17 Wind River Subbasin

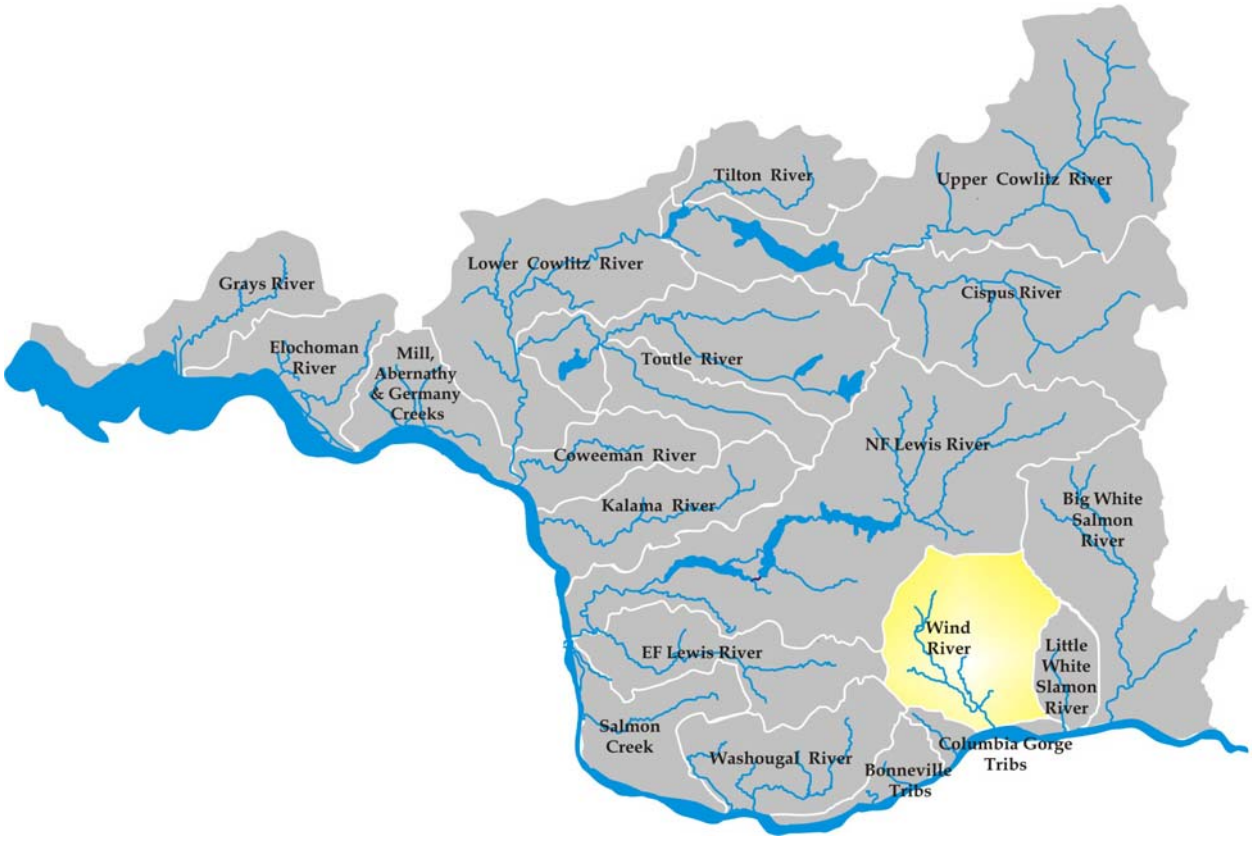


Figure 17-1. Location of the Wind River Subbasin within the Lower Columbia River Basin.

17.1 Basin Overview

The Wind River Subbasin comprises approximately 224 square miles in Skamania County. The river enters the Columbia near the town of Carson, Washington. Principal tributaries include Trout, Panther, and Brush creeks. The subbasin is part of WRIA 29.

The Wind Subbasin will play a key role in the recovery of salmon and steelhead. The subbasin has historically supported populations of fall Chinook, winter and summer steelhead, chum, and coho. Today, Chinook, steelhead and chum 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.

Wind 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 Wind fish. 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 Wind Subbasin.

The Wind Subbasin is 93% forested. Non-forested lands include alpine meadows in the upper northeast basin and areas of development in lower elevation, privately-owned areas. Approximately 9.6% of the land is private, while almost all of the remainder lies within the Gifford Pinchot National Forest. Forestry land uses dominate the subbasin. The percentage of the forest in late-successional forest stages has decreased from 83,500 acres to 31,800 acres since pre-settlement times. This change is attributed to timber harvest and forest fires (USFS 1996).

The assessments illustrate the overwhelming importance of the lower mainstem and Panther Canyon reaches for summer steelhead parr rearing. While these reaches are affected by sediment and flow regime impairments originating in upstream subwatersheds, they have healthy local watershed conditions and are well-protected from riparian impacts due to the steepness of the canyons and lack of near-stream roadways. Recovery efforts should ensure that no further degradation of these important reaches occurs.

The next most important area for summer steelhead in the subbasin is the middle Wind mainstem between Stabler and Panther Creek. These alluvial reaches provide potentially abundant spawning and rearing areas but are heavily impacted by a variety of habitat impairments. Past timber harvest, splash dam logging, stream-adjacent roadways, residential development, and flood control levees have served to create unstable conditions with low habitat diversity and high fine sediment loading.

The importance of the mainstem Wind for steelhead and resident fish underscores the importance of retaining or recovering subbasin-wide land cover conditions that affect these key downstream reaches. Due to a large amount of public land in the subbasin, many subwatersheds support functioning watershed process conditions that should be maintained. These actions, combined with vegetation recovery and road removal in impaired subwatersheds, will greatly benefit fish and wildlife populations.

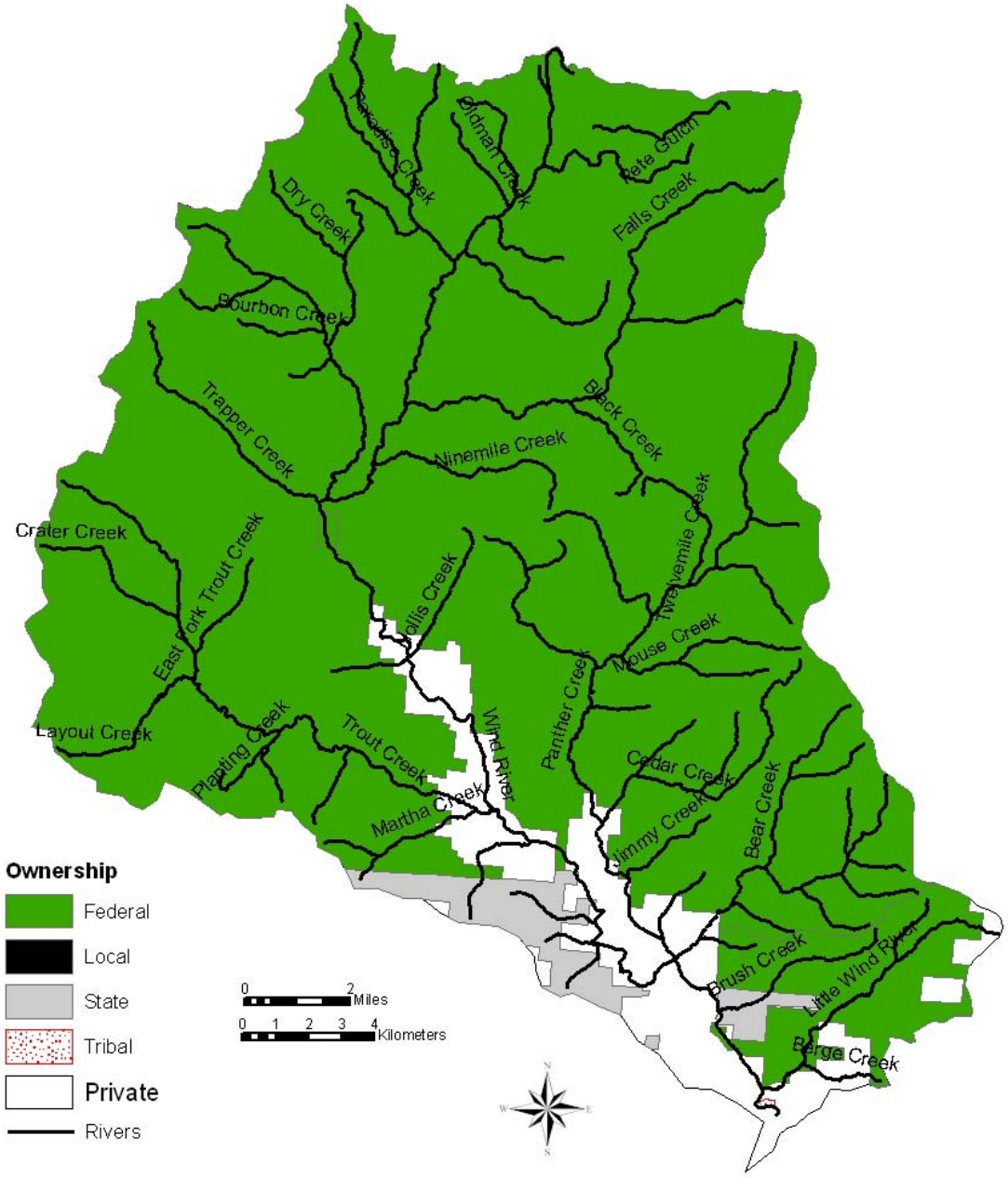
Canyon reaches in Trout Creek (upstream of Hemlock Lake) and lower Panther Creek are important for steelhead rearing. Degraded sediment and flow conditions in these reaches result from watershed process impairments in upstream basins. Contributing factors include high road densities and young vegetation in portions of the Trout Creek and Panther Creek basins. At the least, additional road building and intensive timber harvest in these areas should be avoided.

Although recovery efforts in the middle and upper basin will yield the greatest benefit to most species, targeting local conditions in the lower river could provide important benefits to winter steelhead and fall Chinook, which typically do not ascend Shipherd Falls at river mile 2. Restoration of chum is unlikely because of the effects of Bonneville Dam and Pool.

The largest population centers are the towns of Carson and Stabler. Carson draws its water supply from Bear Creek, a Wind River tributary. The year 2000 population of the subbasin was estimated at 2,096 persons and is expected to increase to 3,077 by 2020 (Greenberg and Callahan 2002). Population growth in the basin is not expected to be a major factor affecting salmon and steelhead habitat in the next 20 years.

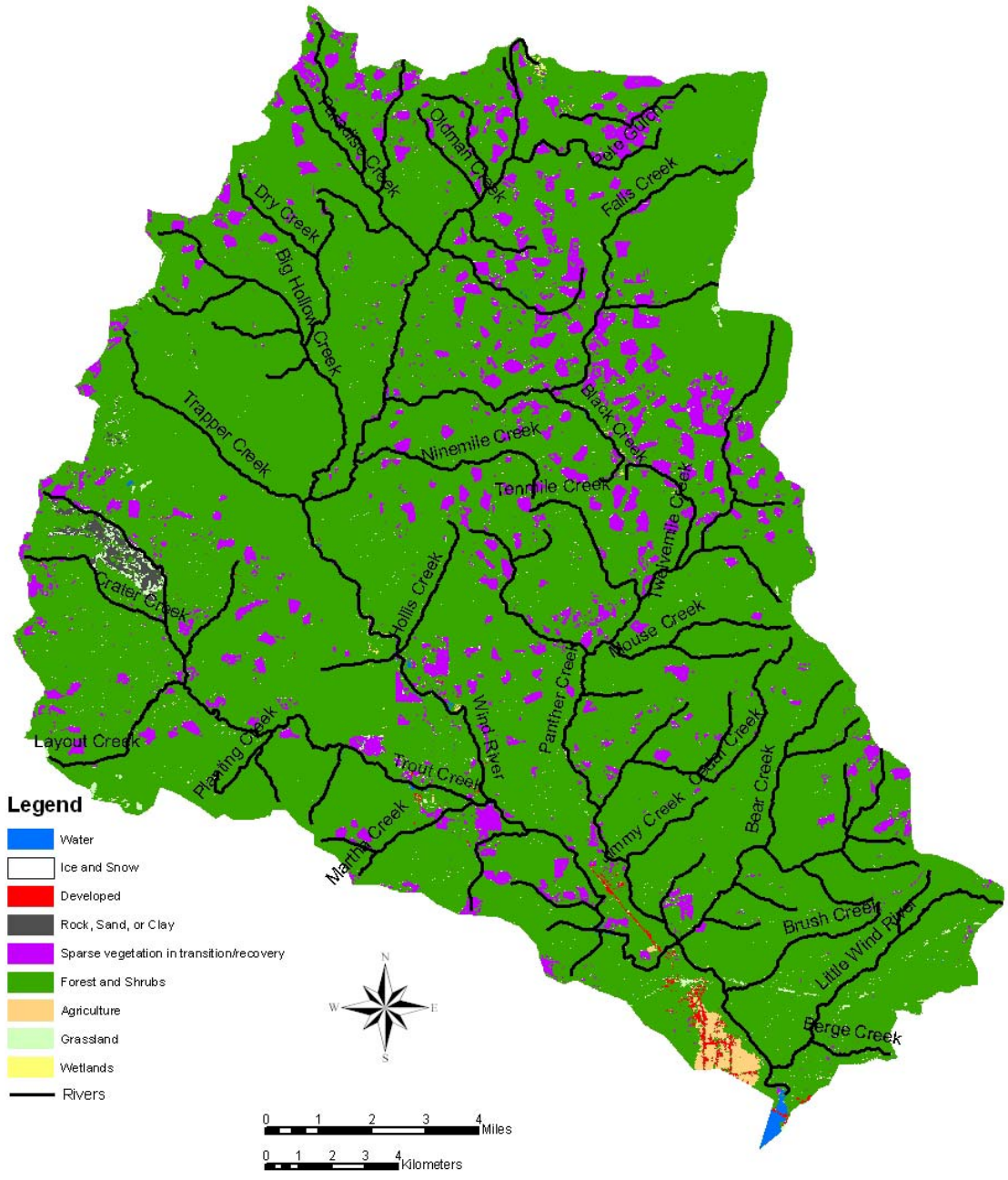
Land Ownership	
Federal	89%
Private	11%
State	0%
Other public	0%

Land Ownership



Vegetation Composition	
Late Seral	25%
Mid Seral	41%
Early Seral	26%
Other Forest	0%
Non Forest	8%

Land Use / Cover



17.2 Species of Interest

Focal salmonid species in the Wind Subbasin include summer steelhead, winter steelhead fall Chinook, chum, and coho. The health or viability of these populations is currently very low for chum, low for fall Chinook, coho, and winter steelhead, and above medium for summer 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 summer steelhead to above high viability level, providing for greater than 95% chance of persistence over 100 years, restoring coho to a high viability level, providing for a 95% probability of persistence over 100 years, restoring chum to a medium level of viability, providing for a 75-94% probability of persistence over 100 years, and maintaining fall Chinook and winter steelhead at low viability levels, providing for a 40-74% probability of persistence over 100 years.

Other species of interest in the Wind River 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 expected to benefit from habitat improvements in the estuary, Columbia River, and mainstem, and in the Wind Subbasin, although specific spawning and rearing habitat requirements for lamprey are not well known.

Table 17-1. Current viability status of Wind populations and the biological objective status that is necessary to meet the recovery criteria for the Gorge strata and the lower Columbia ESU.

	ESA	Hatchery	Current		Objective	
Species	Status	Component	Viability	Numbers	Viability	Numbers
Fall Chinook	Threatened	No	Low	0-400	Low	1,400-2,400
Winter Steelhead	Threatened	No	Low+	100	Low+	100
Summer Steelhead	Threatened	No	Med+	100-800	High+	1,200-1,900
Chum	Threatened	No	Very Low	<100	Med	<100-1,100
Coho	Candidate	No	Low	200-300	High	unknown

Fall Chinook– The historical Wind River adult tule fall Chinook population is estimated from 2,500-3,500 fish. The current natural spawning number in the tributaries is 0 to 400 fish. However, there are significant numbers of upriver bright (URB) stock fall Chinook (not part of the lower Columbia ESU) that spawn in the lower Wind River. The URB spawners originated from strays produced at Little White Salmon and Bonneville hatcheries. There are also stray tule fall Chinook from Spring Creek Hatchery that spawn in the Wind. Natural spawning occurs primarily in the lower mainstem Wind downstream of Shipperd Falls (RM 2). The tule fall Chinook spawning time is from mid-September to early October. Juvenile rearing occurs near and downstream of the spawning areas. Juveniles migrate from the Bonneville tributaries in the spring and early summer of their first year.

Winter Steelhead– The historical Wind River adult population is estimated at 300-2,500 fish. Current natural spawning returns are about 100 fish. Shipperd Falls was a historical block to winter steelhead until 1956 when a fish ladder was constructed. Spawning occurs in the mainstem to RM 11 and in Trout Creek. 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 Wind River basin.

Summer Steelhead– The historical Wind River adult population is estimated at 2,000-5,000 fish. Current natural spawning returns range from 100-800 fish. Summer steelhead spawning occurs throughout the Wind Basin including the mainstem Wind, the Little Wind, and Panther, Bear, Trout, Trapper, Dry, and Paradise creeks. Spawning time is early March through May. Juvenile rearing occurs both downstream and upstream of the spawning areas. Juveniles rear for a full year or more before migrating from the Wind River basin.

Chum– The historical Wind River adult population is estimated at 25,000-30,000. Current natural spawning returns are assumed to be very low, since the chum count at Bonneville Dam is typically less than 100 fish. Spawning occurs in the lower reaches below Shipperd Falls, with the majority of historical spawning area now inundated by Bonneville Reservoir. Spawning occurs from late November through December. Natural spawning chum in the Wind are all naturally produced as no hatchery chum are released in the area. Juveniles rear in the lower reaches for a short period in the early spring and quickly migrate to the Columbia.

Coho– The historical Wind and upper Gorge tributary adult early coho population is estimated at 1,000-10,000. Current natural spawning returns are low at about 200-300 fish. There is no coho hatchery production in the Wind River, however significant hatchery coho programs exist nearby in the Little White Salmon and the Klickitat rivers. Spawning occurs primarily in the lower Wind and tributaries, including the Little Wind River. Early coho spawning occurs from mid October to mid-November. Juvenile rearing occurs upstream and downstream of spawning areas. Juveniles rear for a full year in the Wind Basin before migrating as yearlings in the spring.

Coastal cutthroat.– Coastal cutthroat abundance in Wind River has not been quantified but the population is considered depressed. Anadromous and resident forms of cutthroat trout are present in the Wind Subbasin. Anadromous cutthroat enter the Wind River from July-December and spawn from December 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 Wind River population. However, based on declining trends measured at Bonneville Dam and Willamette Falls it is assumed that Pacific lamprey have declined in the Wind River also. Adult lamprey return from the ocean to spawn in the spring and summer. Juveniles rear in freshwater up to seven years before migrating to the ocean.

Figure 17-2. Summary of habitat limiting factors, population status, expected population improvement trend with existing programs and biological objectives depicted for the Wind Subbasin.

17.3 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 Wind 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 an important relative impact on all species, while estuary habitat impacts appear to be of lesser importance.
- The impact of hydrosystem access and passage is one of the more important factors for chum and fall Chinook. Hydrosystem effects on chum are substantial enough to minimize the relative importance of all other potentially manageable impact factors.
- Harvest has relatively high impacts on fall Chinook, while harvest impacts to steelhead and coho are moderate. The relative impact of harvest on chum is minor.
- Hatchery impacts are relatively moderate for coho and summer steelhead. Hatchery impacts on chum, fall Chinook, and winter steelhead are low.

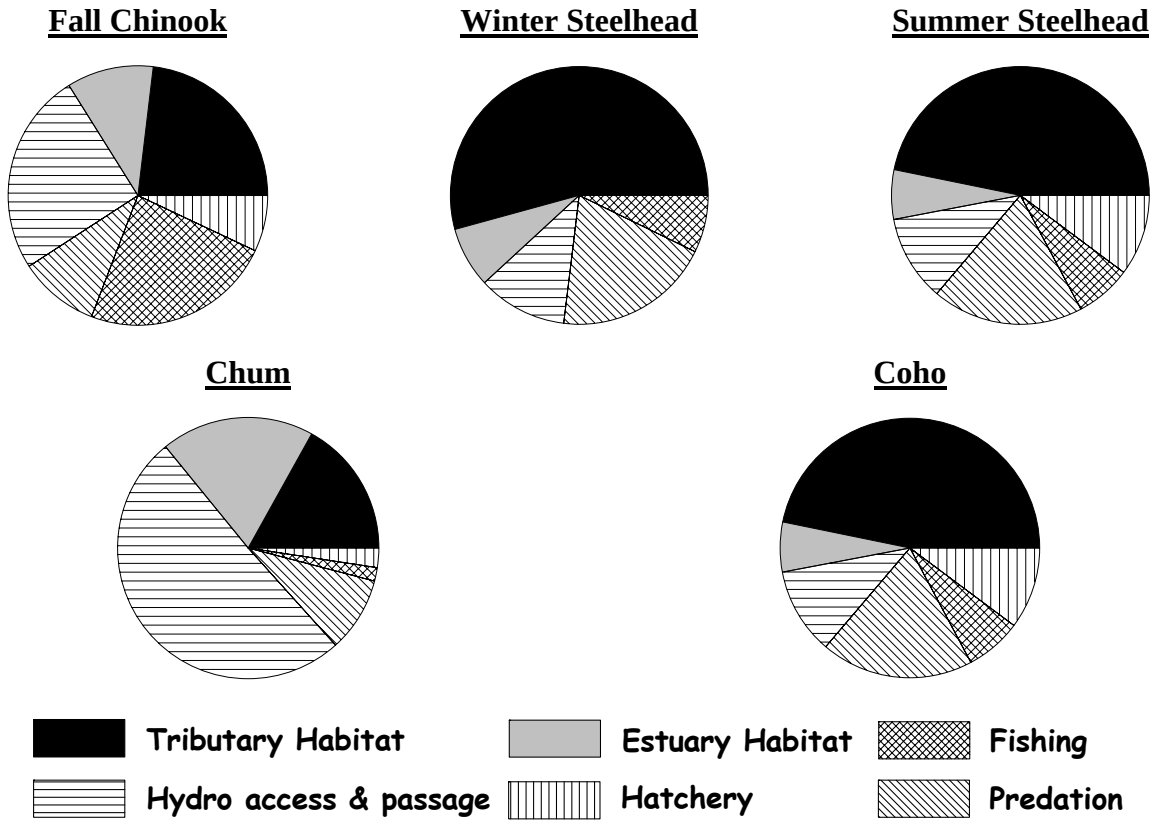


Figure 17-3. Relative contribution of potentially manageable impacts for Wind populations.

17.4 Limiting Factors, Threats, and Measures

17.4.1 Hydropower Operation and Configuration

There are no hydro-electric dams in the Wind River basin. However, Wind 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.

17.4.2 Harvest

Most harvest of Wind River wild salmon and steelhead is 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. Wind River fall Chinook are harvested in ocean and Columbia River commercial, and sport fisheries, Columbia River treaty Indian fisheries, as well as in-basin sport fisheries. Non-Indian 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 commercial chum fisheries and retention of chum is prohibited in Columbia River and tributary sport fisheries. Chum are impacted incidental to fisheries directed at coho and winter steelhead. Harvest of Wind River coho occurs in the ocean commercial and recreational fisheries off the Washington and Oregon coasts and in the Columbia River. Wild coho impacts are limited by fishery management to retain 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 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 Wind River subbasin populations are summarized in the following table:

Table 6. Regional harvest measures with significant application to the Wind Subbasin populations.

Measure	Description	Comments
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.

17.4.3 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.

The Carson National Fish Hatchery (since 1937) operates in the mainstem Wind at RM 18. The hatchery produces spring Chinook for treaty Indian and non-Indian harvest opportunity. Spring Chinook are not native to the Wind River. Releases of summer steelhead from Skamania Hatchery occurred until 1997. The main threats from hatchery released spring Chinook are potential ecological interactions between natural juvenile salmon and steelhead and hatchery released spring Chinook.

Table 17-2. Wind River hatchery production.

Hatchery	Release Location	Spring Chinook
Carson NFH	Wind River	1,420,000

Regional hatchery strategies and measures are focused on evaluating and reducing biological risks and reducing the risks to natural populations. Federal artificial production programs will be evaluated in detail through the Hatchery and Genetic Management Plan (HGMP) process relative to risks to natural populations. The resulting program specific actions will be developed, evaluated, and documented through the HGMPs 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 Wind subbasin are summarized in Table 7.

Table 17-3. Regional hatchery measures from Volume I, Chapter 7 with potential implementation actions in the Wind River Subbasin.

Measure	Description	Comments
H.M6	Evaluate Carson NFH facility and operations.	Evaluate through HGMP and APRE processes to assess need for facility and operational changes to reduce impacts to wild salmonids.
H.M22	Juvenile release strategies to minimize impacts to naturally-spawning populations.	Release strategies would be aimed at minimizing interactions between hatchery released spring Chinook smolts and wild steelhead, fall Chinook, chum, and coho.
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.

17.4.4 Ecological Interactions

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

17.4.5 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 Wind 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 Wind salmon and steelhead populations are addressed by regional strategies and measures identified in Volume I and the Columbia Mainstem and Estuary Subbasin sections of Volume II.

17.4.6 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 Wind 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 17-4. A summary of the primary habitat limiting factors and threats are presented in Table 17-5. Habitat measures and related information are presented in Table 17-6. Results of IWA watershed process modeling are depicted for

subwatersheds in Figure 17-5. Reach- and subwatershed-scale limiting factors generated from the technical assessment are included in Table 17-4. 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. Tier, 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 Wind River basin include the following:

- Lower mainstem and Little Wind – Wind 1-3; Little Wind 1
- Middle & upper mainstem Wind – Wind 5a-7b
- Trout Creek – Trout 1a-2b; Martha Creek
- Wind and Panther Creek Canyons – Wind 4a-4b; Panther 1a-1b
- Upper Panther – Panther 1e-2a

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.

The lower mainstem and Little Wind River reaches provide habitat for fall Chinook, chum, coho, and winter steelhead, all of which do not typically ascend Shipherd Falls at river mile 2. These reaches are impacted by the Bonneville Dam impoundment, development activities around the towns of Carson and Home Valley, and basin-wide forest practices. Effective recovery measures here will include controlling excessive runoff and soil erosion from the Carson Golf Course, floodplain reconnection near the mouth of the Little Wind, and passive restoration of riparian areas. Emphasis should also be placed on addressing sediment supply conditions in the Little Wind Basin.

Productive reaches in the middle and upper mainstem are located between Stabler and Paradise Creek. These reaches have been impacted by upper basin forest practices and by localized riparian and floodplain development. Although restoration opportunities exist in these reaches, the primary recovery emphasis is preservation. The lower (privately-owned) reaches are likely to witness increased development along the river valley bottom. It is imperative that land-

use planning and critical areas protections are adequate to prevent impairment of habitat and habitat-forming processes.

The Trout Creek system contains productive steelhead spawning habitat in the Trout Creek flats area (reach Trout 1d) and good rearing in the reach just upstream of Hemlock Lake. Trout Creek flats was heavily impacted by past forest practices and has undergone significant restoration in recent years. The primary recovery emphasis is for preservation. These reaches are almost entirely within the Gifford Pinchot National Forest and there is good potential for continued preservation and passive restoration of watershed processes.

The lower Wind and Panther Creek canyons have good current production and have been identified in the technical assessment as having high preservation value. The Wind Canyon is located between Shipherd Falls and Trout Creek. Panther Creek Canyon extends from the mouth of Panther Creek to approximately Cedar Creek. Although these reaches are surrounded by private lands, they are relatively protected from riparian impacts due to steep, inaccessible canyons. Residential development encroaches into the riparian corridor of Panther Creek in a few places but the impacts are minor. These reaches are most important for steelhead parr rearing. The recovery emphasis is for preservation and therefore no limiting factors or threats are identified for these areas.

Upper Panther Creek also has high preservation value. These relatively functioning stream reaches support summer steelhead spawning and rearing and are completely within the Gifford Pinchot National Forest. There are good opportunities for passive restoration and preservation of watershed process conditions in the Panther Creek Basin.

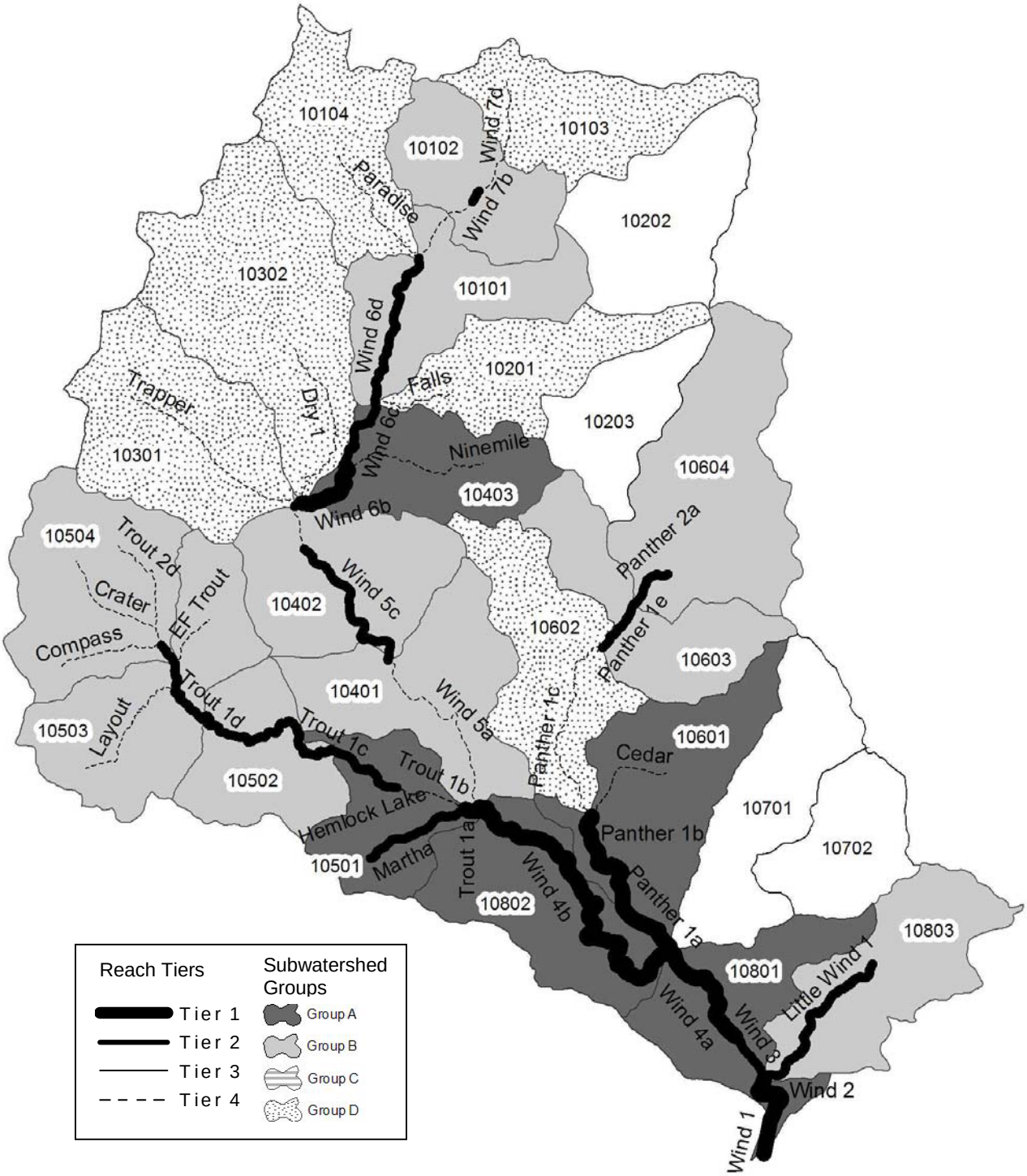


Figure 17-4. Reach tiers and subwatershed groups in the Wind River Basin. Tier 1 reaches and Group A subwatersheds represent the areas where recovery actions would yield the greatest benefits with respect to species recovery objectives. The subwatershed groups are based on Reach Tiers. Priorities at 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.

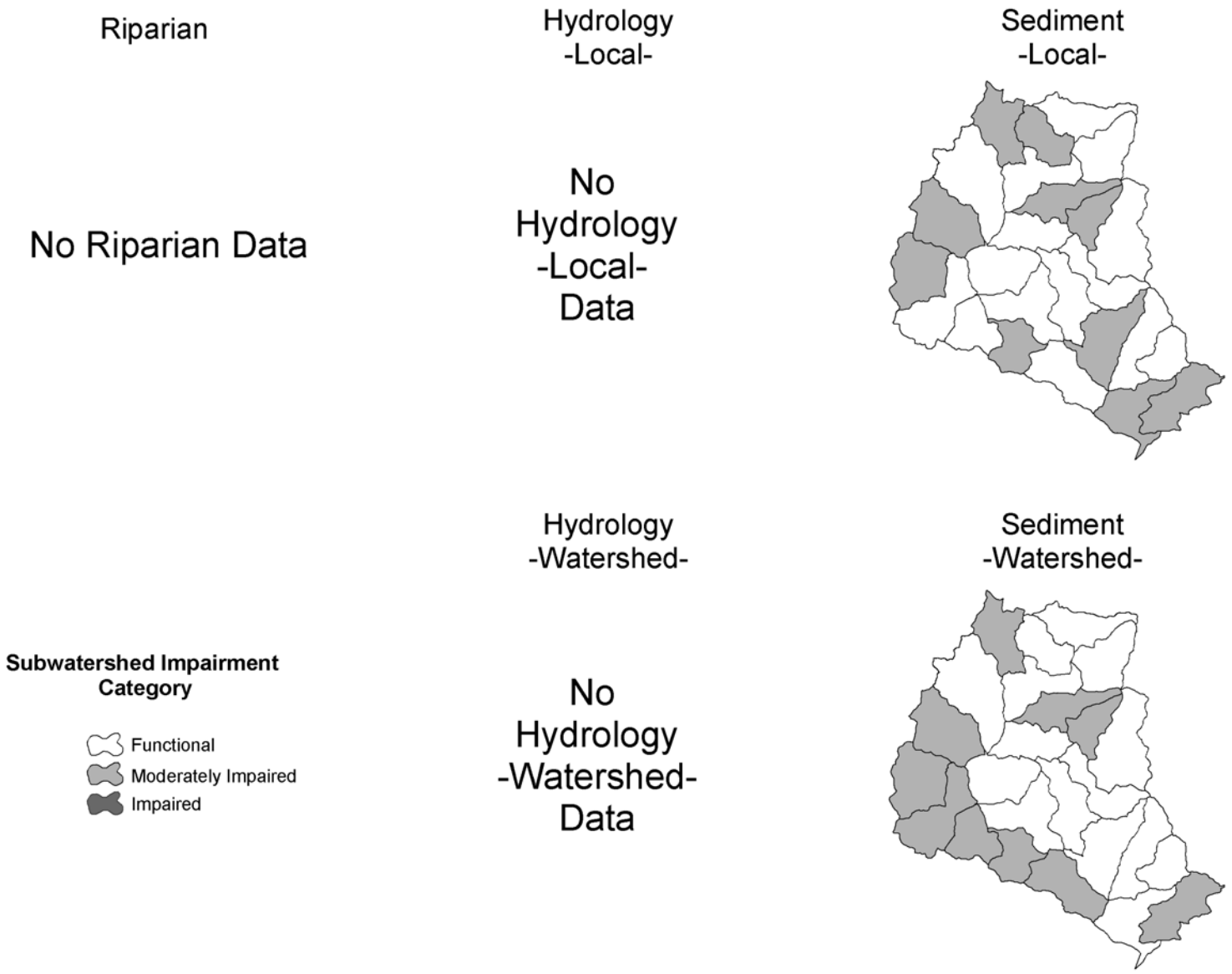


Figure 17-5. IWA subwatershed impairment ratings by category for the Wind River Basin. Watershed process impairment ratings are based on landscape conditions that influence the hydrologic regime, the sediment regime, and riparian function. See Volume II and Volume V of the Recovery Plan Technical Foundation for additional information.

Table 17-4. 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. ND = No Data available for the analysis

Sub-watershed Group	Sub-watershed	Reaches within subwatershed	Species Present	High priority reaches by species	Critical life stages by species	High impact habitat factors	Preservation or restoration emphasis	Watershed processes (local)			Watershed processes (watershed)	
								Hydrology	Sediment	Riparian	Hydrology	Sediment
A	10802	Wind 4b	StS	Wind 4b	Egg incubation Fry colonization Summer rearing Winter rearing	sediment	P	ND	F	ND	ND	M
	10801	Shipherd Falls	Chum	Wind 2	Spawning Egg incubation Fry colonization Adult holding	none	PR	ND	M	ND	ND	F
		Wind 1	StS	Wind 4a	Egg incubation Fry colonization Summer rearing Winter rearing	habitat diversity sediment	P					
		Wind 2 Wind 3 Wind 4a	Coho	Wind 1 Wind 2	Spawning Egg incubation Fry colonization Summer rearing Juvenile migrant (age 0) Winter rearing Adult holding	habitat diversity key habitat quantity	PR					
			ChF	Wind 2	Spawning Egg incubation Fry colonization Adult holding	none	P					
			StW	none								
	10601	Cedar Panther 1a Panther 1b	StS	Panther 1a Panther 1b	Egg incubation Fry colonization Summer rearing Winter rearing	habitat diversity sediment	P	ND	M	ND	ND	F
	10501	Hemlock Dam Hemlock Lake Martha Trout 1a Trout 1b Trout 1c	StS	Trout 1a	Egg incubation Fry colonization Summer rearing Winter rearing	habitat diversity	P	ND	M	ND	ND	M
	10403	Ninemile Wind 6b Wind 6c	StS	Wind 6b	Egg incubation Fry colonization Summer rearing Adult holding	none	P	ND	F	ND	ND	F
B	10803	Little Wind 1	Coho	none				ND	M	ND	ND	M
			StW	Little Wind 1	Spawning Egg incubation Fry colonization Summer rearing Adult holding	key habitat quantity	PR					
	10604	Panther 2a Panther 2b	StS	none				ND	F	ND	ND	F
	10603	Panther 1e	StS	none				ND	F	ND	ND	F
	10504	Compass Crater Trout 2a Trout 2b Trout 2c Trout 2d	StS	none				ND	M	ND	ND	M
	10503	EF Trout Layout Trout 1d Trout 2a	StS	none				ND	F	ND	ND	M
	10502	Trout 1c Trout 1d	StS	none				ND	F	ND	ND	M
	10402	Wind 5c Wind 5d Wind 6a	StS	none				ND	F	ND	ND	F
	10401	Wind 5a Wind 5b	StS	none				ND	F	ND	ND	F
	10102	Wind 7a Wind 7b Wind 7c	StS	none				ND	M	ND	ND	F
	10101	Wind 6d Wind 7a	StS	none				ND	F	ND	ND	F
D	10602	Panther 1c Panther 1d	StS	none				ND	F	ND	ND	F
	10302	Dry 1	StS	none				ND	F	ND	ND	F
	10301	Trapper	StS	none				ND	M	ND	ND	M
	10201	Falls	StS	none				ND	M	ND	ND	M
	10104	Paradise	StS	none				ND	M	ND	ND	M
	10103	Wind 7d	StS	none				ND	F	ND	ND	F

Table 17-5. Salmonid habitat limiting factors and threats in priority areas. Priority areas include the lower mainstem & Little Wind (LW), middle & upper mainstem Wind (UW), and Trout Creek (TR). Linkages between each threat and limiting factor are not displayed – each threat directly and indirectly affects a variety of habitat factors.

Limiting Factors	LW	UW	TR
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 and/or side-channel habitats	✓	✓	✓
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, or rate of change	✓	✓	✓
Water quality			
Altered stream temperature regime	✓	✓	✓
Bacteria	✓	✓	
Substrate and sediment			
Excessive fine sediment	✓	✓	✓
Embedded substrates	✓	✓	✓

Threats	LW	UW	TR
Rural development			
Clearing of vegetation	✓	✓	
Floodplain filling	✓	✓	
Increased impervious surfaces	✓		
Increased drainage network	✓		
Roads – riparian/floodplain impacts	✓	✓	
Leaking septic systems	✓	✓	
Forest practices			
Timber harvests –sediment supply impacts	✓	✓	✓
Timber harvests – impacts to runoff		✓	✓
Riparian harvests	✓		✓
Forest roads – impacts to sediment supply	✓	✓	✓
Forest roads – impacts to runoff		✓	✓
Forest roads – riparian/floodplain impacts			✓
Splash-dam logging (historical)		✓	
Channel manipulations			
Bank hardening	✓	✓	
Channel straightening	✓	✓	
Artificial confinement	✓	✓	

Table 17-6. 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 Wind & Little Wind Wind 3; Little Wind 1 ***Middle Wind*** Wind 5a-5d	• Bed and bank erosion • Altered habitat unit composition • Restricted channel migration • Disrupted hyporheic processes • Reduced flood flow dampening • Altered nutrient exchange processes • Channel incision	• Floodplain filling • Channel straightening • Artificial confinement	• All species	2-15 years	Great potential benefit due to improvements in many limiting factors. This passive restoration approach can allow channels to restore naturally once confinement structures are removed. There are challenges with implementation on private lands due to existing infrastructure already in place, potential flood risk to property, and large expense. Opportunities exist in areas of public ownership in these reaches.
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 Wind & Little Wind Wind 3; Little Wind 1 ***Middle Wind*** Wind 5a-5d	• Loss of off-channel and/or side-channel habitat • Blockages to off-channel habitats • Altered habitat unit composition	• Artificial confinement • Channel straightening • Floodplain filling	• chum • Coho • Summer steelhead	2-15 years	Good potential benefit especially for chum (lower Wind), 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 due to existing infrastructure already in place, private property, and large expense. No regulatory mechanisms in place for this type of restoration.
3. Protect and restore riparian function ***A. Reforest riparian zones*** ***B. Allow for the passive restoration of riparian vegetation*** ***C. Livestock exclusion fencing*** ***D. Invasive species eradication*** ***E. Hardwood-to-conifer conversion***					

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
Lower Wind & Little Wind Wind 1-3; Little Wind 1 ***Middle & upper Wind*** Wind 5a-7b ***Trout Creek*** Trout 1a-2b; Martha Cr	• Reduced stream canopy cover • Altered stream temperature regime • Reduced bank/soil stability • Reduced wood recruitment • Lack of stable instream woody debris • Exotic and/or noxious species	• Timber harvest – riparian harvests • Riparian grazing • Clearing of vegetation due to rural development	• All species	20-100 years	High potential benefit due to the many limiting factors that are addressed. Riparian impairment is related to most land-uses and is a concern throughout the basin. Riparian protections on forest lands are provided for under current harvest policy. Riparian restoration projects are relatively inexpensive and are often supported by landowners. The specified stream reaches are the highest priority for riparian measures, however, 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 streambank stability ***A. Restore eroding streambanks*** ***B. Restore mass wasting (landslides, debris flows) within river corridors***					
Lower mainstem Wind 2-3 ***Middle mainstem*** Wind 5a-5c	• Reduced bank/soil stability • Excessive fine sediment • Embedded substrates	• Artificial confinement • Clearing of vegetation • Roads – riparian / floodplain impacts	• All species	5-50 years	There are a few areas along the lower mainstem where landslides, debris flows, and gullies have contributed large quantities of sediment to the river. Inadequate control of runoff at the Carson Golf Course is a major contributor. There are also portions of the middle Wind with severe bank erosion concerns. Recovery measures should focus on controlling stormwater runoff and using bio-engineered approaches that rely on structural as well as vegetative techniques to stabilize erosion-prone areas.
5. Protect and restore natural sediment supply processes ***A. Address forest road related sources*** ***B. Address timber harvest related sources*** ***C. Address agricultural sources*** ***D. Address developed land sources***					
Entire basin	• Excessive fine sediment • Embedded substrates	• Timber harvest – impacts to sediment supply • Forest roads – 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

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
		• Development – impacts to sediment supply			implementation on developing lands due to few sediment-focused regulatory requirements for developed lands. Use IWA impairment ratings to identify restoration and preservation opportunities.
6. Protect and restore runoff processes ***A. Address forest road impacts*** ***B. Address timber harvest impacts*** ***C. Limit additional watershed imperviousness*** ***D. Manage stormwater runoff***					
Entire basin	• Stream flow – altered magnitude, duration, or rate of change of flows	• Timber harvest – impacts to runoff • Forest roads – impacts to runoff • Increased impervious surfaces • Increased drainage network (road ditches, storm drains) • Clearing of vegetation (development, agriculture)	• 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 FPRs, the USFS Northwest Forest Plan, and forest land HCPs. There are challenges associated with addressing runoff issues on developed lands due to continued increase in watershed imperviousness related to development and lack of adequate mitigation. Use IWA impairment ratings to identify restoration and preservation opportunities.
7. 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 Wind River basin are being identified as part of Watershed Planning for WRIA 29.
8. Protect and restore water quality ***A. Restore the natural stream temperature regime*** ***B. Reduce fecal coliform bacteria levels***					
Entire basin	• Altered stream temperature regime • Bacteria	• Riparian harvests • Riparian grazing • Leaking septic	• All species	1-50 years	Primary emphasis for restoration should be placed on stream segments that are listed on the 2004 303(d) list.

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
		systems			
9. 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 Wind & Little Wind Wind 1-3; Little Wind 1 ***Middle & upper Wind*** Wind 5a-7b ***Trout Creek*** Trout 1a-2b; Martha Cr	• Lack of stable instream woody debris • Altered habitat unit composition	• None (symptom-focused restoration strategy)	• All species	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. There has been considerable success with LWD installation projects on several reaches in the Wind River basin.
10. Protect and restore fish access to channel habitats ***A. Hemlock Dam and Lake***					
Trout Creek Hemlock Dam and Lake	• Blockages to channel habitats	• Hemlock Dam	• summer steelhead	immediate	Hemlock Dam and Lake may present a passage concern for juvenile and adult fish, although the extent of the impact is unknown. The USFS is currently evaluating options for dam removal.
11. 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), especially within the river corridor of the middle mainstem. Many 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.
12. 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***					

Location	Limiting Factors Addressed	Threats Addressed	Target Species	Time	Discussion
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.

17.5 Program Gap Analysis

The Wind Basin (~224 sq mi) is located in Skamania County. Approximately 10% of the land is private, while almost all of the remainder lies within the Gifford Pinchot National Forest. Forestry land uses dominate the subbasin.

- Gifford Pinchot Forest lands comprise approximately 200 square miles of the Wind Basin;
- Department of Natural Resources timber lands are estimated at 5 square miles;
- Private lands along the lower Wind mainstem are estimated at 10 square miles;
- There are no significant industrial forest lands;
- The Wind River subbbasin falls entirely in Skamania County.
- Carson and Stabler are unincorporated communities within the subbasin.
- Population growth is expected to remain stable over the next 20 years.

Protection Programs

Protection programs in the Wind Basin are implemented by the Gifford Pinchot NF, the Department of Natural Resources, Skamania County, and other regulatory agencies. Protection programs in this analysis include programs that protect habitat conditions or watershed functions through management policies and programs, regulatory measures, incentives, and fee title acquisition or the purchase of easements. Major programs implementing protection measures are identified below.

Federal Programs

- ***U.S. Forest Service Gifford Pinchot National Forest*:**
  - The Gifford Pinchot NF Plan provides high levels of protection for riparian areas and forest stands within the Wind Basin; [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]
    - ✓ Riparian buffers in all areas of the Gifford Pinchot NF are at least 300'.
    - ✓ A significant portion of the Wind Basin is "Administratively Withdrawn" under protections offered through the Columbia Gorge National Scenic Act.
    - ✓ Most of the Wind Basin is managed as "Late-Successional Reserves," and as a result, has excellent protections.
    - ✓ Some of the uppermost reaches of the Wind River is located in the Indian Heaven Wilderness Area. Trapper Creek headwaters are further protected by the Trapper Creek Wilderness Area.

- ***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.9A; M.9B]

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. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]
  - 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. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]

- ***Washington 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. [M.1A; M.2A; M.2B; M.9A; M.9B]

  - 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.3A; M.4A; M.4B; M.5D; M.6D; M.7A; M.7B; M.7C; M.7D; M.7E; M.8A; M.9B; M.9A; M.9B]

- ***Washington Department of Ecology***

  - Water Resources Program/Water Rights: Department of Ecology, in consultation with the Department of Fish and Wildlife, has administratively closed selected areas within the North Fork Lewis watershed 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 may have the potential to adversely impact low summer stream flows. Currently, there are approximately 58 cfs of water rights in the EF Lewis. It is unknown how much of this volume is being utilized for beneficial uses. This compares to an average August low flow of 83 cfs. [M.7A; M.7B; M.7C; M.7D]

  - Water Resources Program/Watershed Planning: In cooperation with Skamania County, 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) 29 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.7A; M.7B; M.7C; M.7D; M.8A; M.8B; M.11A]

Local Government Programs

- ***Skamania County***
  - Comprehensive Planning and Land Use Regulation: Skamania County is required by state law to have a critical areas ordinance. It is not otherwise required to plan in accordance with the Washington Growth Management Act (GMA). The County's land use controls provide only fair protection of watershed processes and habitat. Wetland and stream setbacks range from 25 to 200 feet depending on the class designation. The County shoreline management ordinance provisions for the Wind protect the shorelines from substantial development or extensive timber harvest within a 200-foot buffer. [M.11A; M.11B; M.11C]
  - Road and Parks Programs: The County Road and Parks and Recreation programs have implemented management practices to deal with environmental issues.

Restoration Programs

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

Federal Programs

- ***Gifford Pinchot National Forest***
  - The Wind Basin is one of five priority areas for the Gifford Pinchot NF. It receives significant restoration attention in terms of instream work, road decommissioning, and riparian restoration. Restoration efforts have focused on the Trout Creek watershed and the mining reach of the upper Wind River. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]

State Programs

- ***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. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]
  - State Forest Practices Act:
    - Industrial forests within the lower NF Lewis 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 [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]
    - 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. [M.3A; M.3B; M.5A; M.5B; M.6A; M.6B; M.8A]

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

  - Habitat Program: The Department provides advice and assistance to local governments and landowners interested in measures to restore habitat. [M.1A; M.2A; M.2B; M.3A; M.4A; M.4B; M.5D; M.6D; M.7A; M.7B; M.7C; M.7D; M.7E; M.8A; M.9B; M.9A; M.9B]

- ***Conservation Commission/ Underwood Conservation District:*** The Conservation District provides technical assistance and incentives (e.g., Conservation Reserve and Enhancement Program) to encourage agricultural landowners to restore riparian areas and stream habitat. The Conservation District is actively involved in the subbasin. It supports the Wind River Watershed Council and has sponsored several restoration projects within the Basin, including Upper Trout Creek Restoration and Sand Hill Road Landslide renovation. [M.1A; M.2A; M.2B; M.3A; M.3C; M.4A; M.4B; M.5C; M.8A; M.8B; M.9A; M.9B]

Local Government Programs

No active programs

Community Restoration Programs

- ***Wind River Watershed Council:*** This organization comprised of federal, state, and local agencies and interested community members develop watershed policies and restoration projects and priorities. [M.3A; M.9A; M.9B]

Gap Analysis

***Forest-related Programs*:** In the Wind Basin, forestry programs have a prominent role in protecting and restoring watershed functions and habitat conditions at levels supporting recovery goals. This is because forestry management and regulatory programs apply to approximately 93 % of the basin. The Wind Basin benefits from very high levels of protection and restoration from the Gifford Pinchot National Forest. Certainty of forestry-related protection and restoration programs is relatively high because programs are being implemented and funded. Program areas of concern include 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: Watershed processes and habitat in the mid and lower Wind Basin have some protections through Skamania County's land use regulations. Skamania County's comprehensive plan and land use ordinances have fair levels of protection; however, Best Available Science updates would improve their Critical Area Ordinances and Shoreline Master Program. In addition, as in all lower Columbia subbasins, there are very limited protection mechanisms for agricultural practices relative to riparian areas and hydrologic impairment.

Restoration-related Programs: Forest related improvements to the Wind Basin will accrue over time as a result of improved forest management practices that are already in place.

Significant restoration activities are occurring in the Wind Basin and there appears to be excellent cooperation among the Forest Service, Underwood Conservation District and the Washington Department of Fish and Wildlife. Noxious weed control efforts are a concern in the Wind, as they are in most basins in the region. Focused attention on the Japanese Knotweed, as well as other invasive plant species is important.

Table 17-7. Program Actions to Address Gaps

Action #	Lead Agency	Proposed Action
WIND.1	Skamania County, Carson, Stabler	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
WIND.2	Skamania County; Carson, Stabler	Development and implement controls to protect historic stream meander patterns and channel migration zones and avoid hardening stream banks and shorelines
WIND.3	Skamania County, Carson, Stabler	Development and implement controls and development standards to adequately protect wetlands, wetland buffers, and wetland function.
WIND.4	Skamania County, Carson, Stabler	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
WIND.5	Skamania County, Carson, Stabler	Apply land use and resource protection code enforcement across jurisdictions in a consistent manner, using appropriate funding levels and application
WIND.6	LCFRB, WDNR. WSDOT, Counties, private property owners.	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.
WIND.7	Skamania County, Underwood Conservation District	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.
WIND.8	State of Washington (DOE, DFW)	Close the Wind Basin to further surface water withdrawals, including groundwater in connectivity with surface waters; curtail unauthorized withdrawals
WIND.9	LCFRB, WDFW, Skamania County, Underwood 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.
WIND.10	SRFB, BPA, NOAA, USFWS, DOE, ACOE	Increase available funding for projects that implement measures and address underlying threats
WIND.11	State of Washington (Dept of Agriculture, and Department of Ecology)	Develop and implement agricultural practices and regulations to protect riparian conditions and water quality
WIND.12	Underwood CD	Expand landowner incentive (e.g. CREP) and education plans to promote further habitat protection and restoration.
WIND.13	LCFRB, Underwood CD, Skamania County	Address threats proactively by building agreement on priorities among the various program implementers
WIND.14	FEMA	Update floodplain maps using Best Available Science