8 Cowlitz Subbasin – Toutle

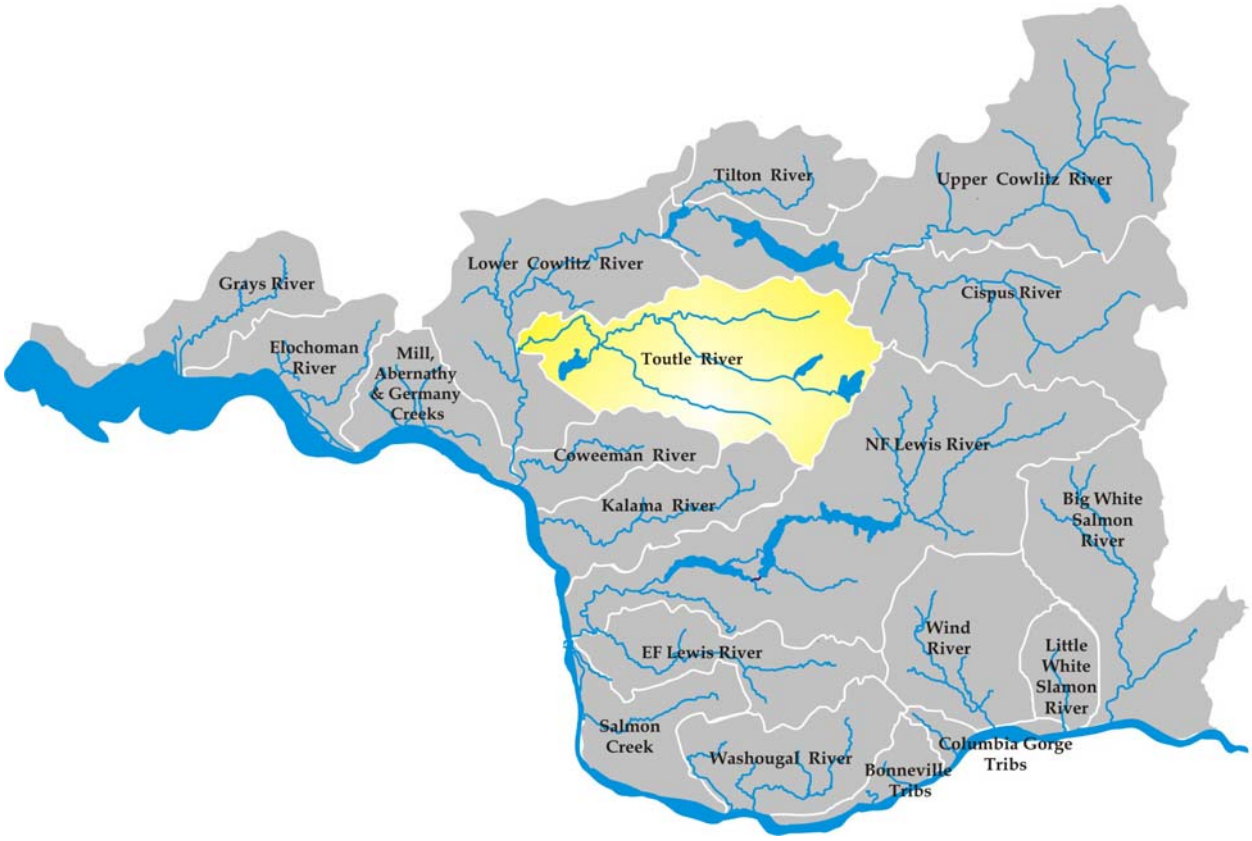


Figure 8-1. Location of the Toutle River Basin within the Lower Columbia River Basin.

8.1 Basin Overview

The Toutle River basin comprises approximately 513 square miles, primarily in Cowlitz County with some tributaries in Lewis and Skamania counties. The Toutle River enters the Cowlitz approximately 5 miles upstream of the town of Castle Rock, Washington. Principal tributaries include the Green River and, South Fork and North Fork Toutle. The basin is part of WRIA 26.

The Toutle Basin will play a key role in the recovery of salmon and steelhead. The North Fork Toutle Basin has historically supported populations of fall Chinook, winter steelhead, and coho. The South Fork Toutle Basin has historically supported populations of spring Chinook, winter steelhead, and coho. Today, Chinook and steelhead are listed as threatened under the ESA. Coho salmon are a candidate for listing. Other fish species of interest are Pacific Lamprey and coastal cutthroat trout – these species are also expected to benefit from salmon protection and restoration measures.

Toutle salmon and steelhead are affected by a variety of in-basin and out-of basin factors including stream, Columbia River mainstem, estuary, and ocean habitat conditions; harvest; hatcheries; and ecological relationships with other species. Analysis has demonstrated that recovery cannot be achieved by addressing only one limiting factor. Recovery will require action to reduce or eliminate all manageable factors or threats. The deterioration of habitat conditions in the Columbia River mainstem, estuary, and plume affect all anadromous salmonids within the Columbia Basin. Direct harvest of listed salmon and steelhead is prohibited but sport

and commercial fisheries focusing on hatchery fish and other healthy wild populations, primarily in the mainstem Columbia and ocean, incidentally affect ESA-listed Toutle fish. North Toutle Hatchery operates within the North Fork Toutle with the potential to both adversely affect wild salmon and steelhead populations and to assist in recovery efforts. Releases from Skamania Hatchery are made into the South Fork Toutle. Key ecological interactions of concern include effects of nonnative species; nutrient inputs from salmon carcasses; and predation by species affected by development including Caspian terns, northern pikeminnow, seals, and sea lions. Discussions of out-of-basin factors, strategies, and measures common to all subbasins may be found in Volume I, Chapters 4 and 7. This subbasin chapter focuses on habitat and other factors of concern specific to the Toutle Subbasin.

Forestry is the dominant land use and commercial forestland makes up over 90% of the basin. Much of the upper basin around Mount St. Helens is within the Mount 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 Mount St. Helens were decimated in the 1980 eruption. Intensive forest harvest and road building followed the eruption and contributed to widespread sediment and flow impairment. The majority of the forest is now in early seral or 'other forest' (bare soil, shrubs) vegetation conditions.

Of the three primary tributaries (North Fork, South Fork, Green River), the North Fork Toutle suffered the greatest eruption-related impacts, followed by the South Fork and then the Green River, which was mostly spared the devastating mud and debris flows. The North Fork historically provided productive habitats for steelhead and Chinook but productivity continues to remain limited due to eruption and forestry impacts. The sediment loads in the North Fork remain very high, with a braided channel that is under frequent adjustment. The North Fork is further impacted by the Sediment Retention Structure (SRS). The SRS was created in an effort to retain sediments following the eruption, but has become a persistent source of sediment to downstream reaches. The SRS is also a passage barrier and fish are currently transported around the structure.

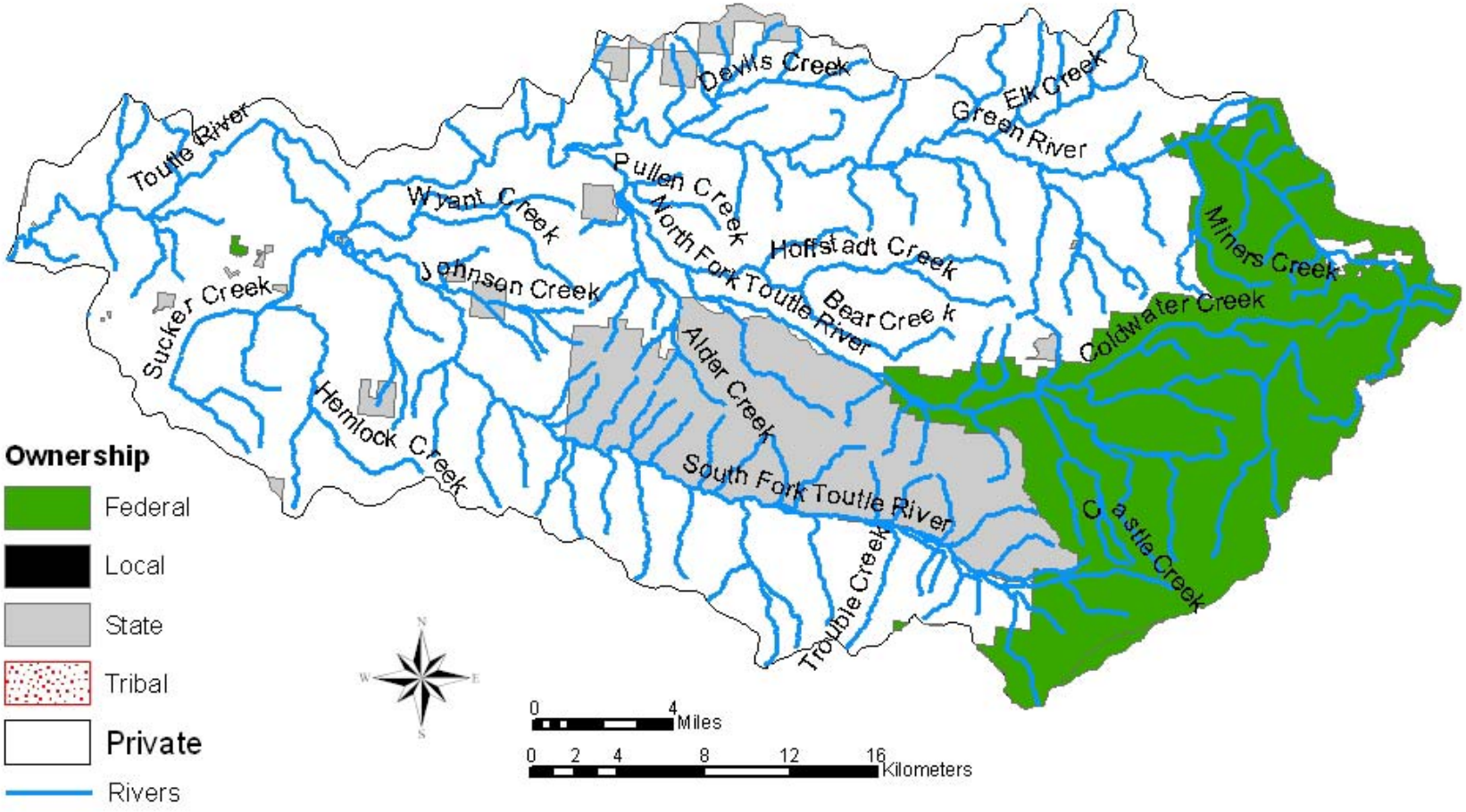
The South Fork, which also continues to suffer from high sediment loads, is recovering more rapidly than the North Fork. The South Fork has high restoration as well as preservation value for steelhead and Chinook. The Green River also has high restoration and preservation value.

The lower mainstem is utilized by fall Chinook and historically provided chum habitat. These reaches were heavily degraded by the dredging of eruption-related sediments and the placement of these sediments in the floodplain. Channels are currently disconnected from floodplains and channel instability remains high.

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%

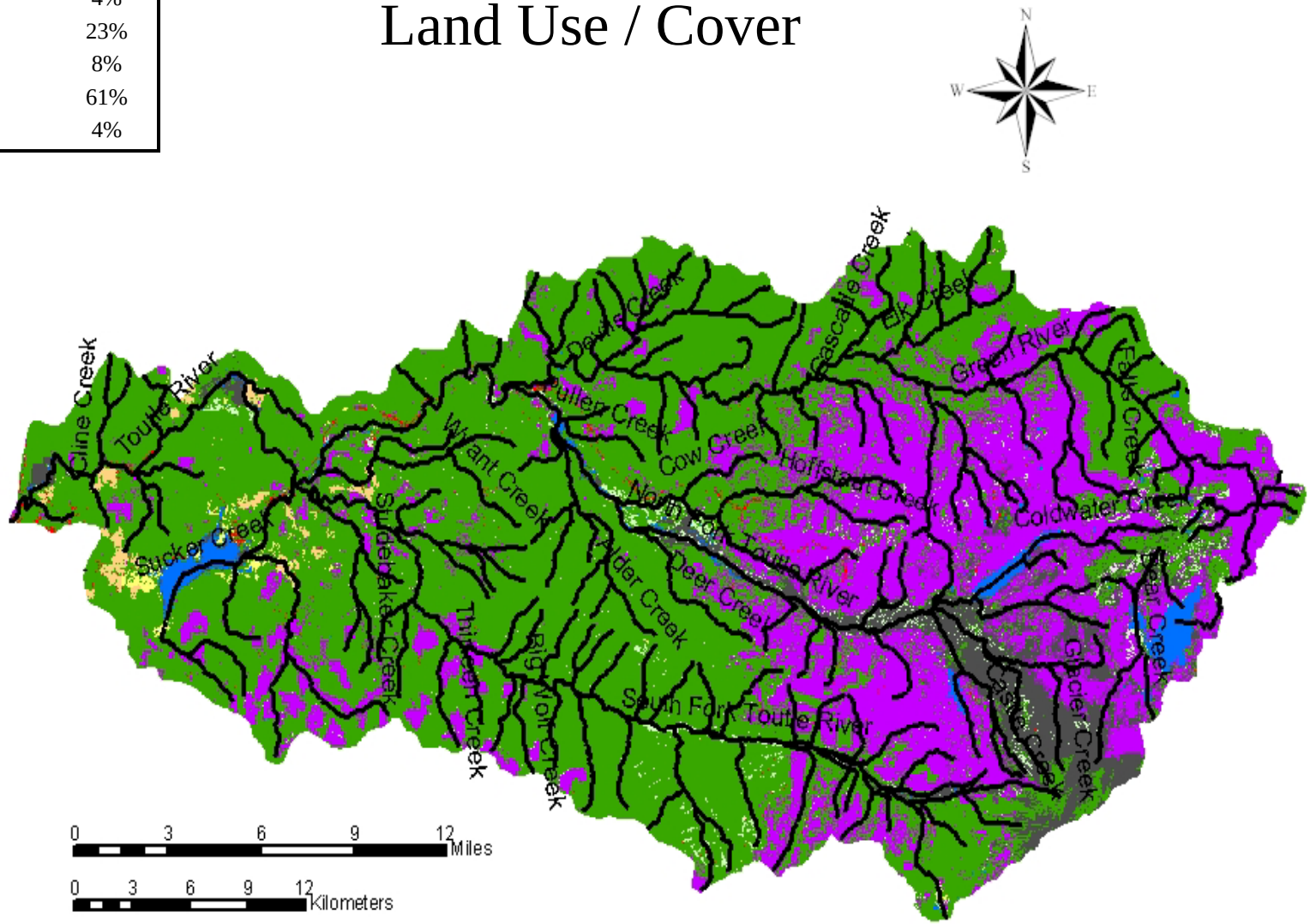
Land Ownership	
Private	54%
Federal	28%
State	18%
Other public	0%

Land Ownership



Vegetation Composition	
Late Seral	4%
Mid Seral	23%
Early Seral	8%
Other Forest	61%
Non Forest	4%

Land Use / Cover



8.2 Species of Interest

8.2.1 North Fork Toutle

Focal salmonid species in the North Fork Toutle include fall Chinook, winter steelhead, chum and coho. The health or viability of all focal populations is currently low. Focal populations need to improve to a targeted level that contributes to recovery of the species (see Volume I, Chapter 6). Recovery goals call for restoring winter steelhead and coho to a high viability level. This level will provide for a 95% probability of population survival over 100 years. The recovery goal for fall Chinook is low viability which allows for a 40-74% chance of persistence over 100 years.

Other species of interest in the NF Toutle include coastal cutthroat trout and Pacific lamprey. Regional objectives for these species are described in Volume I, Chapter 6. Recovery actions targeting focal salmonid species are also expected to provide significant benefits for these other species. Cutthroat will benefit from improvements in stream habitat conditions for salmonids. 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 of lamprey are not well known.

Table 8-1.Current viability status of North Fork Toutle populations and the biological objective status that is necessary to meet the recovery criteria for the Cascade strata and the lower Columbia ESU.

	ESA	Hatchery	Current		Objective	
Species	Status	Component	Viability	Numbers	Viability	Numbers
Fall Chinook	Threatened	Yes	Low	300-5,000	Low	1,400-14,100
Winter steelhead	Threatened	No	Low	100-300	High	700-3,500
Coho	Candidate	Yes	Low	unknown	High	unknown

Fall Chinook – 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 hatchery origin fish spawning in the Lower 0.5 mile of the Green River. Prior to the eruption of Mt. St. Helens in 1980, the majority of fall Chinook spawning occurred in the lower 5 miles of the mainstem 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 Hathery 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.

Winter Steelhead – 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.

Coho – The historical NF Toutle adult population is estimated as high as 60,000 fish, with the majority of returns early stock which spawn in November. Current returns are unknown but assumed to be low since the 1980 eruption of Mt. St. Helens. A number of hatchery produced fish spawn naturally. Natural spawning can occur in most areas of the Green and NF Toutle, most notably Devils and Elk creeks on the Green and Alder, Hoffstadt, and Bear creeks on the NF Toutle. Juvenile rearing occurs upstream and downstream of spawning areas. Juveniles rear for a full year in the Toutle Basin before migrating as yearlings in the spring.

Coastal Cutthroat – 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.

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.

8.2.2 South Fork Toutle

Focal salmonid species in the South Fork Toutle basin include spring Chinook, winter steelhead, and coho. SF Toutle chum are considered part of the lower Cowlitz population and fall Chinook part of the mainstem Toutle population. The health or viability of the focal populations is currently very low for spring Chinook, low for coho, and medium for winter steelhead. Focal populations need to improve to a targeted level that contributes to recovery of the species (see Volume I, Chapter 6). Recovery goals call for restoring winter steelhead and coho to a high or very high viability level. This level will provide for a 95% or better probability of population survival over 100 years. The recovery goal for spring Chinook is medium viability which allows for a 75-95% chance of persistence over 100 years.

Table 8-2. Current viability status of South Fork Toutle populations and the biological objective status that is necessary to meet the recovery criteria for the Cascade strata and the lower Columbia ESU.

	ESA	Hatchery	Current		Objective	
Species	Status	Component	Viability	Numbers	Viability	Numbers
Spring Chinook	Threatened	No	Very Low	<200	Med	1,400-3,400
Winter Steelhead	Threatened	Yes	Med	200-2,500	High+	1,400-1,900
Coho	Candidate	No	Low	unknown	High	unknown

Spring Chinook – The historical Toutle population (including mainstem, SF and NF) is estimated from 4,000-40,000, although these estimates may be high. Only 400 spring Chinook were counted in 1951. The current return is likely less than 200 fish. Spawning occurs from late August –early October. Juveniles typically spend a full year rearing in the Toutle and migrate to the Columbia in the spring of their second year.

Winter Steelhead – The historical SF Toutle adult population is estimated from 4,000-4,500 fish. Current natural spawning returns range from 200-2,500 fish. In-breeding with hatchery produced summer steelhead is thought to be low because of differences in spawn timing. Spawning occurs primarily in the mainstem SF Toutle, and Studebaker, Johnson, and Bear creeks. Spawning time is early 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 SF Toutle.

Coho – The historical SF Toutle adult population is estimated from 15,000-40,000, with the majority of returns early stock coho. Early coho spawning occurs primarily in early to mid-November. Current returns are unknown but assumed to be low. Natural spawning can occur in most areas of the basin including the mainstem, and Outlet, Johnson, Studebaker, Bear, and

Herrington creeks. Juvenile rearing occurs upstream and downstream of spawning areas. Juveniles rear for a full year in the SF Toutle basin before migrating as yearlings in the spring.

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

Pacific lamprey – Information on lamprey abundance is limited and does not exist for the Sf Toutle 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 Basin . 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 Basin. Juveniles rear in freshwater up to 6 years before migrating to the ocean.

Figure 8-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs, and biological objectives depicted for the Toutle Basin.

8.3 Potentially Manageable Impacts

Stream habitat, estuary/mainstem habitat, harvest, hatchery and predation effects have all contributed to reduced salmonid productivity, numbers, and population viability in the Toutle subbasin. The pie charts below represent the relative order of magnitude of quantifiable effects for each of these factors for each focal species. The preferred recovery scenario targets an equivalent reduction in each impact factor in proportion to the magnitude of the effect. Population-specific targets are discussed in further detail in Volume I, Chapter 6.

- Loss of tributary habitat quantity and quality is highly important to all three populations, and is extremely important to winter steelhead. Effects from losses to estuary habitat are relatively minor.

- Harvest is important to both spring Chinook and coho, but is of lesser importance to winter steelhead.

- Hatchery impacts are moderately important to coho and spring Chinook. For winter steelhead, hatchery impacts are non-existent.

- Predation impacts are moderately important to all three populations within the Toutle. Loss of tributary habitat quality and quantity is an important impact for all species, particularly for chum and steelhead. Loss of estuary habitat quality and quantity is also important, particularly for chum.

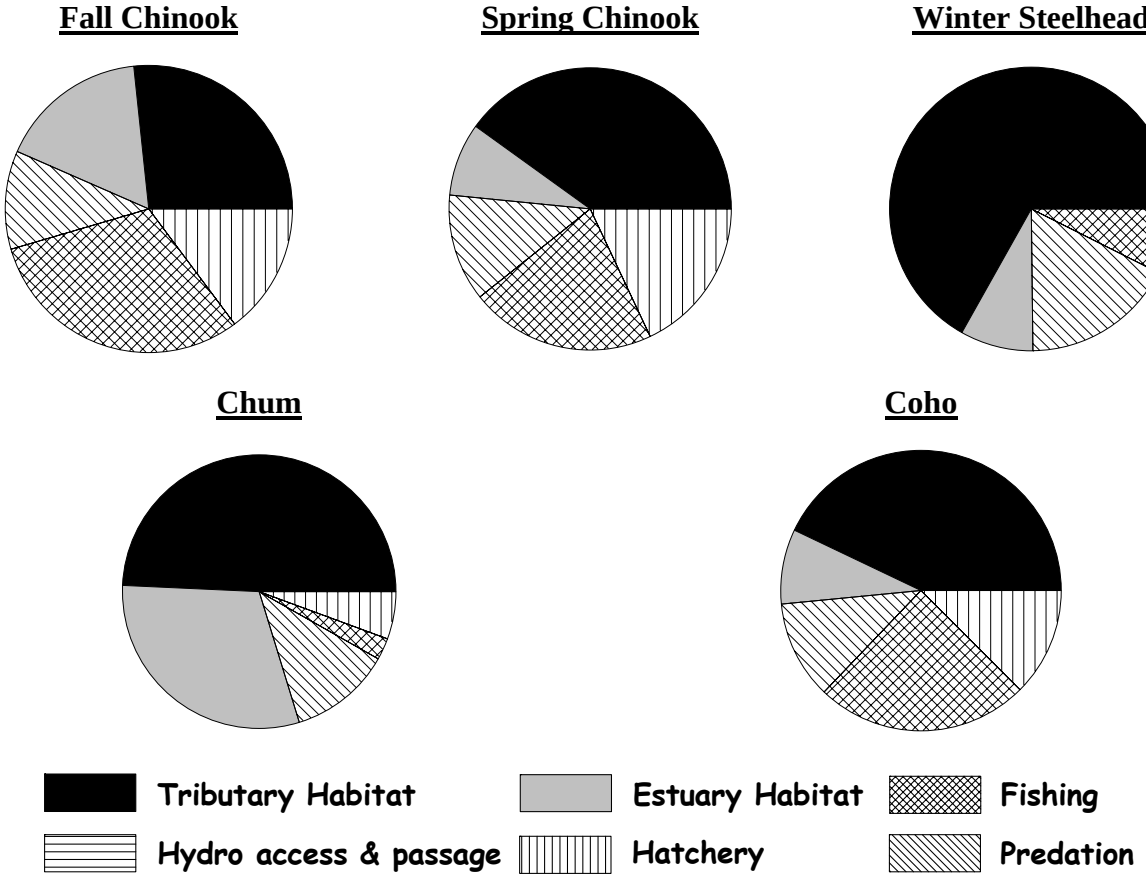


Figure 8-3. Relative contribution of potentially manageable impacts for Toutle populations.

8.4 Limiting Factors, Threats, and Measures

8.4.1 Hydropower Operation and Configuration

There are no hydro-electric dams in the Toutle River Basin. However, Toutle species are affected by mainstem Columbia hydro operations and flow regimes which affect habitat in migration corridors and in the estuary. Mainstem hydro factors and threats are addressed by regional strategies and measures identified in Volume I.

8.4.2 Harvest

8.4.2.1 *Toutle*

Most harvest of Toutle salmon and steelhead occurs incidental to the harvest of hatchery fish and healthy wild stocks in the Columbia estuary, mainstem, and ocean. This mortality is very low for chum and steelhead, but is more significant for fall Chinook. Toutle fall Chinook are harvested in ocean and Columbia River commercial and sport fisheries as well as in-basin sport fisheries. Harvest is controlled by an ESA harvest limit associated with Coweeman natural fall Chinook. No harvest of chum occurs in ocean fisheries, there are no directed Columbia River or Toutle basin chum fisheries, 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 fin-marked hatchery fish and release unmarked wild fish. 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.

Measures 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. The regional measures 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, Chapter 7. A number of regional strategies for harvest involve implementation of measures within specific subbasins. In-basin fishery management is applicable to steelhead and salmon while regional management is more applicable to salmon. Harvest measures with significant application to Toutle Subbasin populations are summarized in the following table:

Table 8-3. Regional harvest measures from Volume I, Chapter 7 with specific implementation actions in the Toutle Subbasin.

Measure	Description	Comments
F.M17	Monitor chum handle rate in winter steelhead and late coho tributary sport fisheries.	State agencies would include chum incidental handle assessments as part of their annual tributary sport fishery sampling plan.
F.M13	Develop a mass marking plan for hatchery tule Chinook for tributary harvest management and for naturally-spawning escapement monitoring.	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.
F.M18	Monitor and evaluate commercial and sport impacts to naturally-spawning steelhead in salmon and hatchery steelhead target fisheries.	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.
F.M19	Continue to improve gear and regulations to minimize incidental impacts to naturally-spawning steelhead.	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.
F.M24	Maintain selective sport fisheries in Ocean, Columbia River, and tributaries and monitor naturally-spawning stock impacts.	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.

8.4.3 Hatcheries

As noted in the regional strategies, hatcheries can adversely affect wild salmon and steelhead populations in several ways. These include domestication or the reduction in the fitness of wild fish due to interbreeding with hatchery fish, direct competition between wild and hatchery fish for habitat and nutrients, and the introduction of disease. Hatcheries can also assist in recovery efforts by providing fish needed to reestablish extirpated populations or to augment wild populations that have reached critically low levels.

8.4.3.1 *North Fork Toutle*

The North Toutle Hatchery (since 1952) produces fall Chinook, coho, and 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 8-4.North Toutle Hatchery Production.

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

Regional hatchery strategies and measures are focused on evaluating and reducing biological risks and reducing the risks to natural populations. Artificial production programs within the North Toutle facility will be evaluated in detail through the WDFW Benefit-Risk Assessment Procedure (BRAP) relative to risks to natural populations. The resulting program specific actions will be developed, evaluated, and documented through the Hatchery and Genetic Management Plan for public review and consideration by NOAA Fisheries (details in programs Technical Foundation, Volume IV). Regional hatchery measures identified in Volume I, Chapter 7 with potential applications to programs within the North Toutle subbasin are summarized in Table 7.

Table 8-5. Regional hatchery measures from Volume I, Chapter 7 with potential implementation actions in the Toutle Subbasin.

Measure	Description	Comments
H.M2,5,13,38	Integrated hatchery and wild program for fall Chinook. Evaluate potential for integration of an early stock coho program.	Assures fitness of the natural produced fish which will improve population productivity. Integrated programs would be developed specific to the Toutle populations in the BRAP procedure.
H.M14	Use only local broodstock in the fall Chinook hatchery program.	This measure will preclude transfer of outside basin stock into the North Toutle Hatchery program. This will enable a hatchery and wild integrated program to be developed with fall Chinook that are ecologically adapted to the Toutle Basin.
H.M15,32,40	Juvenile release strategies to minimize interactions with naturally spawning fish	Release strategies are aimed at reducing or avoiding interactions with wild steelhead, fall Chinook, coho by release timing and release location strategies.
H.M17,34,42	Mark hatchery steelhead, coho, fall Chinook with an adipose fin-clip for identification and selective harvest	Marking hatchery fish allows for identification of hatchery fish in the natural spawning grounds and at collection facilities which enables accurate accounting of wild fish. Marking also enables selective fisheries to retain hatchery fish and release wild fish.
H.M8	Adaptively manage hatchery programs to further protect and enhance natural populations and improve operational efficiencies.	Appropriate research, monitoring, and evaluation programs along with guidance from regional hatchery evaluations will be utilized to improve the survival and contribution of hatchery fish, reduce impacts to natural fish, and increase benefits to natural fish.
H.M2,6	Evaluate North Toutle Hatcheries facility operations.	The hatchery would be evaluated in the BRAP process for potential hazards associated with barriers to fish passage and adequacy of screens.

8.4.3.2 *South Fork Toutle*

There are no hatcheries operating in the South Fork Toutle Basin. Skamania stock summer steelhead are released into the South Fork Toutle as smolts for harvest opportunity. Skamania Hatchery steelhead are a composite stock and are genetically different from the naturally produced winter steelhead from the South Fork Toutle River. 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.

Table 8-6. South Fork Toutle River hatchery production.

Hatchery	Release Location	Summer Steelhead
Skamania	South Fork Toutle	25,000

Regional hatchery strategies and measures are focused on evaluating and reducing biological risks and reducing the risks to natural populations. Artificial production programs within the Toutle facilities will be evaluated in detail through the WDFW Benefit-Risk Assessment Procedure (BRAP) relative to risks to natural populations. The resulting program specific actions will be developed, evaluated, and documented through the Hatchery and Genetic Management Plan for public review and consideration by NOAA Fisheries (details in programs Technical Foundation, Volume IV). Regional hatchery measures identified in Volume I, Chapter 7 with potential applications at facilities within the South Fork Toutle Subbasin are summarized in Table 7.

Table 8-7. Regional hatchery measures from Volume I, Chapter 7 with potential implementation actions in the South Fork Toutle Subbasin.

Measure	Description	Comments
H.M32	Juvenile release strategies to minimize interactions with naturally-spawning fish.	Release strategies are aimed at reducing or avoiding interactions with wild steelhead, fall Chinook, coho by release timing and release location strategies.
H.M8	Adaptively manage hatchery programs to further protect and enhance natural populations and improve operational efficiencies.	Appropriate research, monitoring, and evaluation programs along with guidance from regional hatchery evaluations will be utilized to improve the survival and contribution of hatchery fish, reduce impacts to natural fish, and increase benefits to natural fish.

8.4.4 Ecological Interactions

Ecological interactions focus on how salmon and steelhead, other fish species, and wildlife interact with each other and the subbasin ecosystem. Toutle salmon and steelhead are affected throughout their lifecycle by ecological interactions with non-native species, food web components, and predators. Interactions are similar for Toutle populations to those of most other subbasin salmonid populations. These interactions are described in further detail in Volume I, Chapter 4. Ecological Interactions are addressed by regional strategies and measures identified in Volume I, Chapter 7.

8.4.5 Habitat – Estuary and Lower Columbia Mainstem

Conditions in the Columbia River mainstem, estuary, and plume affect all anadromous salmonid populations within the Columbia Basin. 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 are similar for Toutle populations to those of most other subbasin salmonid populations. Effects are likely to be greater for chum and fall Chinook than spring Chinook, steelhead, and coho. Estuary and mainstem effects on Toutle salmon populations are addressed by regional strategies and measures identified in Volume I and the Columbia Mainstem and Estuary Subbasin sections of Volume II.

8.4.6 Habitat – Subbasin Streams and Watersheds

Decades of human activity 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 River basin have the greatest impact on the health and viability of salmon and steelhead relative to the other limiting factors and threats discussed in this chapter.

Subwatersheds, reaches, and habitat attributes have been prioritized for protection and/or restoration based on the plan's biological objectives, fish distribution, critical life history stages, current habitat conditions, and potential fish population performance. Priority areas for habitat preservation and restoration are identified in Figure 8-4. A summary of the primary habitat limiting factors and threats are presented in Table 8-9. Habitat measures and related information are presented in Table 8-10. Results of IWA watershed process modeling are depicted for subwatersheds in Figure 8-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 8-8. Details on species-specific spatial priorities and limiting factors at the subbasin level may be found in volume II of the Technical Foundation. A description of the methodology used to generate composite (multi-species) reach and subwatershed priorities can be found in the introduction to this volume of the recovery plan.

The areas with the greatest current or potential contribution to focal salmonid population health and productivity are listed below. Tier 1 and 2 reaches within these priority areas are included in the list. The habitat limiting factors, threats, and measures included in this chapter focus primarily on the priority areas and the Tier 1 and 2 reaches within them. Tiers 3, 4, and non-tiered reaches are considered secondary priority, but in many cases, these lower priority areas will also require restoration and preservation actions in order to achieve recovery objectives. Watershed process measures generally focus on the entire basin as opposed to being limited only to high priority areas because conditions in high priority areas are often influenced by cumulative watershed effects. High priority areas and reaches in the Toutle Basin include the following:

- Lower Toutle Mainstem - Toutle 1-5
- Lower North Fork and South Fork Toutle – NF Toutle 1-2; SF Toutle 1-3
- Upper South Fork Toutle – SF Toutle 4-20
- North Fork Toutle – NF Toutle 6-13
- Green River – Green River 1-9

The following paragraphs provide a brief overview of each of these priority areas, including species most affected, land-use threats, and the general type of measures that will be necessary for recovery. Additional detail can be found in the tables and figures that follow.

While reach level habitat conditions often result from local factors, they are also affected or shaped by systemic watershed processes. Limiting factors such as temperature, high and low flows, sediment input and large woody debris recruitment are often affected by or result from

upstream conditions and degraded watershed processes. Access to key reaches may also be affected by barriers that occur downstream of a reach. Accordingly, restoration of a priority reach may require action outside the targeted reach. The IWA analysis was used to identify potential upstream watershed areas that could influence reach level habitat attributes. EDT was used to allow a relative comparison of reaches and habitat attributes within a reach.

Potentially productive habitats for fall Chinook, chum, and coho exist in the lower few miles of the lower mainstem Toutle. These reaches were heavily impacted by mud and debris flows during the 1980 Mount St. Helens eruption. Further degradation to channel, riparian, and floodplain conditions was caused by channel dredging and floodplain spoils placement in an effort to increase flow conveyance following the eruption. Effective recovery measures will entail reducing channel confinement and restoring riparian areas.

The lower SF Toutle up to approximately Brownell Creek and the NF Toutle just upstream of the SF confluence (reach NF Toutle 1-2) have good current and potential habitat for coho and fall Chinook. These reaches also support winter steelhead, but to a lesser degree. The SF was heavily impacted by the 1980 eruption, but less so than the NF. These reaches have recovered significantly over the past 24 years. The recovery emphasis in these reaches is for restoration as well as preservation actions. Floodplain and riparian restoration will need to be combined with recovery of functioning watershed process conditions.

The upper SF Toutle provides important habitat for winter steelhead and fall Chinook. These reaches have experienced rapid recovery since the 1980 eruption and subsequent heavy timber harvests. They have strong preservation value in addition to restoration value.

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. The reaches with the most potential are located just downstream of the Green River confluence and further upstream on the NF between Hoffstadt Creek and Castle Creek (reach NF Toutle 13). 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. Emphasis should also be placed on addressing the continued supply of sediment from the SRS, which has become a persistent limiting factor for fish in downstream reaches.

Green River reaches contain important current and potential production for winter steelhead, fall Chinook, and coho, especially between Cascade Creek and Elk Creek. 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.

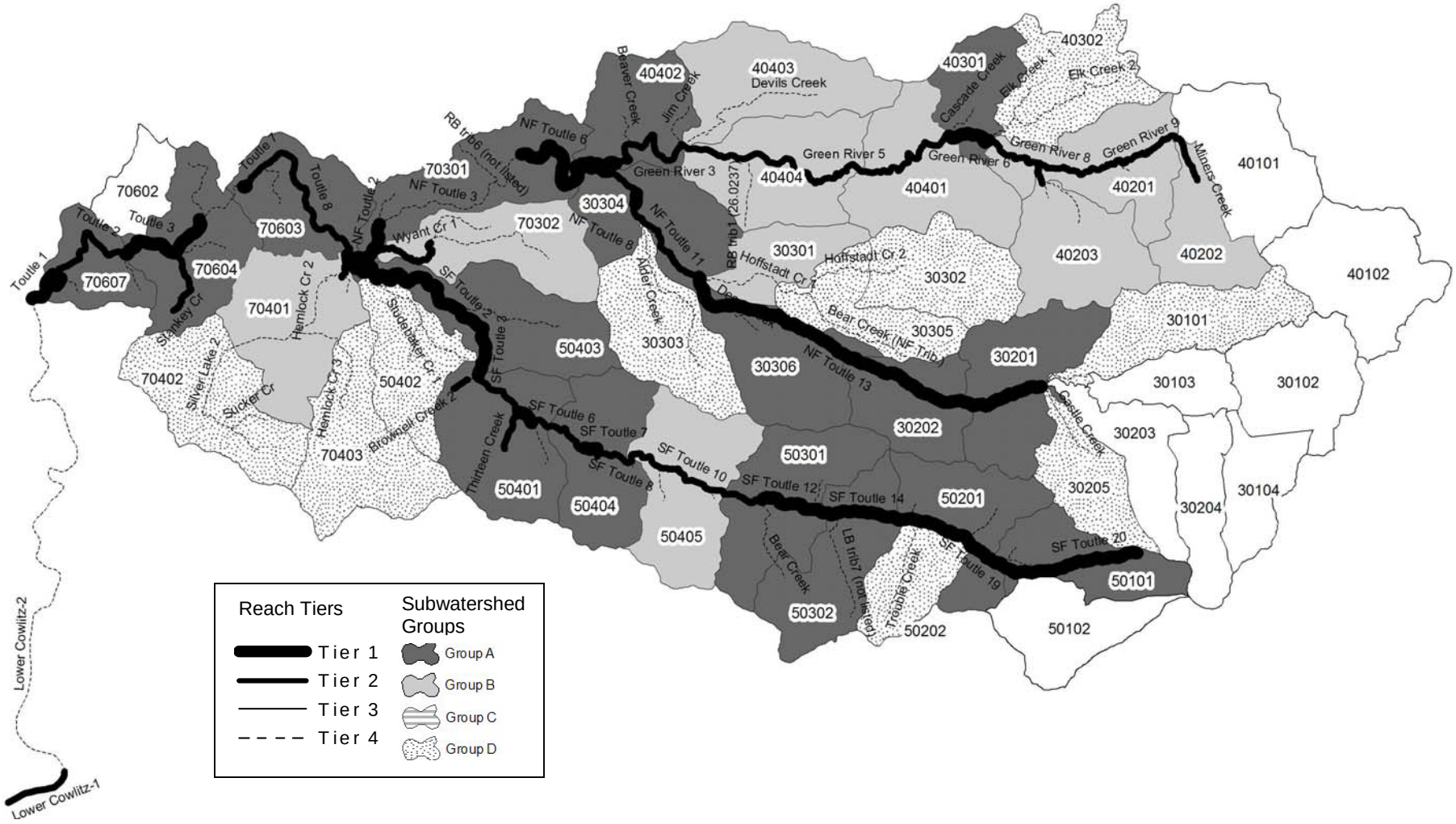


Figure 8-4. Reach tiers and subwatershed groups in the Toutle Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at the reach 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.

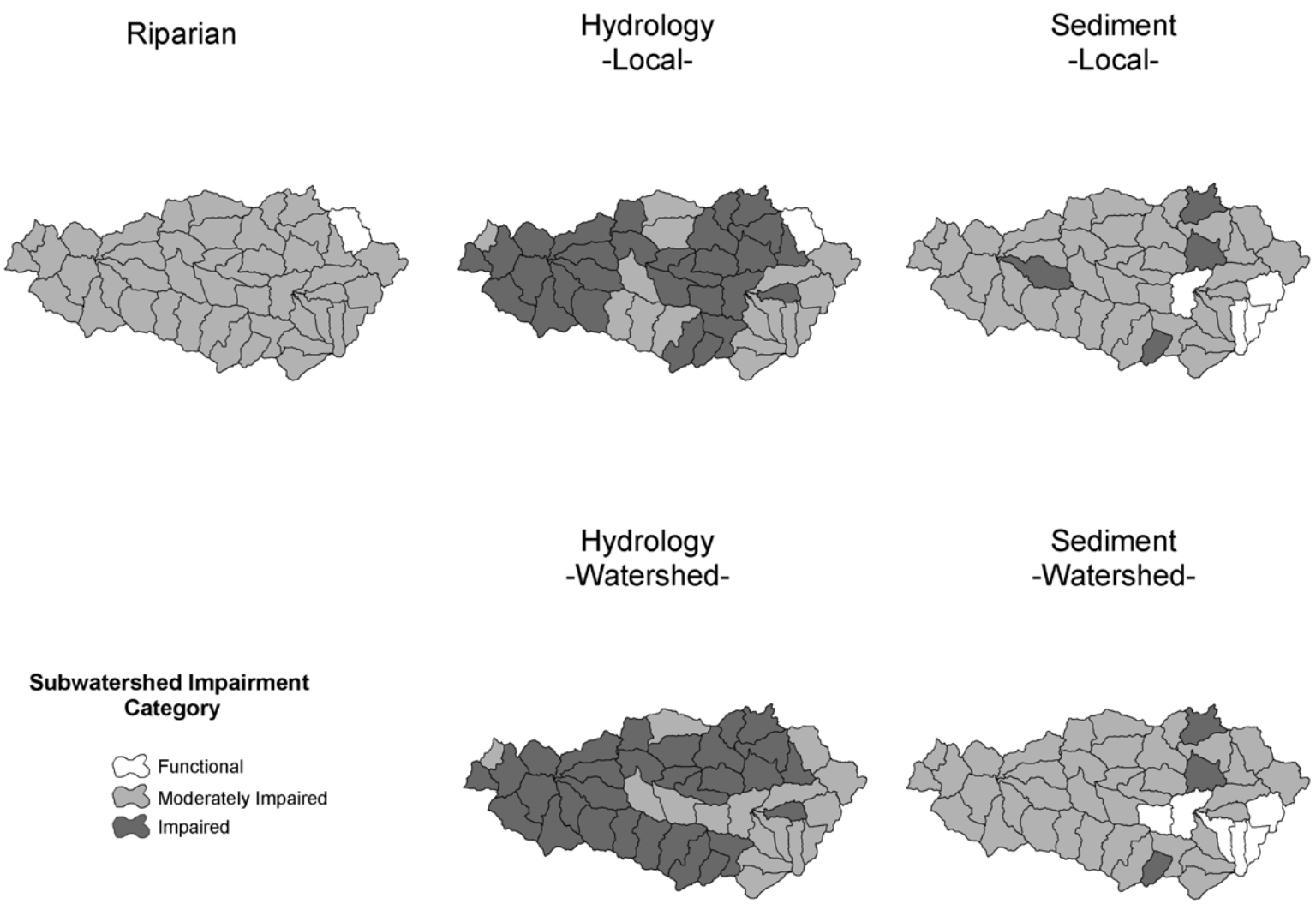


Figure 8-5. IWA subwatershed impairment ratings by category for the Toutle basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.

Table 8-8. Summary table of reach- and subwatershed-scale limiting factors in priority areas. The table is organized by subwatershed groups, beginning with the highest priority group. Species-specific reach priorities, critical life stages, high impact habitat factors, and recovery emphasis (P=preservation, R=restoration, PR=restoration and preservation) are included. Watershed process impairments: F=functional, M=moderately impaired, I=impaired. Species abbreviations: ChS=spring Chinook, ChF=fall Chinook, StS=summer steelhead, StW=winter steelhead.

Sub-watershed Group	Sub-watershed	Reaches within subwatershed	Species Present	High priority reaches by species	Critical life stages by species	High impact habitat factors by species	Preservation or restoration emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
A	70607	LB trib1 (26.0228) LB trib2 (26.0229) Toutle 1 Toutle 2	StW	none				I	M	M	I	M
			Coho	Toutle 1	Summer rearing Winter rearing Juvenile migrant (age 1) Adult holding	habitat diversity sediment key habitat quantity	R					
			ChF	none								
			Chum	Toutle 1	Spawning Egg incubation Fry colonization Adult holding	none	R					
			ChS	none								
	70604	Hollywood Gorge LB trib3 (26.0235) Rock Creek Stankey Cr Toutle 3 Toutle 4 Toutle 5	StW	none				I	M	M	I	M
			Coho	Toutle 3 Toutle 4	Egg incubation Summer rearing Winter rearing Juvenile migrant (age 1)	channel stability habitat diversity temperature sediment	R					
			ChF	Toutle 4	Spawning Egg incubation Adult holding	channel stability temperature sediment	R					
			Chum	Toutle 3 Toutle 4 Toutle 5	Spawning Egg incubation Fry colonization Adult holding	channel stability habitat diversity sediment	R					
			ChS	none								
	70603	Hollywood Gorge LB trib4 (not listed) Toutle 6 Toutle 7 Toutle 8 Toutle 9	StW	none				I	M	M	I	M
			Coho	Toutle 6 Toutle 9	Summer rearing Winter rearing Juvenile migrant (age 1)	channel stability habitat diversity sediment	R					
			ChF	Toutle 9	Spawning Egg incubation Fry colonization	sediment	R					
			Chum	Toutle 6	Spawning Egg incubation Fry colonization Adult holding	habitat diversity sediment	R					
			ChS	none								
	70301	LB trib9 (not listed) NF Toutle 1 NF Toutle 2 NF Toutle 3 NF Toutle 4 NF Toutle 5 NF Toutle 6	StW	none				I	M	M	I	M
			Coho	NF Toutle 1 NF Toutle 2 NF Toutle 6	Egg incubation Fry colonization Summer rearing Juvenile migrant (age 0) Winter rearing Juvenile migrant (age 1)	channel stability habitat diversity temperature sediment	R					
		RB trib5 (not listed)	ChF	none								
		RB trib6 (not listed) RB trib7 (26.0320)	ChS	none								
	50404	Big Wolf Creek LB trib5 (not listed) SF Toutle 6 SF Toutle 7 SF Toutle 8 Twenty Creek	StW	none				M	M	M	I	M
			Coho	SF Toutle 7	Egg incubation Summer rearing Winter rearing	habitat diversity	R					
			ChF	SF Toutle 7 SF Toutle 8	Spawning Egg incubation Fry colonization Summer rearing	sediment	P					
			ChS	none								
	50403	Johnson Creek SF Toutle 1 SF Toutle 2 SF Toutle 3	StW	none				I	I	M	I	M
			Coho	SF Toutle 1 SF Toutle 2 SF Toutle 3	Egg incubation Fry colonization Summer rearing Winter rearing	channel stability habitat diversity sediment	R					
			ChF	SF Toutle 1 SF Toutle 2 SF Toutle 3	Spawning Egg incubation Fry colonization	temperature sediment	PR					
	50401	Brownell Creek 1 Brownell Creek 2 Eighteen Creek SF Toutle 3 SF Toutle 4 SF Toutle 5 SF Toutle 6 Thirteen Creek	StW	none				I	M	M	I	M
			Coho	SF Toutle 3 SF Toutle 5	Egg incubation Summer rearing Winter rearing	channel stability habitat diversity sediment	R					
			ChF	SF Toutle 3 SF Toutle 4	Spawning Egg incubation Fry colonization Adult holding	sediment	PR					
	50302	Bear Creek LB trib7 (not listed) SF Toutle 13 SF Toutle 14 SF Toutle 15	StW	SF Toutle 13 SF Toutle 14 SF Toutle 15	Egg incubation Winter rearing Summer rearing	habitat diversity flow sediment key habitat quantity	PR	I	M	M	I	M
			Coho	none								
			ChF	SF Toutle 13	Egg incubation Fry colonization Adult holding		P					

Sub-watershed Group	Sub-watershed	Reaches within subwatershed	Species Present	High priority reaches by species	Critical life stages by species	High impact habitat factors by species	Preservation or restoration emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
A	50301	Bear Creek Harrington Creek SF Toutle 11 SF Toutle 12 SF Toutle 13	StW	SF Toutle 12 SF Toutle 13	Egg incubation Winter rearing Summer rearing	habitat diversity	PR	M	M	M	I	M
			Coho	none								
			ChF	SF Toutle 11 SF Toutle 12 SF Toutle 13	Egg incubation Fry colonization Summer rearing Adult holding	sediment	P					
	50201	RB trib2 (not listed) RB trib3 (not listed) RB trib4 (not listed) SF Toutle 16 SF Toutle 17 SF Toutle 18 SF Toutle 19	StW	SF Toutle 16 SF Toutle 17 SF Toutle 18 SF Toutle 19	Egg incubation Fry colonization Summer rearing Winter rearing	channel stability habitat diversity flow sediment	PR	I	M	M	I	M
			Coho	SF Toutle 17	Egg incubation Fry colonization Summer rearing Winter rearing	habitat diversity sediment	R					
			ChF	SF Toutle 16	Spawning Egg incubation Fry colonization Adult holding	sediment	PR					
	50101	Disappointment Cr SF Toutle 20	StW	SF Toutle 20	Egg incubation Fry colonization Summer rearing Winter rearing	flow sediment key habitat quantity	R	M	M	M	M	M
			Coho	none								
	40402	Beaver Creek Green River 1 Green River 2 Green River 3 Jim Creek	StW	none				I	M	M	I	M
			Coho	Green River 1	Egg incubation Summer rearing Winter rearing	habitat diversity sediment	R					
			ChF	Green River 3	Spawning Egg incubation Fry colonization	none	P					
			ChS	none								
	40301	Cascade Creek Green River 5 Green River 6	StW	Green River 6	Egg incubation Winter rearing Summer rearing	none	PR	I	M	M	I	M
			Coho	none								
			ChF	none								
	30306	Deer Creek NF Toutle 12 NF Toutle 13	StW	NF Toutle 12 NF Toutle 13	Egg incubation Fry colonization Summer rearing Winter rearing Juvenile migrant (age 1) Juvenile migrant (age 2+)	temperature flow sediment key habitat quantity	R	I	M	M	M	M
			Coho	none								
			ChS	NF Toutle 12	Spawning Egg incubation Fry colonization Adult holding	channel stability habitat diversity temperature sediment	R					
	30304	NF Toutle 10 NF Toutle 11 NF Toutle 7 NF Toutle 8 NF Toutle 9 SRS (sedi retention)	StW	NF Toutle 7	Egg incubation Juvenile migrant (age 1) Summer rearing	temperature sediment	R	I	M	M	I	M
			Coho	NF Toutle 10	Egg incubation Fry colonization Summer rearing Juvenile migrant (age 0) Winter rearing Juvenile migrant (age 1)	habitat diversity sediment	R					
			ChF	none								
			ChS	NF Toutle 10 NF Toutle 11	Spawning Egg incubation Fry colonization Summer rearing Adult holding	channel stability habitat diversity temperature sediment	R					
	30202	NF Toutle 13	StW	NF Toutle 13	Egg incubation Fry colonization Summer rearing Winter rearing Juvenile migrant (age 1) Juvenile migrant (age 2+) Adult holding	sediment key habitat quantity	R	I	M	M	M	F
			Coho	none								
			ChS	none								
	30201	NF Toutle 13	StW	NF Toutle 13	Egg incubation Fry colonization Summer rearing Winter rearing Juvenile migrant (age 1) Juvenile migrant (age 2+) Adult holding	sediment key habitat quantity	R	I	F	M	M	F
			Coho	none								
			ChS	none								

Sub-watershed Group	Sub-watershed	Reaches within subwatershed	Species Present	High priority reaches by species	Critical life stages by species	High impact habitat factors by species	Preservation or restoration emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
B	70401	Hemlock Cr 1 Hemlock Cr 2 RB trib9 (not listed) Silver Lake 1 Silver Lake 2	StW Coho	none none				I	M	M	I	M
	70302	LB trib10 (not listed) Wyant Cr 1 Wyant Cr 2	StW Coho	none none				I	M	M	I	M
	50405	LB trib6 (not listed) SF Toutle 10 SF Toutle 11 SF Toutle 9 Whitten Creek	StW Coho ChF	none none SF Toutle 11 SF Toutle 9	Spawning Egg incubation Fry colonization Summer rearing	sediment	P	M	M	M	I	M
	40404	Green River 5 RB trib1 (26.0237)	StW Coho ChF	none none none				M	M	M	I	M
	40403	Devils Creek Green River 4	StW Coho ChF	none none Green River 4	Spawning Egg incubation Fry colonization	channel stability habitat diversity temperature sediment	P	M	M	M	M	M
	40401	Green River 5	StW Coho ChF	none none none				I	M	M	I	M
	40203	Shultz Cr trib Shultz Creek 1 Shultz Creek 2	StW Coho	none none				I	I	M	I	I
	40202	Miners Creek	StW Coho	none none				I	M	M	I	M
	40201	Green River 7 Green River 8 Green River 9 Tradedollar Creek	StW Coho ChF	none none none				I	M	M	I	M
	30301	Hoffstadt Cr 1 NF Toutle 11	StW Coho ChF	none none none				I	M	M	I	M
D	70403	Hemlock Cr 3 Silver Lake 1	StW Coho	none none				I	M	M	I	M
	70402	Silver Lake 2 Sucker Cr	StW Coho	none none				I	M	M	I	M
	50402	RB trib10 (not listed) Studebaker Cr 1 Studebaker Cr 2	StW Coho	none none				I	M	M	I	M
	50202	LB trib8 (not listed) Trouble Creek	StW Coho	none none				I	I	M	I	I
	40302	Elk Cr trib Elk Creek 1 Elk Creek 2	StW Coho	none none				I	I	M	I	I
	30305	Bear Creek (NF Trib.) Hoffstadt Cr 1 Hoffstadt Cr 2	StW Coho	none none				I	M	M	I	M
	30303	Alder Creek_A Alder Creek_B	StW Coho	none none				M	M	M	M	M
	30302	Hoffstadt Cr 2	StW Coho	none none				I	M	M	I	M
	30205	Castle Creek	StW Coho	none none				M	M	M	M	M
	30101	Coldwater Creek	StW Coho	none none				M	M	M	M	M

Table 8-9. 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)				✓	

Table 8-10. Habitat measures in priority areas, with reference to limiting factors addressed, threats addressed, target species, and estimated time until benefits would be realized (time). Tier 1 and 2 reaches, or other areas of known priority, are listed under the location column for some measures (i.e. stream corridor measures). Reaches not included in the table (Tier 3, 4, and non-tiered reaches) are considered secondary priority.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
1. Protect and restore floodplain function and channel migration processes ***A. Set back, breach, or remove artificial channel confinement structures***					
Lower mainstem Toutle 1-5 ***Lower NF and lower SF*** NF Toutle 1-2, SF 1-3	• Bed and bank erosion • Altered habitat unit composition • Restricted channel migration • Disrupted hyporheic processes • Reduced flood flow dampening • Altered nutrient exchange processes	• Floodplain filling • Channel straightening • Artificial confinement • Dredge and fill activities	• Chum • Coho • Fall Chinook	2-15 years	Much of the channel confinement in these reaches is due to dredging of sediments and placement of spoils in floodplains following the 1980 eruption. This passive restoration approach can allow channels to restore naturally once confinement structures are removed. There are challenges with implementaiton on private lands due to existing infrastructure already in place, potential flood risk to property, potential increase in sediment supply to downstream reaches, and large expense.
2. Protect and restore off-channel and side-channel habitats ***A. Restore historical off-channel and side-channel habitats where they have been eliminated*** ***B. Provide access to blocked off-channel habitats*** ***C. Create new off-channel or side-channel habitats (i.e., spawning channels)***					
Lower mainstem Toutle 1-5 ***Lower NF and lower SF*** NF Toutle 1-2, SF 1-3	• Loss of off-channel and/or side-channel habitat • Blockages to off-channel habitats • Altered habitat unit composition	• Floodplain filling • Channel straightening • Artificial confinement • Dredge and fill activities	• Chum • Coho	2-15 years	Good potential benefit especially for chum, which have lost a significant portion of historically available off-channel habitat for spawning. Potential benefit is limited by moderate probability of success with creation of new habitats. There are challenges with implementation on private lands due to existing infrastructure already in place, potential flood risk to property, and large expense.
3. Protect and restore riparian function ***A. Reforest riparian zones*** ***B. Allow for the passive restoration of riparian vegetation*** ***C. Hardwood-to-conifer conversion***					

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
Lower mainstem Toutle 1-5 ***Lower NF and lower SF*** NF Toutle 1-2, SF 1-3 ***Upper SF Toutle*** SF Toutle 4-20 ***Upper NF Toutle*** NF Toutle 6-13 ***Green River*** Green River 1-9	• Reduced stream canopy cover • Altered stream temperature regime • Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris	• Timber harvest – riparian harvests • Clearing of vegetation due to rural development and agriculture	• All species	20-100 years	High potential benefit due to the many limiting factors that are addressed. Riparian impairment is related to harvest, agriculture, and eruption-related impacts. Riparian protections on forest lands are provided for under current harvest policy. Riparian restoration projects are relatively inexpensive and are often supported by landowners. Whereas the specified stream reaches are the highest priority for riparian measures, riparian restoration and preservation should occur throughout the basin since riparian conditions affect downstream reaches. Use IWA riparian ratings to help identify restoration and preservation opportunities.
4. Protect and restore natural sediment supply processes ***A. Address forest road related sources*** ***B. Address timber harvest related sources*** ***C. Address agricultural sources***					
Entire basin	• Excessive fine sediment • Excessive turbidity • Embedded substrates	• Timber harvest – impacts to sediment supply • Forest roads – impacts to sediment supply • Agricultural practices – impacts to sediment supply	• All species	5-50 years	High potential benefit due to sediment effects on egg incubation and early rearing. Improvements are expected on timber lands due to requirements under the new FPRs, the USFS Northwest Forest Plan, and forest land HCPs. There are challenges with implementation on agricultural lands due to few sediment-focused regulatory requirements for agricultural lands. Use IWA impairment ratings to identify restoration and preservation opportunities.
5. Protect and restore runoff processes ***A. Address forest road impacts*** ***B. Address timber harvest impacts***					
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Timber harvest – impacts to runoff • Forest roads – impacts to runoff	• All species	5-50 years	High potential benefit due to flow effects on habitat formation, redd scour, and early rearing. Improvements are expected on timber lands due to requirements under the new

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
					FPRs, the USFS Northwest Forest Plan, and forest land HCPs. Use IWA impairment ratings to identify restoration and preservation opportunities.
6. Protect and restore instream flows ***A. Water rights closures*** ***B. Purchase or lease existing water rights*** ***C. Relinquishment of existing unused water rights*** ***D. Enforce water withdrawal regulations*** ***E. Implement water conservation, use efficiency, and water re-use measures to decrease consumption***					
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Water withdrawals	• All species	1-5 years	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.
7. Protect and restore water quality ***A. Restore the natural stream temperature regime***					
Entire basin	• Altered stream temperature regime	• Riparian harvests	• All species	1-50 years	Primary emphasis for restoration should be placed on stream segments that are on the 2004 303(d) list.
8. Protect and restore instream habitat complexity ***A. Place stable woody debris in streams to enhance cover, pool formation, bank stability, and sediment sorting*** ***B. Structurally modify stream channels to create suitable habitat types***					
Lower mainstem Toutle 1-5 ***Lower NF and lower SF*** NF Toutle 1-2, SF 1-3 ***Upper SF Toutle*** SF Toutle 4-20 ***Upper NF Toutle*** NF Toutle 6-13 ***Green River*** Green River 1-9	• Lack of stable instream woody debris • Altered habitat unit composition	• None (symptom-focused restoration strategy)	• Coho • Winter steelhead • Summer steelhead • Spring Chinook	2-10 years	Moderate potential benefit due to the high chance of failure. Failure is probable if habitat-forming processes are not also addressed. These projects are relatively expensive for the benefits accrued. Moderate to high likelihood of implementation given the lack of hardship imposed on landowners and the current level of acceptance of these type of projects.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
9. Protect and restore fish access to channel habitats ***A. Sediment Retention Structure*** ***B. Culvert barriers on various tributary streams***					
NF Toutle - Sediment Retention Structure ***Culvert barriers on various small tribs***	• Blockages to channel habitats	• Sediment Retention Structure • Dams, culverts, in-stream structures	• Coho • Winter steelhead • Spring Chinook • Fall Chinook	immediate	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. Culverts or other barriers block as much as 23 miles of anadromous habitat, although this 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.
10. Protect habitat conditions and watershed functions through land-use planning that guides population growth and development ***A. Plan growth and development to avoid sensitive areas (e.g., wetlands, riparian zones, floodplains, unstable geology)*** ***B. Encourage the use of low-impact development methods and materials*** ***C. Apply mitigation measures to off-set potential impacts***					
Privately owned portions of the basin	***Preservation Measure*** – addresses many potential limiting factors and threats		• All species	5-50 years	The focus should be on management of land-use conversion and managing continued development in sensitive areas (e.g., wetlands, stream corridors, unstable slopes). Critical areas regulations do not have a mechanism for restoring existing degraded areas, only for preventing additional degradation. Legal and/or voluntary mechanisms need to be put in place to restore currently degraded habitats.
11. Protect habitat conditions and watershed functions through land acquisition or easements where existing policy does not provide adequate protection ***A. Purchase properties outright through fee acquisition and manage for resource protection*** ***B. Purchase easements to protect critical areas and to limit potentially harmful uses*** ***C. Lease properties or rights to protect resources for a limited period***					
Privately owned portions of the basin	***Preservation Measure*** – addresses many potential limiting factors and threats		• All species	5-50 years	Land acquisition and conservation easements in riparian areas, floodplains, and wetlands have a high potential benefit. These programs are under-funded and have low landowner participation.

8.5 Program Gap Analysis

The Toutle Basin (~513 sq mi) is located primarily in Cowlitz County, but its headwaters are in Skamania County, with some tributaries of the Green River in Lewis County.

- Federal lands within the watershed (~143 sq mi) consist primarily of the U.S. Forest Service-managed Mt St Helens National Volcanic Monument (NVM);
- Large private industrial forest lands consist of 257 square miles and are the largest land use;
- Department of Natural Resources forestlands lands encompass about 92 square miles.
- Small forestlands (~20 sq mi) are found in the lower reaches of the Toutle Basin;
- Approximately 8 square miles in the headwaters of the Green River lie in Skamania County;
- The tributaries flowing south to the Green River and their watersheds are located in Lewis County;
- The remainder of the Toutle Basin is located in Cowlitz County.

Protection Programs

Protection programs in the Toutle Basin are implemented primarily by the Mt St Helens NVM, large and small industrial forest owners pursuant to the state forest practice rules, and Cowlitz and Lewis Counties. Protection programs in this analysis include those programs that protect habitat conditions or watershed functions through management policies and programs, regulatory measures, and acquisition of sensitive habitats or protective easements.

Federal Programs

- ***U.S. Army Corps of Engineers***

  - Administers the Section 10 (Rivers and Harbor Act) and Section 404 (Clean Water Act) permit processes. Section 10 requires approval of any activity in, above, or below a navigable river, which affects course, location, condition, or capacity of navigable waters. Section 404 requires prior approval of dredging, filling, grading, clearing, and bank hardening. In waters used by listed fish species, the permits are subject to ESA Section 7 consultation with NOAA Fisheries to ensure that any approved action is adequately protective of the fish; [M.1A; M.2A; M.2B; M.4A; M.8A; M.8B]

- ***U.S. Forest Service***

  - Mt St Helens National Volcanic Monument: In 1982 the President and Congress created the 110,000-acre National Volcanic Monument for research, recreation, and education. Inside the Monument, the environment is left to respond naturally to the disturbance. Much of the North and South Forks were extensively altered by the eruption. The habitat conditions in the South Fork are recovering more quickly than in the North Fork. [M.3A; M.3B; M.4A; M.4B; M.5A; M.5B; M.7A]

State Programs

- ***Department of Natural Resources***

- State Forest Land HCP:
  State forest lands are managed under the provisions of a Habitat Conservation Plan (HCP). The Habitat Conservation Plan has protects riparian areas through the use of buffers, mitigates impacts on watershed processes through harvest restrictions and new road construction standards that are more stringent than Forest Practices Rules. These activities address measures M.3A, M.3B, M.4A, M.4B, M.5A, M.5B and M.7A.
- State Forest Practices:
  Riparian areas and watershed functions on small- and industrial forest lands are protected under the State of Washington Forest Practices Rules, including the Forest and Fish Module. These rules provide for riparian buffers, harvest restrictions, sensitive area protections, and protective standards for new road construction. These activities address measures M.3A, M.3B, M.4A, M.4B, M.5A, M.5B and M.7A.

➢ ***Department of Fish and Wildlife***

- Hydraulics Project Approval (HPA): The Department administers the state Hydraulic Code. The purpose of this program is to protect stream conditions and habitat. The regulations apply to such activities as streambank protection, instream construction, culvert installation, channel changes or realignments, debris removal, and water diversion facilities. Those proposing such actions must obtain a Hydraulic Project Approval (HPA) permit. This regulatory process addresses measures M.1A, M.2A, M.2B, M.2C, M.8A, and M.8B.

- Habitat Program: The Department provides advice to local governments and landowners interested in measures to protect habitat values on their property. [M.1A; M.2A; M.2B; M.7A; M.8A; M.8B; M.9A; M.9B; M.10A; M.10B; M.10C]

➢ ***Washington Department of Ecology***

- Water Resources Program/Water Rights: Department of Ecology, in consultation with the Department of Fish and Wildlife, has administrative closed selected areas within the lower Cowlitz basin to further surface and groundwater withdraws (where groundwater is in continuity with surface water). Existing administrative closures by the Department of Ecology protect surface waters from further withdrawals. Formal rule-making would strengthen the closures. The extent of unauthorized surface water withdrawals is unknown, but, given the low intensity of development, it is unlikely they would exacerbate summer low flows. [M.6A; M.6B; M.6C; M.6D]

- Water Resources Program/Watershed Planning: In cooperation with the Lower Columbia Fish Recovery Board, other state and federal agencies, tribes, local governments, and citizens, the Department funds and participates in a state authorized watershed planning process for Water Resource Inventory Area (WRIA) 26 pursuant to RCW 90.82. The goal of the plan is to ensure adequate water for people and fish. The planning process is dealing with water quantity and quality, stream flows and fish habitat. Once approved by counties within the WRIA, the plan will be binding on state agencies and local governments. [M.6A; M.6B; M.6C; M.6D; M.7A; M.10A]

➢ ***Department of Transportation***

- Road Maintenance Program

WSDOT has an ESA Section 4(d) Road Maintenance Program. The Maintenance Program uses trained crews to primarily manage roadside vegetation, litter control, and maintenance of safety rest areas associated with SR 12. [M.9]

Local Government Programs

➢ ***Cowlitz County***

- Comprehensive Planning and Land Use Regulations: [M.10A; M.10B; M.10C]
  - The comprehensive plan that applies to the non-federal lands, but contains no significant policies for the protection of watershed processes and stream habitat.
  - Zoning along State Highway 504 and county roads provides for one dwelling per 2 acres and one dwelling per 5 acres along non-county roads. [Measure12]
  - Cowlitz County has not adopted protective stream buffers.
  - Wetland buffers vary from 25' to 200' and are based upon soil type and wildlife utilization.
  - The County has not developed comprehensive ordinances for the protection of watershed processes or stream habitat conditions.
- Road Maintenance

  The County has not developed or implemented a road maintenance program to protect habitat. [M.9B]

➢ ***Lewis County***

- Comprehensive Planning and Land Use Regulations: County land use regulations have minor applicability within the watershed given the very small amount of land that is not federal or industrial and small forest ownership.

➢ ***Skamania County***

- Comprehensive Planning and Land Use Regulations: Since all ownership occurs within the Skamania County portion of the watershed is federal , Skamania County land use controls are not applicable;

Restoration Programs

Restoration programs in the Toutle Basin are implemented by a variety of agencies, organizations, and private interests. Major programs implementing protection measures are identified below:

Federal Programs

- ***U.S. Forest Service Mt St Helens NVM:*** Restoration only occurs passively. Monitoring and evaluation of natural restoration occurs in the Toutle; [M.3B]

- ***U.S. Army Corps of Engineers:*** The Corps built and operates a Sediment Retention Structure (SRS) on the North Fork Toutle that was designed to prevent additional sediment from Mt St Helens from entering the Cowlitz and Columbia Rivers. The SRS has relieved but not prevented downstream sediment problems; The SRS does represent a significant barrier to upstream habitats; [M.9A]

State Plans

- ***Washington Department of Natural Resources***

  - State Forest Land Habitat Conservation Plan (HCP): The Department manages state forest lands pursuant to a Habitat Conservation Plan (HCP). The HCP road maintenance and restoration objectives require barrier upgrades and road abandonment and/or other improvements. This program addresses measures M.3A, M.3B, M.4A, M.4B, M.5A, M.5B and M.9B.

  - State Forest Practices Act:
    - ✓ Industrial forests within the Toutle Basin are governed by Forest and Fish regulations and have rigid schedules for maintaining and improving roads and removing barriers. Industrial landowners have 15 years to bring roads and barriers into compliance with regulations.
    - ✓ Small private forest owners are governed by Forest and Fish regulations; however their road and barrier maintenance and improvement programs are tied to state funding. In the State 2003-05 Biennial Budget, 2 million dollars was allocated statewide to support small private forest owners.
    - ✓ This program addresses measures M.3A, M.3B, M.4A, M.4B, M.5A, M.5B and M.9A].

- ***Washington Department of Fish and Wildlife***

  - Habitat Program: The Department provides advice to local governments and landowners interested in measures to restoring watershed processes and stream habitat. [M.1A; M.2A; M.2B; M.7A; M.8A; M.8B; M.9A; M.9B; M.10A; M.10B; M.10C]

- ***Washington Department of Ecology***

  - Water Quality Program: Herrington Creek and Green River are listed for temperature impairment on the WA State 303(d) list. [M.7A]

  - Water Resources Program/Watershed Planning:
    The planning process for WRIA 26 is dealing with water quantity and quality, stream flows and fish habitat. Potential restoration efforts address improving summer low flows through conservation and acquisition of water rights. Once approved by counties within the WRIA, the plan will be binding on state agencies and local governments. [M.6A; M.6B; M.6C; M.6D; M.7A; M.10A]

- ***Salmon Recovery Funding Board (SRFB)/ Lower Columbia Fish Recovery Board***

  - Washington Salmon Recovery Act (RCW 77.85): As noted under preservation programs above, the SRFB and the LCFRB jointly administer a grant program that allocates federal Pacific Salmon Recovery Funds and State funds for habitat protection and restoration projects by state and local agencies, nonprofit organizations, and landowners. To date the SRFB has provided $42,000 for restoration in Brownell Creek. [M.1A; M.2A; M.2B; M.3A; M.7A; M.8A; M.8B; M.9B; M.11A; M.11B]

Local Government Programs

- ***Cowlitz County***
  - Public Works Program:
    The County inventoried culverts on county roads and is replacing and/or upgrading barrier culverts. [M.9B]

- ***Cowlitz Noxious Weed Control Board*** has three primary programs that address weed control in the lower Cowlitz Basin; [M.3D]
  - ✓ Public education to prevent the spread of noxious weeds;
  - ✓ Survey County lands to assess emerging issues; and
  - ✓ Enforcement of noxious weed control

Community Programs

- ***Friends of the Cowlitz*** is a non-profit organization designs and implements restoration projects and rears Summer Steelhead on the Toutle Basin.

Gap Analysis

Forest-related Programs: Ninety-five percent of the Toutle Basin is in forest use or restricted public use. Forestry programs play a substantial role in protecting and restoring watershed functions and habitat conditions at levels supporting recovery goals. Certainty of forestry-related protection and restoration programs is relatively high because programs are being implemented and, for the most part, fully funded. Program areas of concern include state funding for small commercial forest landowners and the continued potential for hydrologic

impacts caused by past harvest practices. Monitoring of watershed processes and habitat conditions will be required to confirm the effectiveness of these measures.

Protection-related Programs: Non-federal lands in the upper Toutle Basin have limited protections through Cowlitz County land use regulatory mechanisms. County programs lack effective provisions that commonly are used to direct growth away from sensitive habitat, preserve watershed processes, protect streams and wetlands, and manage stormwater. In addition, as in all lower Columbia subbasins, there are very limited mechanisms to protect riparian areas and hydrologic functions.

Restoration-related Programs: Over a long period of time, improvements to the Toutle will occur as a result of improved forest management practices that are already in place. Impacts from the eruption of Mt St Helens will continue to influence the lower Toutle mainstem primarily due to bare soils and early seral forests. Active restoration in the lower mainstem should focus on floodplain function and channel migration, as well as restoring off-channel and side-channel habitats. Programs to address these issues are currently not in place.

Table 8-11. Program Actions to Address Gaps

Action #	Lead Agency	Proposed Action
TOUTLE.1	Cowlitz County	Develop and implement controls to adequately protect riparian areas to maintain currently functional and restored habitat around rivers, estuaries, streams, lakes, deepwater habitats, and intermittent streams. Require mitigation, where necessary, to offset unavoidable damage to habitat conditions in riparian management areas
TOUTLE.2	Cowlitz County	Development and implement controls to protect historic stream meander patterns and channel migration zones and avoid hardening stream banks and shorelines
TOUTLE.3	Cowlitz County	Development and implement controls and development standards to adequately protect wetlands, wetland buffers, and wetland function.
TOUTLE.4	Cowlitz County, Lewis County,	Develop and implement controls to address erosion and sediment run-off during (and after) construction to prevent sediment and pollutant discharge to streams, wetlands and other water bodies
TOUTLE.5	Cowlitz County, Lewis County,	Apply land use and resource protection code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
TOUTLE.6	State of Washington	Provide state funding for small forest owners in the Toutle Basin to a level sufficient to achieve the road and barrier improvements of Forest and Fish on a schedule parallel to private industrial forest owners
TOUTLE.7	Forest Managers LCFRB, and DFW	Identify and sequence early action forest-wide restoration projects that analysis indicates could provide significant benefits. In these cases, it may be appropriate to identify outside funding to initiate these early actions
TOUTLE.8	ACOE	Improve downstream sediment conditions resulting from the NF Toutle Sediment Retention Structure
TOUTLE.9	ACOE	Provide improved adult and juvenile fish passage at the NF Toutle Sediment Retention Structure.
TOUTLE.10	LCFRB, USFS, WDNR. WSDOT, Counties, cities, private property	Develop and implement a coordinated and strategic barrier removal program based on watershed fish priorities and ensuring an effective and efficient sequencing of barrier removal work.

	owners.	
TOUTLE.11	Cowlitz County, Lewis County	Utilize a combination of public outreach/education and, incentives, and to promote (1) stewardship practices for protecting habitat and water quality and (2) landowner support of and participation in habitat restoration efforts.
TOUTLE.12	State of Washington (DOE, DFW)	Close the Toutle Basin to further surface water withdrawals, including groundwater in connectivity with surface waters; curtail unauthorized withdrawals
TOUTLE.13	LCFRB, WDFW, Cowlitz County, Cowlitz CD, LCFEG	Build capacity (e.g. technical and administrative skills, personnel and fiscal resources) needed to allow agencies and organizations to undertake protection and restoration projects, including noxious weed control in a reasonable period time.
TOUTLE.14	SRFB, BPA, NOAA, USFWS, DOE, ACOE	Increase available funding for projects that implement measures and address underlying threats
TOUTLE.15	State of Washington (Dept of Agriculture, and Department of Ecology)	Develop and implement agricultural practices and regulations to protect riparian conditions and water quality
TOUTLE.16	Cowlitz Conservation District	Expand landowner incentive (e.g. CREP) and education plans to promote further habitat protection and restoration.
TOUTLE.17	LCFRB, Cowlitz CD, Cowlitz County,	Address threats proactively by building agreement on priorities among the various program implementers
TOUTLE.18	FEMA	Update floodplain maps using Best Available Science