occurs in a manner that protects key habitats. Conversion of land-use from forest or agriculture to residential use has the potential to increase impairment of aquatic habitat, particularly when residential development is paired with flood control measures. County government can limit potentially harmful land-use conversions by thoughtfully directing growth through comprehensive planning and tax incentives, by providing consistent protection of critical areas across jurisdictions, and by preventing development in floodplains. In cases where existing programs are unable to protect critical habitats due to inherent limitations of regulatory mechanism, conservation easements and land acquisition may be necessary.

#2 – Protect hillslope processes

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Manage forest practices to minimize impacts to sediment supply processes, runoff regime, and water quality B. Manage growth and development to minimize impacts to sediment supply processes, runoff regime, and water quality	• Excessive fine sediment • Excessive turbidity • Embedded substrates • Stream flow – altered magnitude, duration, or rate of change of flows • Water quality impairment	• Timber harvest – impacts to sediment supply, water quality, and runoff processes • Forest roads – impacts to sediment supply, water quality, and runoff processes • Development – impacts to sediment supply, water quality, and runoff processes	All species	Hillslope runoff and sediment delivery processes have been degraded due to forest denudation related to the 1980 eruption of Mt. St. Helens and subsequent intensive timber harvest and road building, particularly on private commercial timberlands. Limiting additional degradation will be necessary to prevent further habitat impairment.

Priority Locations

1st- Functional subwatersheds contributing to Tier 1 or 2 reaches (functional for sediment *or* flow according to the IWA – local rating)
2nd- All other functional subwatersheds plus Moderately Impaired subwatersheds contributing to Tier 1 or 2 reaches
3rd- All other Moderately Impaired subwatersheds plus Impaired subwatersheds contributing to Tier 1 or 2 reaches

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
WDNR	Forest Practices Rules, State Lands HCP	✓	
USFS	Northwest Forest Plan	✓	
Cowlitz County	Comprehensive Planning		✓
Cowlitz/Wahkiakum Conservation District / NRCS	Landowner technical assistance, conservation programs		✓

Program Sufficiency and Gaps

Hillslope processes on private forest lands are protected through Forest Practices Rules administered by the WDNR. These rules, developed as part of the Forests & Fish Agreement, are believed to be adequate for protecting watershed sediment supply, runoff processes, and water quality on private forest lands. The program is new, however, and careful monitoring of the effect of the regulations is necessary particularly effects on subwatershed hydrology and sediment delivery Small private landowners may be unable to meet some of the requirements on a timeline commensurate with large industrial landowners. Financial assistance to small owners would enable greater and quicker compliance. On non-forest lands (rural residential and agricultural), County Comprehensive Planning is the primary nexus for protection of hillslope processes. Cowlitz County can control impacts through zoning that protects open-space, through stormwater management ordinances, and through tax incentives to prevent lands from becoming developed. These protections are pertinent in the lower mainstem Toutle basin that is the most susceptible to growth.

#3 – Address fish passage and sediment issues at the Sediment Retention Structure on the NF Toutle

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Restore access to isolated habitats blocked by culverts, dams, or other barriers B. Reduce persistent sediment contribution from the SRS	• Blockages to channel habitats • Excessive fine sediment • Excessive turbidity • Embedded substrates	Dams, culverts, in-stream structures	All species	As many as 50 miles of habitat are blocked by the Sediment Retention Structure on the NF Toutle. Fish are currently transported around this structure. The structure is also a source of persistent sediment to the lower river.

Priority Locations

1st- Sediment Retention Structure on the NF Toutle

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
USACE	Sediment Retention Structure operations and maintenance		✓
WDFW	Habitat Program		✓

Program Sufficiency and Gaps

The Sediment Retention Structure (SRS) on the NF Toutle is operated by the USACE. There are concerns with the persistent contribution of fine sediment over the structure and into downstream habitats. The current management status of the structure is unknown. There are continued discussions regarding its operation and function.

#4 - Restore floodplain function and channel migration processes

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Set back, breach, or remove artificial confinement structures	• Bed and bank erosion • Altered habitat unit composition • Restricted channel migration • Disrupted hyporheic processes • Reduced flood flow dampening • Altered nutrient exchange processes • Channel incision • Loss of off-channel and/or side-channel habitat • Blockages to off-channel habitats	• Floodplain filling • Channel straightening • Artificial confinement	All species	Portions of the mainstem Toutle, lower NF Toutle, lower SF Toutle, and Green River all suffer from channel confinement and bank hardening in some areas. There is significant potential for restoration of floodplain function and channel migration processes that could improve flow conditions and create key habitat types. Selective breaching, setting back, or removing confining structures would help to restore floodplain and CMZ function as well as facilitate the creation of off-channel and side channel habitats. There are challenges with implementation due to private lands, existing infrastructure already in place, potential flood risk to property, and large expense.

Priority Locations

1st- Tier 1 reaches with hydro-modifications (can be obtained from EDT ratings)
2nd- Tier 2 reaches with hydro-modifications
3rd- Other reaches with hydro-modifications

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
WDFW	Habitat Program		✓
USACE	Water Resources Development Act (Sect. 1135 & Sect. 206)		✓
Lower Columbia Fish Enhancement Group	Habitat Projects		✓
NGOs, tribes, Conservation Districts, agencies, landowners	Habitat Projects		✓

Program Sufficiency and Gaps

There currently are no programs or policy in place that set forth strategies for restoring floodplain function and channel migration processes in the Toutle Basin. Without programmatic changes, projects are likely to occur only seldom as opportunities arise and only if financing is made available. The level of floodplain and CMZ impairment in the Toutle and the importance of these processes to listed fish species put an increased emphasis on restoration. Means of increasing restoration activity include building partnerships with landowners, increasing landowner participation in conservation programs, allowing restoration projects to serve as mitigation for other activities, and increasing funding for NGOs and government entities to conduct restoration projects. Floodplain restoration projects are often expensive, large-scale efforts that require partnerships among many agencies, NGOs, and landowners. Building partnerships is a necessary first step toward floodplain and CMZ restoration.

#5- Restore degraded hillslope processes on forest, agricultural, and developed lands

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Upgrade or remove problem forest roads B. Reforest heavily cut areas not recovering naturally	• Excessive fine sediment • Excessive turbidity • Embedded substrates • Stream flow – altered magnitude, duration, or rate of change of flows • Water quality impairment	• Timber harvest – impacts to sediment supply, water quality, and runoff processes • Forest roads – impacts to sediment supply, water quality, and runoff processes • Rural residential and small scale agriculture – impacts to water quality and runoff processes	All species	Hillslope runoff and sediment delivery processes have been degraded due to the 1980 Mt. St. Helens eruption and subsequent intensive timber harvest and road building. Rural residential development and small-scale agricultural operations contribute to degraded hillslope processes in the lower basin. Hillslope processes must be addressed for reach-level habitat recovery to be successful.

Priority Locations

1st- Moderately impaired or impaired subwatersheds contributing to Tier 1 reaches (mod. impaired or impaired for sediment *or* flow according to IWA – local rating)
Subwatersheds: All subwatersheds in the basin

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
WDNR	State Lands HCP, Forest Practices Rules	✓	
WDFW	Habitat Program		✓
USFS	Northwest Forest Plan, Mt. St. Helens National Volcanic Monument	✓	
Cowlitz County	Stormwater Management		✓
Cowlitz/Wahkiakum Conservation District / NRCS	Landowner technical assistance, conservation programs, habitat projects		✓
NGOs, tribes, Conservation Districts, agencies, landowners	Habitat Projects		✓

Program Sufficiency and Gaps

Forest management programs including the new Forest Practices Rules (private timber lands), the WDNR HCP (state timber lands), and the Northwest Forest Plan (federal lands) are expected to afford protections that will passively and actively restore degraded hillslope conditions. Timber harvest rules are expected to passively restore sediment and runoff processes. The road maintenance and abandonment requirements for private timber lands are expected to actively address road-related impairments within a 15 year time-frame. While these strategies are believed to be largely adequate to protect watershed processes, the degree of implementation and the effectiveness of the prescriptions will not be fully known for at least another 15 or 20 years. Of particular concern is the capacity of some forest land owners, especially small forest owners, to conduct the necessary road improvements (or removal) in the required timeframe. Additional financial and technical assistance would enable small forest landowners to conduct the necessary improvements in a timeline parallel to large industrial timber land owners. Ecological restoration of lands in rural residential development and small-scale agriculture occurs relatively infrequently and there are no programs that specifically require restoration in these areas. Restoring existing developed and farmed lands can involve retrofitting facilities with new materials, replacing existing systems, and adopting new management practices. Means of increasing restoration activity include increasing landowner participation through education and incentive programs, requiring Best Management Practices through permitting and ordinances, and increasing available funding for entities to conduct restoration projects.

#6 - Restore riparian conditions throughout the basin

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Restore the natural riparian plant community B. Exclude livestock from riparian areas C. Eradicate invasive plant species from riparian areas	• Reduced stream canopy cover • Altered stream temperature regime • Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris • Exotic and/or invasive species • Bacteria	• Timber harvest – riparian harvests • Riparian grazing • Clearing of vegetation due to agriculture and residential development	All species	Riparian areas were severely degraded from mudflows from the 1980 Mt. St. Helens eruption and subsequent timber harvest. Riparian impairment is a concern throughout the basin. There is a high potential benefit of riparian restoration due to the many limiting factors that are addressed. The increasing abundance of exotic and invasive species in riparian areas is a particular concern. Riparian restoration projects are relatively inexpensive and are often supported by landowners.

Priority Locations

1st- Tier 1 reaches
2nd- Tier 2 reaches
3rd- Tier 3 reaches
4th- Tier 4 reaches

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
WDNR	State Lands HCP, Forest Practices Rules	✓	
WDFW	Habitat Program		✓
USFS	Northwest Forest Plan	✓	
Lower Columbia Fish Enhancement Group	Habitat Projects		✓
Cowlitz/Wahkiakum Conservation District / NRCS	Landowner technical assistance, conservation programs, habitat projects		✓
NGOs, tribes, Conservation Districts, agencies, landowners	Habitat Projects		✓
Noxious Weed Control Boards (State and County level)	Noxious Weed Education, Enforcement, Control		✓

Program Sufficiency and Gaps

There are no regulatory mechanisms for actively restoring riparian conditions; however, existing programs will afford protections that will allow for the *passive* restoration of riparian forests. These protections are believed to be adequate for riparian areas on forest lands that are subject to Forest Practices Rules, the State forest lands HCP, or the Northwest Forest Plan. Other lands receive variable levels of protection and passive restoration through the Cowlitz County Comprehensive Plan. Degraded riparian zones in rural residential, agricultural, or transportation corridor uses will not passively restore with existing regulatory protections and will require active measures. Riparian restoration in these areas may entail livestock exclusion, tree planting, road relocation, invasive species eradication, and adjusting current land-use in the riparian zone. Means of increasing restoration activity include building partnerships with landowners, increasing landowner participation in conservation programs, allowing restoration projects to serve as mitigation for other activities, and increasing funding for NGOs, government entities, and landowners to conduct restoration projects.

#7 - Restore channel structure and stability

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Place stable woody debris in streams to enhance cover, pool formation, bank stability, and sediment sorting B. Structurally modify channel morphology to create suitable habitat C. Restore natural rates of erosion and mass wasting within river corridors	• Lack of stable instream woody debris • Altered habitat unit composition • Reduced bank/soil stability • Excessive fine sediment • Excessive turbidity • Embedded substrates	• None (symptom-focused restoration strategy)	All species	Channel structure and stability was severely compromised due to mudflows associated with the 1980 eruption. Channels remain highly aggraded and unstable. Much of the large wood was transported through the system or buried in sediments during or shortly after the eruption. As channels naturally become more stable, large wood installation projects may be appropriate. Care should be taken to acknowledge that structural enhancements may not succeed if channels are too unstable or if artificial confinement structures are inhibiting natural flow processes.

Priority Locations

1st- Tier 1 reaches
2nd- Tier 2 reaches
3rd- Tier 3 reaches
4th- Tier 4 reaches

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
NGOs, tribes, agencies, landowners	Habitat Projects		✓
WDFW	Habitat Program		✓
USACE	Water Resources Development Act (Sect. 1135 & Sect. 206)		✓
Lower Columbia Fish Enhancement Group	Habitat Projects		✓
USFS	Habitat Projects		✓
Cowlitz/Wahkiakum Conservation District / NRCS	Landowner technical assistance, conservation programs, habitat projects		✓

Program Sufficiency and Gaps

There are no regulatory mechanisms for actively restoring channel stability and structure. Passive restoration is expected to slowly occur as stream channels and riparian areas continue to naturally recover from the eruption and past timber harvests. Natural recovery will be made possible through regulatory protections afforded to riparian areas and hillslope processes. Active measures may be warranted in high priority reaches. Past structural enhancement projects have largely been opportunistic and have been completed due to the efforts of local NGOs, landowners, and government agencies; such projects are likely to continue in a piecemeal fashion as opportunities arise and only if financing is made available. The lack of LWD in stream channels, and the importance of wood for habitat of listed species, places an emphasis on LWD supplementation projects. Means of increasing restoration activity include building partnerships with landowners, increasing landowner participation in conservation programs, allowing restoration projects to serve as mitigation for other activities, and increasing funding for NGOs, government entities, and landowners to conduct restoration projects.

#8 – Restore degraded water quality with emphasis on temperature impairments

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Increase riparian shading B. Decrease channel width-to-depth ratios	• Altered stream temperature regime	• Timber harvest – riparian harvests • Riparian grazing • Clearing of vegetation due to rural development and agriculture	• All species	There are a few stream segments on the draft 2002-2004 303(d) list for temperature impairment and one stream segment included as a concern for temperature impairment. Despite the few listed segments, elevated stream temperature is believed to be a concern throughout the basin due to high channel width-to-depths and lack of riparian cover. High suspended sediment levels are also a concern but are related primarily to high sediment loads and unstable channels due to the 1980 eruption.

Priority Locations

1st- Reaches with 303(d) listings
2nd- All remaining reaches

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
Washington Department of Ecology	Water Quality Program		✓
WDNR	State Lands HCP, Forest Practices Rules	✓	
WDFW	Habitat Program		✓
USFS	Northwest Forest Plan	✓	
Lower Columbia Fish Enhancement Group	Habitat Projects		✓
Cowlitz/Wahkiakum Conservation District / NRCS	Landowner technical assistance, conservation programs, habitat projects		✓
NGOs, tribes, Conservation Districts, agencies, landowners	Habitat Projects		✓

Program Sufficiency and Gaps

Ecology's Water Quality Program manages the State 303(d) list of impaired water bodies. There are a few listings for temperature in the Toutle Basin and one area of concern (Green River) (WDOE 2004). A Water Quality Clean-up Plan (TMDL) is required by Ecology and it is anticipated that the TMDL will adequately set forth strategies to address the temperature impairment. It will be important that the strategies specified in the TMDL are implementable and adequately funded. The 303(d) listings are believed to address the primary water quality concerns; however, other impairments may exist that the current monitoring effort is unable to detect. Additional monitoring is needed to fully understand the degree of water quality impairment in the basin.

#9 – Provide for adequate instream flows during critical periods

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Protect instream flows through water rights closures and enforcement B. Restore instream flows through acquisition of existing water rights C. Restore instream flows through implementation of water conservation measures	• Stream flow – maintain or improve Summer low-flows	• Water withdrawals	All species	Instream flow management strategies for the Toutle Basin have been identified as part of Watershed Planning for WRIA 26 (LCFRB 2004). Strategies include water rights closures, setting of minimum flows, and drought management policies. This measure applies to instream flows associated with water withdrawals and diversions, generally a concern only during low flow periods. Hillslope processes also affect low flows but these issues are addressed in separate measures.

Priority Locations
Entire Basin

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
WRIA 25/26 Watershed Planning Unit	Watershed Planning	✓	
Washington Department of Ecology	Water Resources Program		✓

Program Sufficiency and Gaps

The Water Resources Program of Ecology, in cooperation with the WDFW and other entities, manages water rights and instream flow protections. A collaborative process for setting and managing instream flows was launched in 1998 with the Watershed Planning Act (HB 2514), which called for the establishment of local watershed planning groups who's objective was to recommend instream flow guidelines to Ecology through a collaborative process. The current status of this planning effort is to adopt a watershed plan by December 2004. Instream flow setting in the Toutle Basin will be conducted using the recommendations of the WRIA 25/26 Planning Unit, which is coordinated by the LCFRB. Draft products of the WRIA 25/26 watershed planning effort can be found on the LCFRB website: www.lcfrb.gen.wa.us. The recommendations of the planning unit have been developed in close coordination with recovery planning and the instream flow prescriptions developed by this group are anticipated to adequately protect instream flows necessary to support healthy fish populations. The measures specified above are consistent with the planning group's recommended strategies.

#10 – Restore access to habitat blocked by artificial barriers

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Restore access to isolated habitats blocked by culverts, dams, or other barriers	• Blockages to channel habitats • Blockages to off-channel habitats	Dams, culverts, in-stream structures	All species	Culverts or other barriers block as much as 23 miles of anadromous habitat; the blocked habitat is believed to be marginal in most cases. Passage restoration projects should focus on cases where it can be demonstrated that there is good potential benefit and reasonable project costs. Passage issues at the SRS on the NF Toutle are addressed in a separate measure.

Priority Locations

1st- Several small tributaries with blockages

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
WDNR	Forest Practices Rules, Family Forest Fish Passage, State Forest Lands HCP		✓
WDFW	Habitat Program		✓
Lower Columbia Fish Enhancement Group	Habitat Projects		✓
Washington Department of Transportation / WDFW	Fish Passage Program		✓
Cowlitz County	Roads		✓

Program Sufficiency and Gaps

The Forest Practices Rules require forest landowners to restore fish passage at artificial barriers by 2016. Small forest landowners are given the option to enroll in the Family Forest Fish Program in order to receive financial assistance to fix blockages. The Washington State Department of Transportation, in a cooperative program with WDFW, manages a program to inventory and correct blockages associated with state highways. The Salmon Recovery Funding Board, through the Lower Columbia Fish Recovery Board, funds barrier removal projects. Past efforts have corrected major blockages and have identified others in need of repair. Additional funding is needed to correct remaining blockages. Further monitoring and assessment is needed to ensure that all potential blockages have been identified.

#11 – Create/restore off-channel and side-channel habitat

Submeasures	Factors Addressed	Threats Addressed	Target Species	Discussion
A. Restore historical off-channel and side-channel habitats where they have been eliminated B. Create new channel or off-channel habitats (i.e. spawning channels)	• Loss of off-channel and/or side-channel habitat	• Floodplain filling • Channel straightening • Artificial confinement	chum coho	There was significant loss of off-channel and side-channel habitats due to mudflows associated with the 1980 eruption. Sediment loading and subsequent channel braiding may set the stage for the creation of quality side channel and off-channel habitats as stream channels slowly stabilize and fines are transported out of the system. Dredging and levee construction following the eruption will limit side-channel and off-channel creation in places. Creating habitats may be warranted in some areas, especially targeted for chum spawning; however, processes limiting habitat creation and maintenance (i.e. instability, confinement) must be addressed for them to be successful.

Priority Locations

1st- Lower mainstem Toutle, lower NF Toutle, lower SF Toutle
2nd- Other reaches that may have potential for off-channel and side-channel habitat restoration or creation

Key Programs

Agency	Program Name	Sufficient	Needs Expansion
WDFW	Habitat Program		✓
Lower Columbia Fish Enhancement Group	Habitat Projects		✓
NGOs, tribes, Conservation Districts, agencies, landowners	Habitat Projects		✓
USACE	Water Resources Development Act (Sect. 1135 & Sect. 206)		✓

Program Sufficiency and Gaps

There are no regulatory mechanisms for creating or restoring off-channel and side-channel habitat. Means of increasing restoration activity include building partnerships with landowners, increasing landowner participation in conservation programs, allowing restoration projects to serve as mitigation for other activities, and increasing funding for NGOs, government entities, and landowners to conduct restoration projects.

Table I-15. Habitat actions for the Toutle Basin.

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
Toutle 1. Address fish passage and sediment issues at the Sediment Retention Structure on the NF Toutle	Expansion of existing program or activity	WDFW, USACE	3	High: Sediment from the SRS affects downstream reaches. Volitional access is blocked to approx. 50 miles	High: Reduction of sedimentation of lower NF and mainstem Toutle. Volitional passage to ~50 miles of habitat	High
Toutle 2. Conduct floodplain restoration where feasible along the mainstem Toutle, SF Toutle, and NF Toutle, especially in areas affected by dredging and floodplain filling following the 1980 Mt. St. Helens eruption. Survey landowners, build partnerships, and provide financial incentives	New program or activity	NRCS, C/WCD, NGOs, WDFW, LCFRB, USACE, LCFEG	4, 6, 7, 8 & 10	High: Lower mainstem and lower portion of lower mainstem tributaries	High: Restoration of floodplain function, habitat diversity, and habitat availability.	High
Toutle 3. Fully implement and enforce the Forest Practices Rules (FPRs) on private timber lands in order to afford protections to riparian areas, sediment processes, runoff processes, water quality, and access to habitats	Activity is currently in place	WDNR	1, 2, 5, 6, 8 & 10	High: Private commercial timber lands	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Toutle 4. Continue to manage federal forest lands according to the Northwest Forest Plan	Activity is currently in place	USFS	1, 2, 5, 6, 8 & 10	Medium: National Forest and National Monument lands in the upper basin	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	High
Toutle 5. Review and adjust	Expansion	Cowlitz County	1, 5, 6, & 8	Low: Applies to	Medium: Protection of water	High

[1] Relative amount of basin affected by action
[2] Expected response of action implementation
[3] Relative certainty that expected results will occur as a result of full implementation of action

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
operations to ensure compliance with the Endangered Species Act; examples include roads, parks, and weed management	of existing program or activity			lands under public jurisdiction	quality, greater streambank stability, reduction in road-related fine sediment delivery, restoration and preservation of fish access to habitats	
Toutle 6. Expand standards in County ordinances to afford adequate protections of ecologically important areas (i.e. stream channels, riparian zones, floodplains, CMZs, wetlands, unstable geology)	Expansion of existing program or activity	Cowlitz County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Toutle 7. Prevent floodplain impacts from new development through land use controls and Best Management Practices	New program or activity	Cowlitz County, Ecology	1	Medium: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Protection of floodplain function, CMZ processes, and off-channel/side-channel habitat. Prevention of reduced habitat diversity and key habitat availability	High
Toutle 8. Manage future growth and development patterns to ensure the protection of watershed processes. This includes limiting the conversion of lands to developed uses through zoning regulations and tax incentives	Expansion of existing program or activity	Cowlitz County	1 & 2	Medium: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Protection of water quality, riparian function, stream channel structure (e.g. LWD), floodplain function, CMZs, wetland function, runoff processes, and sediment supply processes	High
Toutle 9. Implement the prescriptions of the WRIA 25/26 Watershed Planning Unit regarding instream flows	Activity is currently in place	Ecology, WDFW, WRIA 25/26 Planning Unit	9	High: Entire basin	Medium: Adequate instream flows to support life stages of salmonids and other aquatic biota.	Medium

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
Toutle 10. Increase the level of implementation of voluntary habitat enhancement projects in high priority reaches and subwatersheds. This includes building partnerships, providing incentives to landowners, and increasing funding	Expansion of existing program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, C/W CD, LCFEG	4, 5, 6, 7, 8, 10 & 11	High: Priority stream reaches and subwatersheds throughout the basin	Medium: Improved conditions related to water quality (temperature and bacteria), LWD quantities, bank stability, key habitat availability, habitat diversity, riparian function, floodplain function, sediment availability, & channel migration processes	Medium
Toutle 11. Increase technical support and funding to small forest landowners faced with implementation of Forest Practices Rules to ensure full and timely compliance with regulations	Expansion of existing program or activity	WDNR	1, 2, 5, 6, 8 & 10	Low: Small private timberland owners	High: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased peak flow volumes; restoration and preservation of fish access to habitats	Medium
Toutle 12. Increase funding available to purchase easements or property in sensitive areas in order to protect watershed function where existing programs are inadequate	Expansion of existing program or activity	LCFRB, NGOs, WDFW, USFWS, BPA (NPCC)	1 & 2	Low: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Protection of riparian function, floodplain function, water quality, wetland function, and runoff and sediment supply processes	High
Toutle 13. Increase technical assistance to landowners and increase landowner participation in conservation programs that protect and restore habitat and habitat-forming processes. Includes increasing the incentives (financial or otherwise) and increasing program marketing and outreach	Expansion of existing program or activity	NRCS, C/WCD, WDNR, WDFW, LCFEG, Cowlitz County	1, 2, 4, 5, 6, 7, 8, 9, 10 & 11	Medium: Private lands. Applies primarily to lands in the lower basin in open-space, rural residential, or forestland uses at risk of development	High: Increased landowner stewardship of habitat. Potential improvement in all factors	Medium
Toutle 14. Conduct forest practices on state lands in accordance with the Habitat Conservation Plan in order to afford protections to riparian areas, sediment processes, runoff processes,	Activity is currently in place	WDNR	1, 2, 5, 6, 8 & 10	Medium: State timber lands in the Toutle Basin (approximately 18% of the basin area)	Medium: Increase in instream LWD; reduced stream temperature extremes; greater streambank stability; reduction in road-related fine sediment delivery; decreased	Medium

Action	Status	Responsible Entity	Measures Addressed	Spatial Coverage of Target Area[1]	Expected Biophysical Response[2]	Certainty of Outcome[3]
water quality, and access to habitats					peak flow volumes; restoration and preservation of fish access to habitats. Response is medium because of location and quantity of state lands	
Toutle 15. Assess the impact of fish passage barriers throughout the basin and restore access to potentially productive habitats (not including the SRS, which is covered in a separate action)	Expansion of existing program or activity	WDFW, WDNR, Cowlitz County, WSDOT, LCFEG	10	Low: As many as 23 miles of stream are blocked by artificial barriers	Low: Increased spawning and rearing capacity due to access to blocked habitat. Habitat is marginal in most cases	High
Toutle 16. Create and/or restore lost side-channel/off-channel habitat for chum spawning and coho overwintering	New program or activity	LCFRB, BPA (NPCC), NGOs, WDFW, NRCS, C/W CD	11	Low: Lower mainstem Toutle	Medium: Increased habitat availability for spawning and rearing	Low
Toutle 17. Protect and restore native plant communities from the effects of invasive species	Expansion of existing program or activity	Weed Control Boards (local and state); NRCS, C/W CD, LCFEG	1 & 6	Medium: Greatest risk is in lower basin agriculture and residential use areas	Medium: restoration and protection of native plant communities necessary to support watershed and riparian function	Low
Toutle 18. Assess, upgrade, and replace on-site sewage systems that may be contributing to water quality impairment	Expansion of existing program or activity	Cowlitz County, C/W CD	8	Low: Private agricultural and rural residential lands in lower basin	Medium: Protection and restoration of water quality (bacteria)	Medium

I.5.5. Hatcheries

This subbasin plan describes potential hatchery strategies and actions designed to address recovery objectives and hatchery risks detailed in Volume I and in hatchery program assessments described earlier in this Volume II chapter. These strategies and actions are largely based on assessments in the interim planning process that was completed in 2004. Strategies and actions are generally consistent with more recent plans based on HSRG analyses and WDFW's Conservation and Sustainable Fisheries Plan. However, in several cases, the ongoing hatchery reform and planning process has identified revisions to the alternatives presented herein.

Subbasin Hatchery Strategy

The desired future state of fish production within the Toutle River Basin includes natural salmon and steelhead populations that are improving on a trajectory to recovery and hatchery programs that either enhance the natural fish recovery trajectory or are operated to not impede progress towards recovery. Hatchery recovery actions in each subbasin are tailored to the specific ecological and biological circumstances for each species in the subbasin. This may involve substantial changes in some hatchery programs from their historical focus on production for fishery mitigation. The recovery strategy includes a mixture of conservation programs and mitigation programs. Mitigation programs involve areas or practices selected for consistentency with natural population conservation and recovery objectives. A summary of the types of natural production enhancement strategies and fishery enhancement strategies to be implemented in the Toutle River Basin and South Fork Toutle are displayed by species in Conservation-based hatchery programs include strategies and actions which are specifically intended to enhance or protect production of a particular wild fish population within the basin. A unique conservation strategy is developed for each species and watershed depending on the status of the natural population, the biological relationship between the hatchery and natural populations, ecological attributes of the watershed, and logistical opportunities to jointly manage the populations. Four types of hatchery conservation strategies may be employed:

Table I-16 and Table I-17. More detailed descriptions and discussion of the regional hatchery strategy can be found in Volume I.

Conservation-based hatchery programs include strategies and actions which are specifically intended to enhance or protect production of a particular wild fish population within the basin. A unique conservation strategy is developed for each species and watershed depending on the status of the natural population, the biological relationship between the hatchery and natural populations, ecological attributes of the watershed, and logistical opportunities to jointly manage the populations. Four types of hatchery conservation strategies may be employed:

Table I-16. Summary of natural production and fishery enhancement strategies for the North Fork Toutle River.

		Species					
		Fall Chinook	Spring Chinook	Coho	Chum	Winter Steelhead	Summer Steelhead
Natural Production Enhancement	Supplementation			✓			
	Hatch/Nat Conservation [1]						
	Isolation						
	Refuge						
Fishery Enhancement	Hatchery Production	✓		✓			✓

Table I-17. Summary of potential natural production and fishery enhancement strategies for the South Fork Toutle River.

		Species					
		Fall Chinook	Spring Chinook	Coho	Chum	Winter Steelhead	Summer Steelhead
Natural Production Enhancement	Supplementation			✓			
	Hatch/Nat Conservation [1]						
	Isolation						
	Refuge						
Fishery Enhancement	Hatchery Production						✓

[1] Hatchery and natural population management strategy coordinated to meet biological recovery objectives. Strategy may include integration and/or isolation strategy over time. Strategy will be unique to biological and ecological circumstances in each watershed.

Natural Refuge Watersheds: In this strategy, certain sub-basins are designated as wild-fish-only areas for a particular species. The refuge areas include watersheds where populations have persisted with minimum hatchery influence and areas that may have a history of hatchery production but would not be subjected to future hatchery influence as part of the recovery strategy. More refuge areas may be added over time as wild populations recover. These refugia provide an opportunity to monitor population trends independent of the confounding influence of hatchery fish and will be key indicators of natural population status within the ESU. This strategy would not be included in near-term actions for the Toutle Subbasin,

Hatchery Supplementation: This strategy utilizes hatchery production as a tool to assist in rebuilding depressed natural populations. Supplementation would occur in selected areas that are producing natural fish at levels significantly below current capacity or capacity is expected to increase as a result of immediate benefits of habitat or passage improvements. This is intended to be a temporary measure to jump start critically low populations and to bolster natural fish numbers above critical levels in selected areas until habitat is restored to levels where a population can be self sustaining. This strategy would include coho in the Toutle Subbasin and South Fork Toutle.

Hatchery/Natural Isolation: This strategy is focused on physically separating hatchery adult fish from naturally-produced adult fish to avoid or minimize spawning interactions to allow natural adaptive processes to restore native population diversity and productivity. The strategy may be implemented in the entire watershed or more often in a section of the watershed upstream of a barrier or trap where the hatchery fish can be removed. This strategy is currently aimed at hatchery steelhead in watersheds with trapping capabilities. The strategy may also become part of spring and fall Chinook as well as coho strategy in certain watersheds in the future as unique wild runs develop. This strategy would not be included in near-term actions for the Toutle Subbasin but could be considered in the future for coho. This definition refers only to programs where fish are physically sorted using a barrier or trap. Some fishery mitigation programs, particularly for steelhead, are managed to isolate hatchery and wild stocks based on run timing and release locations. There are no hatchery winter steelhead released in the Toutle basin.

Hatchery/Natural Merged Conservation Strategy: This strategy addresses the case where natural and hatchery fish have been homogenized over time such that they are principally all one stock that includes the native genetic material for the basin. Many spring Chinook, fall Chinook, and coho populations in the lower Columbia currently fall into this category. In many cases, the composite stock productivity is no longer sufficient to support a self-sustaining natural population especially in the face of habitat degradation. The hatchery program will be critical to maintaining any population until habitat can be improved and a strictly natural population can be re-established. This merged strategy is intended to transition these mixed populations to a self-supporting natural population that is not subsidized by hatchery production or subject to deleterious hatchery impacts. Elements include separate management of hatchery and natural subpopulations, regulation of hatchery fish in natural areas, incorporation of natural fish into hatchery broodstock, and annual abundance-driven distribution. Corresponding programs are expected to evolve over time dependent on changes in the populations and in the habitat productivity. This strategy is primarily aimed at Chinook salmon in areas where harvest production occurs. The strategy is not included for Toutle basin Chinook, as the recovery goal for Toutle fall Chinook is to stabilize at the current viability level, and there is no hatchery program for spring Chinook harvest in the basin

Not every lower Columbia River hatchery program will be turned into a conservation program. The majority of funding for lower Columbia basin hatchery operations (including the North Fork Toutle Hatchery) is for producing salmon and steelhead for harvest to mitigate for lost harvest of natural production due to hydro development and habitat degradation. Programs for fishery enhancement will continue during the recovery period, but will be managed to minimize risks and ensure they do not compromise recovery objectives for natural populations. It is expected that the need to produce compensatory fish for harvest through artificial production will reduce in the future as natural populations recover and become harvestable. There are fishery enhancement programs for fall Chinook, coho, and summer steelhead in the Toutle Subbasin.

The North Fork Toutle Hatchery will be operated to include natural production enhancement strategies for coho in the Green River and North and South Fork Toutle River as well as support fishery enhancement of Toutle fall Chinook, Toutle early coho, and Skamania summer steelhead. This plan adds three new conservation programs at the Cowlitz River Hatchery facility (Table I-18).

Table I-18. A summary of conservation and harvest strategies with the potential to be implemented through Toutle River Hatchery programs.

		Stock
Natural Production Enhancement	Supplementation	North Toutle Coho √
		Green River Coho √
		S ForkToutle Coho √
	Hatch/Nat Conservation [1]	
	Isolation	
	Broodstock development	
Fishery Enhancement	In-basin releases	Toutle Early Coho
	(final rearing at Toutle)	Toutle Fall Chinook
		Skamania Summer Steelhead
	Out of Basin Releases	
	(final rearing at Toutle)	

[1] May include integrated and/or isolated strategy over time.
√ Denotes new program

Hatchery Measures and Actions

Hatchery strategies and measures are focused on evaluating and reducing biological risks consistent with the recovery strategies identified for each natural population. Artificial production programs within Toutle River facilities have been evaluated in detail through the WDFW Benefit-Risk Assessment Procedure (BRAP) relative to risks to natural populations. The BRAP results were utilized to inform the development of these program actions specific to the Toutle River Basin (Table I-19 and Table I-20). The Sub-Basin plan hatchery recovery actions were developed in coordination with WDFW and at the same time as the Hatchery and Genetic Management Plans (HGMP) were developed by WDFW for each hatchery program. As a result, the hatchery actions represented in this document will provide direction for specific actions which will be detailed in the HGMPs submitted by WDFW for public review and for NMFS approval. It is expected that the HGMPs and these recovery actions will be complementary and provide a coordinated strategy for the Toutle River Basin hatchery programs. Further explanation of specific strategies and measures for hatcheries can be found in Volume I.

Table I-19. Potential hatchery program actions for implementation in the Toutle River Basin.

Activity	Action	Hatchery Program Addressed	Natural Populations Addressed	Limiting Factors Addressed	Threats Addressed	Expected Outcome
• Continue to mass mark coho hatchery releases to provide the means to identify hatchery fish for selective fisheries and to distinguish between hatchery and wild fish in the Toutle basin • Establish a mass marking program for fall Chinook to enable selective fishing options and distinguish wild and hatchery production.	*Adipose fin-clip mark hatchery released coho **Adipose fin-clip mark hatchery released fall Chinook	North Toutle Hatchery coho and fall Chinook.	Toutle coho, and fall Chinook	Domestication, Diversity, Abundance	• In-breeding • Harvest	• Maintain lower harvest impacts for natural Toutle coho compared to hatchery production • Provide the opportunity to develop fishing regulations which accomplish a lower harvest impact for wild Toutle fall Chinook compared to Toutle Hatchery fall Chinook. • Enable visual identification of hatchery and wild returns to provide the means to account for and manage the natural and wild escapement consistent with biological objectives
• Utilize existing North Toutle early coho stock to supplement natural coho populations in North Toutle, Green, and SF Toutle tributaries. • Develop brood stock representative of Toutle spawn timing abundance curves. • Integrate hatchery and wild broodstock in the future after wild production is established	**North Toutle Hatchery facilities utilized to supplement natural coho	North Toutle Hatchery coho	Toutle Basin coho	Abundance, spatial distribution	• low numbers of natural spawners and distribution into the upper watershed habitat	• Habitat is seeded as it continues to recover from the 1980 eruption of Mt. St. Helens. • Self-sustaining populations are present in North Toute, Green, and SF Toutle tributaries • A future integrated hatchery and wild coho program addresses natural production management and provides harvest opportunity.
• Hatchery produced coho, and fall Chinook will be scheduled for release during the time when the maximum numbers of fish are smolted and prepared to emigrate rapidly.	*Juvenile release strategies to minimize impacts to natural populations	North Toutle Hatchery coho, and fall Chinook	Toutle Basin fall Chinook, chum, and coho, and steelhead	Predation, Competition	• Hatchery smolt residence time in the North and mainstem	• Minimal residence time of hatchery released juvenile resulting in reduced ecological interactions between hatchery and wild juvenile. Displacement of natural fall Chinook from preferred habitat by larger hatchery fall Chinook will be

Activity	Action	Hatchery Program Addressed	Natural Populations Addressed	Limiting Factors Addressed	Threats Addressed	Expected Outcome
					Toutle.	minimized.
• Juvenile rearing strategies will be implemented to provide a fish growth schedule which coincides with an optimum release time for hatchery production survival and to minimize time spent in the Toutle Basin.						• Minimal predation by coho smolts upon natural produced fall Chinook, coho, steelhead, and chum. • Improved survival of wild juveniles, resulting in increased productivity and abundance
• Appropriate maintenance weir in the lower Green River to enable efficient accounting and sorting of fall Chinook and passage of steelhead and coho. • Appropriate maintenance and engineerinf of the Sediment retention Dam trap to assure efficient collection and passage of natural produced salmon and steelhead. • Complies with NPDES permit monitoring requirements. Fish health monitored and treated as per co-mangers fish health policy • Maintain in-take screens at North Toutle Hatchery to assure they do not impact wild juvenile coho, Chinook, or steelhead	**Evaluate facility operations	All species	All species	Access, Habitat quality, genetic integrity	• Fish barriers, in-take screens • water quality, sorting efficiency	• Access to natural spawning habitats for natural returning fish • Hatchery fish disease controlled and water quality standards upheld to avoid impact to habitat quality in the Green and Toutle rivers downstream of the hatchery. • In-take screens at North Toutle hatchery function in a way that has negligible impacts in natural produced salmon and steelhead.

Activity	Action	Hatchery Program Addressed	Natural Populations Addressed	Limiting Factors Addressed	Threats Addressed	Expected Outcome
• Research, monitoring , and evaluation of performance of the above actions in relation to expected outcomes • Performance standards developed for each actions with measurable criteria to determine success or failure • Adaptive Management applied to adjust or change actions as necessary	** Monitoring and evaluation, adaptive management	All species	All species	Hatchery production performance, Natural production performance	• All of above	• Clear standards for performance and adequate monitoring programs to evaluate actions. • Adaptive management strategy reacts to information and provides clear path for adjustment or change to meet performance standard

* Extension or improvement of existing actions-may require additional funding
** New action-will likely require additional funding

Table I-20. Potential hatchery implementation actions in the South Fork Toutle Subbasin

Activity	Action	Hatchery Program Addressed	Natural Populations Addressed	Limiting Factors Addressed	Threats Addressed	Expected Outcome
• Continue to mass mark Skamania Hatchery steelhead releases to provide the means to identify hatchery fish for selective fisheries and to distinguish between hatchery and wild fish returning to the SF Toutle.	*Adipose fin-clip mark hatchery released steelhead.	Skamania Hatchery summer steelhead released into the SF Toutle.	SF Toutle Winter steelhead	Domestication, Diversity, Abundance	• In-breeding • Harvest	• Continue selective fishery opportunity for hatchery produced summer steelhead in the SF Toutle • Enable visual identification of hatchery and wild returns to provide the means to account for and manage the natural and wild escapement consistent with biological objectives
• Hatchery produced steelhead will be scheduled for release during the time when the maximum numbers of fish are smolted and prepared to emigrate rapidly. • Juvenile rearing strategies will be implemented to provide a fish growth schedule which coincides with an optimum release time for hatchery production survival and to minimize time spent in the Toutle Basin.	*Juvenile release strategies to minimize impacts to natural populations	Skamania Hatchery summer steelhead released into the SF Toutle.	SF Toutle winter steelhead and coho.	Predation, Competition	• Hatchery smolt residence time in the SF Toutle and mainstem Toutle.	• Minimal residence time of hatchery released juvenile resulting in reduced ecological interactions between hatchery and wild juveniles. • Minimized predation by summer steelhead smolts upon natural produced winter steelhead and, coho. • Improved survival of wild juveniles, resulting in increased productivity and abundance of winter steelhead and coho
• Research, monitoring , and evaluation of performance of the above actions in relation to expected outcomes • Performance standards developed for each actions with measurable criteria to determine success or failure • Adaptive Management applied to adjust or change actions as necessary	** Monitoring and evaluation, adaptive management	All species	All species	Hatchery production performance, Natural production performance	• All of above	• Clear standards for performance and adequate monitoring programs to evaluate actions. • Adaptive management strategy reacts to information and provides clear path for adjustment or change to meet performance standard

- Extension or improvement of existing actions-may require additional funding
- ** New action-will likely require additional funding

I.5.6. Harvest

Fisheries are both an impact that reduces fish numbers and an objective of recovery. The long-term vision is to restore healthy, harvestable natural salmonid populations in many areas of the lower Columbia basin. The near-term strategy involves reducing fishery impacts on natural populations to ameliorate extinction risks until a combination of actions can restore natural population productivity to levels where increased fishing may resume. The regional strategy for interim reductions in fishery impacts involves: 1) elimination of directed fisheries on natural populations, 2) regulation of mixed stock fisheries for healthy hatchery and natural populations to limit and minimize indirect impacts on natural populations, 3) scaling of allowable indirect impacts for consistency with recovery, 4) annual abundance-based management to provide added protection in years of low abundance while allowing greater fishing opportunity consistent with recovery in years with much higher abundance, and 5) mass marking of hatchery fish for identification and selective fisheries.

Actions to address harvest impacts are generally focused at a regional level to cover fishery impacts accrued to lower Columbia salmon as they migrate along the Pacific Coast and through the mainstem Columbia River. Fisheries are no longer directed at weak natural populations but incidentally catch these fish while targeting healthy wild and hatchery stocks. Subbasin fisheries affecting natural populations have been largely eliminated. Fishery management has shifted from a focus on maximum sustainable harvest of the strong stocks to ensuring protection of the weak stocks. Weak stock protections often preclude access to large numbers of otherwise harvestable fish in strong stocks.

Fishery impact limits to protect ESA-listed weak populations are generally based on risk assessments that identify points where fisheries do not pose jeopardy to the continued persistence of a listed group of fish. In many cases, these assessments identify the point where additional fishery reductions provide little reduction in extinction risks. A population may continue to be at significant risk of extinction but those risks are no longer substantially affected by the specified fishing levels. Often, no level of fishery reduction will be adequate to meet naturally-spawning population escapement goals related to population viability. The elimination of harvest will not in itself lead to the recovery of a population. However, prudent and careful management of harvest can help close the gap in a coordinated effort to achieve recovery.

Fishery actions specific to the subbasins are addressed through the Washington State Fish and Wildlife sport fishing regulatory process. This public process includes an annual review focused on emergency type regulatory changes and a comprehensive review of sport fishing regulations which occurs every two years. This regulatory process includes development of fishing rules through the Washington Administrative Code (WAC) which are focused on protecting weak stock populations while providing appropriate access to harvestable populations. The actions consider the specific circumstances in each area of each subbasin and respond with rules that fit the relative risk to the weak populations in a given time and area of the subbasin. Regulatory and protective fishery actions pertaining to salmon and steelhead in the Toutle basin are presented in Table I-21 for the mainstem and NF Toutle and Table I-22 for the SF Toutle. Additional detail of tributary fishing rules can be found in the WDFW sport fishing regulation pamphlet.

Regional actions cover species from multiple watersheds which share the same migration routes and timing, resulting in similar fishery exposure. Regional strategies and measures for harvest are detailed in Volume I. A number of regional strategies for harvest involve implementation of actions within specific subbasins. In-basin fishery management is generally applicable to steelhead and salmon while regional management is more applicable to salmon. Regional harvest actions with significant application to the Toutle Subbasin and South Fork Toutle populations are summarized in Table I-23.

Table I-21. Summary of regulatory and protective fishery actions in the North ForkToutle basin

Species	General Fishing Actions	Explanation	Other Protective Fishing Actions	Explanation
Fall Chinook	Open for fall Chinook	Hatchery fish are produced for harvest. Hatchery fish are not mass marked	Closures in spawning areas, night closures, and gear restrictions in NF Toutle and Green.	Protects fall Chinook while spawning and in heavy concentration areas
Spring Chinook	Retain only adipose fin-clipped Chinook	Selective fishery for hatchery Chinook, unmarked wild spring Chinook must be released	Open only downstream of North Toutle Hatchery in lower Green River	Spring Chinook fishing only allowed where hatchery fish are concentrated.
chum	Closed to retention	Protects natural chum. Hatchery chum are not produced for harvest		
coho	Retain only adipose fin-clip marked coho	Selective fishery for hatchery coho, unmarked wild coho must be released	Upper NF Toutle, upper Green River, and tributaries closed to salmon fishing	Protects wild spawners in tributary creeks. Hatchery coho are released in the lower Green River.
Winter steelhead	Closed season	Steelhead fishing is closed in the winter months to protect wild fish. No hatchery winter steelhead are released in the Toutle basin	Summer Steelhead and trout fishing closed in the spring and minimum size restrictions in affect	Spring closure Protects adult wild steelhead during spawning and minimum size protects juvenile steelhead
Summer steelhead	Retain only adipose fin-clipped steelhead	Selective fishery for hatchery produced summer steelhead, unmarked wild steelhead must be released	Season open in late spring to late fall when hatchery summer steelhead are present and wild winter steelhead are not	Only wild winter steelhead are native to the Toutle basin. Season is structured to avoid wild fish encounters

Table I-22. Summary of regulatory and protective fishing actions in the South Fork Toutle basin

Species	General Fishing Actions	Explanation	Other Protective Fishing Actions	Explanation
Fall Chinook	Closed to retention	Protects wild fall Chinook. No hatchery produced fall Chinook in the SF Toutle	No fisheries for other salmon	Further protection of wild fall Chinook spawners
chum	Closed to retention	Protects wild chum. Hatchery chum are not released in the SF Toutle	No fisheries for other salmon and steelhead season closed before December	Further protection of wild chum spawners
coho	Closed to retention	Protects wild coho. Hatchery coho are not released in the SF Toutle for harvest.	No fisheries for other salmon	Further protection of wild coho spawners
Summer steelhead	Retain only adipose fin-clip marked steelhead	Selective fishery for hatchery steelhead, unmarked wild steelhead must be released.	Steelhead and trout fishing closed in the spring and minimum size restrictions in affect	Spring closure Protects adult wild winter steelhead during spawning and minimum size protects juvenile steelhead
Winter steelhead	Closed season	Winter months are closed to fishing. No hatchery winter steelhead are released in the SF Toutle	Spring closures, minimum size and special selective gear rules in affect.	Further protection for wild winter adult and juvenile steelhead

Table I-23. Regional harvest actions from Volume I with significant application to the Toutle River Subbasin populations.

Action	Description	Responsible Parties	Programs	Comments
	Monitor chum handle rate in winter steelhead and late coho tributary sport fisheries.	WDFW	Columbia Compact	State agencies would include chum incidental handle assessments as part of their annual tributary sport fishery sampling plan.
	Develop a mass marking plan for hatchery tule Chinook for tributary harvest management and for naturally-spawning escapement monitoring.	WDFW, NMFS, USFWS, Col. Tribes	U.S. Congress, Washington Fish and Wildlife Commission	Provides the opportunity to implement selective tributary sport fishing regulations in the Toutle watershed. Recent legislation passed by Congress mandates marking of all Chinook, coho, and steelhead produced in federally funded hatcheries that are intended for harvest. Details for implementation are currently under development by WDFW, ODFW, treaty Indian tribes, and federal agencies.
	Monitor and evaluate commercial and sport impacts to naturally-spawning steelhead in salmon and hatchery steelhead target fisheries.	WDFW, ODFW	Columbia Compact, BPA Fish and Wildlife Program	Includes monitoring of naturally-spawning steelhead encounter rates in fisheries and refinement of long-term catch and release handling mortality estimates. Would include assessment of the current monitoring programs and determine their adequacy in formulating naturally-spawning steelhead incidental mortality estimates.
	Continue to improve gear and regulations to minimize incidental impacts to naturally-spawning steelhead.	WDFW, ODFW	Columbia Compact, BPA Fish and Wildlife Program	Regulatory agencies should continue to refine gear, handle and release methods, and seasonal options to minimize mortality of naturally-spawning steelhead in commercial and sport fisheries.
	Maintain selective sport fisheries in Ocean, Columbia River, and tributaries and monitor naturally-spawning stock impacts.	WDFW, NMFS, ODFW, USFWS	PFMC, Columbia Compact, BPA Fish and Wildlife Program, WDFW Creel	Mass marking of lower Columbia River coho and steelhead has enabled successful ocean and freshwater selective fisheries to be implemented since 1998. Marking programs should be continued and fisheries monitored to provide improved estimates of naturally-spawning salmon and steelhead release mortality.

* Extension or improvement of existing action
** New action

I.5.7. Hydropower

No hydropower facilities exist in the Toutle subbasin, hence, no in-basin hydropower actions are identified. Toutle River anadromous fish populations will benefit from regional hydropower measures recovery measures and actions identified in regional plans to address habitat effects in the mainstem and estuary.

I.5.8. Mainstem and Estuary Habitat

Toutle River anadromous fish populations will also benefit from regional recovery strategies and measures identified to address habitat conditions and threats in the Columbia River mainstem and estuary. Regional recovery plan strategies involve: 1) avoiding large scale habitat changes where risks are known or uncertain, 2) mitigating small-scale local habitat impacts to ensure no net loss, 3) protecting functioning habitats while restoring impaired habitats to functional conditions, 4) striving to understand, protect, and restore habitat-forming processes, 5) moving habitat conditions in the direction of the historical template which is presumed to be more consistent with restoring viable populations, and 6) improving understanding of salmonid habitat use in the Columbia River mainstem and estuary and their response to habitat changes. A series of specific measures are detailed in the regional plan for each of these strategies.

I.5.9. Ecological Interactions

For the purposes of this plan, ecological interactions refer to the relationships of salmon anad steelhead with other elements of the ecosystem. Regional strategies and measures pertaining to exotic non-native species, effects of salmon on system productivity, and native predators of salmon are detailed and discussed at length in Volume I and are not reprised at length in each subbasin plan. Strategies include 1) avoiding, eliminating introductions of new exotic species and managing effects of existing exotic species, 2) recognizing the significance of salmon to the productivity of other species and the salmon themselves, and 3) managing predation by selected species while also maintaining a viable balance of predator populations. A series of specific measures are detailed in the regional plan for each of these strategies. Implementation will occur at the regional and subbasin scale.

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