CBFWA Fish and Wildlife Agencies' and Tribes' Amendment Comments
Attachment III: Resident Fish Section 4 Condensed
June 12, 2008

The Fish and Wildlife Agencies and Tribes of

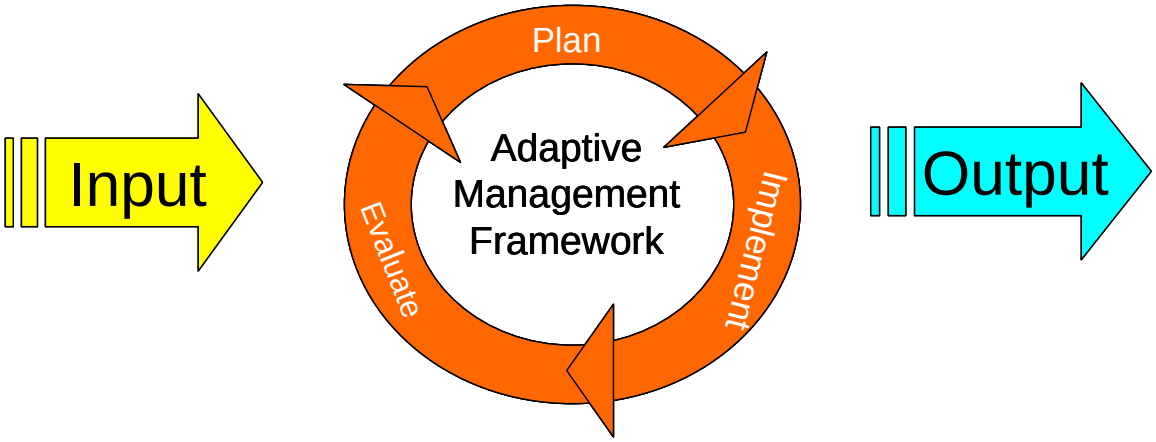
The Columbia Basin Fish and Wildlife Authority

Provide these Recommendations for Amendments to the

NORTHWEST POWER AND CONSERVATION COUNCIL

2000 COLUMBIA BASIN FISH AND WILDLIFE PROGRAM

Updated Section 4.0 - Recommended Amendment to Subbasin and Focal Species Provisions for Resident Fish



June 12, 2008
Final

Section 4.0. Recommended Amendment to Subbasin and Focal Species Provisions for Resident Fish

Section 4.1 Lower Columbia Province

Section 4.1.1 Columbia Lower and Estuary Subbasin

A. White Sturgeon

Section 4.1.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Abundance (36-72 inches)		Number of local populations	Number of adults	Total number of adults
Lower Columbia/ Columbia River Estuary	>400,000		NA	NA	NA
	Annual Harvest				
	50,000		NA	NA	NA
	Productivity				
	>1 recruit per spawner		NA	NA	NA

Status:

Population	Abundance	Annual Harvest	Productivity
Lower Columbia/ Columbia River Estuary	121,500 (2006)	33,783 (2006 combined recreational and commercial harvest)	NA

Section 4.1.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Loss of habitat and population connectivity	Dams	River fragmentation by Bonneville Dam limits the ability of white sturgeon to redistribute, to seek out the best spawning and rearing areas, and

		to access and follow seasonal food resources.
Pollutants and contaminants	Current land use practices	Industrial discharges and dumping; agriculture and residential applications
Predation	Marine mammals; native and non-native fishes	Steller and California sea lion predation on adult and sub-adult sturgeon; potential sturgeon larvae and egg predation by suckers, walleye, catfish, black bass, etc.
Spawning and recruitment variability	Dams; flows	Current Bonneville Dam operations alter spawning and rearing flows (spring and winter flows)
Fisheries and harvest	Over-harvest	Illegal harvest of legal and over-sized white sturgeon for meat and caviar; potential handling stress from catch and release in over-size fishery
Water temperature	Dams	Bonneville Dam operations can artificially increase river water temperatures to detrimental levels
Flow and flow variation	Dams	Alteration of historic hydrograph as water is stored for power generation and irrigation by the FCRPS
Sediments	Dams; dredging	Bonneville Dam operations and dredging for cargo ships and other commercial uses may result in deposition of fine sediments in preferred spawning habitats.
Habitat quality/quantity	Current land and river use practices	Roads; agriculture; forestry; residential development; Bonneville Dam
Non-native species	Introduced aquatic species	A potential decrease in prey quality (lipid content, energy, etc) and/or competition for food resources with juvenile white sturgeon
Incidental hydrosystem mortality	Dams	Dewatering of Bonneville Dam turbines can result in mortality of stranded white sturgeon

Section 4.1.1A.3 Strategies and Measures for Lower Columbia/Estuary White Stugeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Loss of habitat and population connectivity			
• Restore upstream and downstream movement of white sturgeon in the lower Columbia River	• A. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • B. Manage marine mammals to reduce predation of white sturgeon downstream of Bonneville Dam • C. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • D. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Pollutants and contaminants			
• Ensure water quality and contaminant loads in river substrates meet existing guidelines and regulations	• E. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • F. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Predation			
• Conduct non-lethal hazing actions on the Columbia River to deter Steller and California sea lions from feeding on white sturgeon.	• G. Manage marine mammals to reduce predation of white sturgeon downstream of Bonneville Dam • H. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • I. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

• Investigate the need and potential measures for minimizing egg and larval white sturgeon piscivory	• J. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • K. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • L. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Spawning and recruitment variability			
• Obtain consistent annual spawning and recruitment of white sturgeon in the lower Columbia River	• M. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • N. Fund annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • O. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • P. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Fisheries and harvest			
• Set harvest guidelines to ensure adequate escapement of harvestable-size fish to broodstock	• Q. In consultation with the appropriate management agencies fund intensive sustainable white sturgeon fishery management • R. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • S. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

Water temperature			
• Create habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• T. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • U. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • V. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Flow and flow variation			
• Obtain consistent annual spawning and recruitment of white sturgeon in the lower Columbia River	• W. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • X. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • Y. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Sediments			
• Achieve habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• Z. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • AA. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • BB. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
• Investigate scope and impact of direct white sturgeon mortality due to dredging activities	• CC. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • DD. Conduct dredging operations to minimize operation related mortality on white sturgeon in the free-flowing river below Bonneville Dam • EE. Monitor and evaluate, a)	Immediate	1 – 5 years

	mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • FF. Conduct research that addresses critical white sturgeon uncertainties		
Non-native species			
• Characterize white sturgeon interactions with introduced species.	• GG. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • HH. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Incidental hydrosystem mortality			
• Operate the hydrosystem to reduce mortality on white sturgeon	• II. Block access to turbine draft tubes during turbine dewatering and other maintenance operations to minimize white sturgeon entrainment and mortality • JJ. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • KK. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

B. Green Sturgeon

Section 4.1.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lower Columbia/ Columbia River Estuary	None		NA	NA	NA

	Subbasin/Management Plans		Recovery Plan		
	Annual Harvest				
	Commercial and sport harvest banned		NA	NA	NA

Status:

Population	Abundance	Annual Harvest	Productivity
Lower Columbia/ Columbia River Estuary	Unknown	Closed	Unknown

Section 4.1.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Harvest	Fishing mortality	Incidental catch in white sturgeon fisheries and non-retention fisheries
Non-native species	Introduced aquatic species	A potential decrease in prey quality (lipid content, energy, etc) and/or competition for food resources with juvenile white sturgeon
Predation	Marine mammals	Pinnipeds
Habitat diversity and productivity	Current land use practices	Dikes and filling activities; loss of wetland habitats and productivity
Contaminants	Current land use	Industrial discharges and dumping; agriculture and residential applications

Section 4.1.1B.3 Strategies and Measures for Lower Columbia/Estuary Green Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Harvest			
• Quantify green sturgeon abundances in the lower Columbia River to better inform management decisions	• A. Develop and conduct studies to quantify green sturgeon abundances and associated spatio-temporal variability • B. Monitor harvest levels and the effectiveness of current fishery regulations	Immediate	1 – 5 years

Non-native species			
• Evaluate green sturgeon interactions with non-native species and remove potentially detrimental non-native prey	• C. Study the impacts of diet shifts on the transfer of energy and materials from prey to green sturgeon • D. Potentially remove detrimental non-native prey	Immediate	6 – 10 years
Predation			
• Evaluate significance of pinniped predation on green sturgeon.	• E. Manage marine mammals to reduce predation of green sturgeon.	Immediate	1 – 5 years
Habitat diversity and productivity			
• Characterize diets of green sturgeon and consider limiting dike construction and filling activities	• F. Asses the importance of macro-detritus and wetland associated macro-benthos in the diets of green sturgeon • G. Regulate diking and filling activities that may limit green sturgeon access to wetland derived production	Immediate	1 – 5 years
Contaminants			
• Ensure water quality and contaminant loads in river substrates meet appropriate guidelines and regulations	• H. Conduct research that quantifies and addresses the affects of specific contaminants and water quality requirements on green sturgeon	Immediate	1 – 5 years

Section 4.1.2 Kalama Subbasin

A. Kalama Coastal Cutthroat Trout

Section 4.1.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Kalama	None		NA	NA	NA

Status:

Population	Adult Abundance
Kalama	Unknown

Section 4.1.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, roads, and residential development
Competition/predation	Non-native species	Rainbow trout
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.1.2A.3 Strategies and Measures for Kalama Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• Implement biological surveys to evaluate population density and composition • Identify migration patterns through telemetry studies • Implement mark-recapture studies to estimate population size	Immediate	5-10 years

B. Lewis Coastal Cutthroat Trout

Section 4.1.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Lewis	None		NA	NA	NA

Status:

Population	Adult Abundance
Lewis	Unknown

Section 4.1.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, roads, and residential development
Competition/predation	Non-native species	Rainbow trout
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.1.2B.3 Strategies and Measures for Lewis Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	5-10 years

Section .4.1.3 Washougal Subbasin

A. Washougal Coastal Cutthroat Trout

Section 4.1.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Washougal	None		NA	NA	NA

Status:

Population	Adult Abundance
Washougal	Unknown

Section 4.1.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, roads, and residential development
Competition/predation	Non-native species	Rainbow trout
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.1.3A.3 Strategies and Measures for Washougal Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	5-10 years

Section 4.1.4 Willamette Subbasin

A. Willamette Bull Trout

Section 4.1.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Upper Willamette	--			--	

	Subbasin/Management Plans		Draft Recovery Plan		
	Number of local populations				
	4		4		
	Total number of adults				
	600-1,000				600-1,000

Status:

Population	Number of local populations	Number of adults/population	Total number of adults
Upper Willamette		--	174 (2007)

Section 4.1.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Inundation by hydro-development, road building, forestry, and urban encroachment
Habitat access	Dams	Lack of passage at Willamette River dams
Population traits	Dams	Lack of passage facilities at Willamette River dams isolates populations and prevents gene flow
Competition	Non-native species	Brook trout competition
Nutrients	Dams	Lack of Chinook salmon in habitat above Willamette River dams due to lack of passage facilities

Section 4.1.4A.3 Strategies and Measures for Willamette Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Improve habitat to sustain populations of bull trout in at least four tributaries of the Willamette River	• A. Protect, restore, and enhance bull trout habitat, and implement projects to restore instream structure and complexity by adding large	Immediately	1-5 years

(McKenzie, Middle Fork Willamette, Clackamas, North Santiam rivers)	woody debris, side channels and spawning gravels		
Habitat Access			
• Restore connectivity in migratory corridor	• B. Correct manmade barriers that impede bull trout access to suitable habitat by developing upstream and downstream passage at dams that block access to former and present bull trout populations	Immediately	1-5years
• Reestablish bull trout in unoccupied historical habitats in the Willamette Basin	• C. Assess the feasibility of reestablishing bull trout in former habitat by compiling existing data on potential bull trout spawning and rearing habitat and gathering new data where there are gaps in the information • D. Determine potential sources of bull trout in the Willamette Basin including all known populations (Anderson Creek, Roaring River, Sweetwater Creek and the McKenzie above Trail Bridge Reservoir) • E. If determined feasible and advisable, relocate bull trout for a minimum of seven years (one bull trout generation)	Immediately	1-5years
Population Traits			
• Develop a genetic management plan for bull trout in the Upper Willamette River core area providing for multiple, genetically healthy populations	• F. Collect tissue samples from bull trout for genetic characterization, characterize the genetic structure among local populations by determining frequencies of alleles • G. Draft a genetic management plan that specifies the rate and directions of artificial gene flow necessary to minimize the risk of inbreeding depression and genetic drift while maintaining population structure • H. Implement the genetic	Immediately	1-5years

	management plan until intact migratory corridors among all local populations in the Willamette Recovery Unit provide opportunities for natural gene flow		
Competition			
• Eliminate or significantly reduce brook trout populations in habitats that contain bull trout populations	• I. Determine brook trout distribution • J. Develop/implement test methods of reducing brook trout in bull trout watersheds	Immediately	1-5years
Nutrients			
• Production of juvenile salmon in waters with bull trout	• K. Re-establish populations of Chinook salmon in bull trout habitats above dams in the Willamette Basin		

B. Willamette Coastal Cutthroat Trout

Section 4.1.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Willamette	None		NA	NA	NA

Status:

Population	Adult Abundance
Willamette	Above critical levels for the past five years

Section 4.1.4B.2 Primary Limiting Factors and Threats:

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Forestry practices, road construction, agriculture, and urbanization

Section 4.1.4B.3 Strategies and Measures for Willamette Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and conserve natural ecological processes that support the viability of populations	• A. Protect /restore: 1) riparian condition and large woody debris, 2) floodplain connectivity and function, 3) stream channel structure and complexity via collaborative efforts with landowners, watershed councils, municipalities, and other public and private entities • B. Develop financial incentive and educational programs to increase participation • C. Employ regulatory mechanisms as necessary	Immediate	1-5 years

C. Willamette Oregon Chub

Section 4.1.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Number of adults/population		Number of local populations	Number of adults	Total number of adults
Willamette	≥ 500		20	≥500	10,000
	Number of Populations				
	20				

Status:

Population	Number of local populations
Willamette	15 stable populations (2007)

Section 4.1.4C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Habitat quality/quantity	Current land use	Operation of Willamette River dams for flood control, agriculture, and urbanization
Competition/predation	Non-native species	Smallmouth bass, largemouth bass, bluegill, bullheads, mosquitofish, etc)

Section 4.1.4C.3 Strategies and Measures for Willamette Oregon Chub

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Modify flood control operations and reduce channelization	• A. Reconnect floodplain habitats, remove revetments, restore wetland habitats, restrict development in floodplains, provide stream and wetland buffers in agricultural lands	Immediate	1-5 years
Competition/Predation			
• Restrict movement of non-native fishes and remove non-native fishes when feasible	• B. Limit stocking of non-native fishes to secure areas where there is no emigration and/or movement during flooding • C. Remove non-native fishes where they threatened nearby Oregon chub populations • D. Restore off-channel and side channel habitats	Immediate	1-5 years

Section 4.2 Columbia Gorge Province

Section 4.2.1 Big White Salmon Subbasin

A. Big White Salmon Rainbow Trout

Section 4.2.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Big White Salmon	None		NA	NA	NA

Status:

Population	Adult Abundance
Big White Salmon	Unknown

Section 4.2.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Fish species	Reintroduction of anadromous fish above Condit Dam
Population traits	Population information	Lack population density, distribution and genetic information

Section 4.2.1A.3 Strategies and Measures for Big White Salmon Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	5-10 years

B. Columbia Gorge White Sturgeon

Section 4.2.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Consumptive Harvest		Number of local populations	Number of adults	Total number of adults
Bonneville	5 kg/ha		NA	NA	NA
	Target Exploitation				
	21% fish 42-60" (sport) 25% fish 45-60" (commercial)		NA	NA	NA

Status:

Population	Consumptive Harvest	Sport Exploitation 42-60"	Commercial Exploitation 45-60"	Annual Recruitment	Broodstock Abundance
Bonneville	1074 (2004-07 average)	NA	NA	Consistent, moderate (1999-2007)	243 (2006)

Section 4.2.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Loss of habitat and population connectivity	Dams	River fragmentation by the FCRPS limits the ability of white sturgeon to redistribute, to seek out the best spawning and rearing areas, and to access and follow seasonal food resources.
Pollutants and contaminants	Current land use practices	Industrial discharges and dumping; agriculture and residential applications
Spawning and recruitment variability	Dams; flows	Current operations of the FCRPS alter spawning and rearing flows (spring and winter flows)
Fisheries and harvest	Over-harvest	Illegal harvest of legal and over-sized white sturgeon for meat and caviar; potential handling stress from catch and release over-size fishery

Limiting Factor	General Threat	Specific Threats
Piscine Predation	Native and non-native fishes	Potential sturgeon larvae and egg predation by suckers, walleye, catfish, black bass, etc.
Water temperature	Dams	FCRPS operations can artificially increase river water temperatures to detrimental levels
Flow and flow variation	Dams	Alteration of historic hydrograph as water is stored for power generation and irrigation by the FCRPS
Sediments	Dams	Operation of the FCRPS may result in deposition of fine sediments in preferred spawning habitats
Loss of prey base	Dams	Abundance and migrations of historically important prey species have been negatively impacted by the FCRPS.
Non-native species	Introduced aquatic species	A potential decrease in prey quality (lipid content, energy, etc) and/or competition for food resources with juvenile white sturgeon

Section 4.2.1B.3 Strategies and Measures for Columbia Gorge White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Loss of habitat and population connectivity			
• Restore upstream and downstream movement of white sturgeon impounded in Columbia River reservoirs	• A. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • B. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • C. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately	Immediate	1 – 5 years

	implement Master Plan processes • D. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • E. Conduct research that addresses critical white sturgeon uncertainties		
Pollutants and contaminants			
• Ensure water quality and contaminant loads in river substrates meet existing guidelines and regulations	• F. Development a regionally accepted White Sturgeon Conservation and Management Plan. • G. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • H. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Spawning and recruitment variability			
• Obtain consistent annual spawning and recruitment of white sturgeon in Bonneville Reservoir	• I. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • J. In consultation with the appropriate state agencies and tribes, implement intensive sustainable white sturgeon fishery management • K. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • L. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • M. Identify and quantify	Immediate	1 – 5 years

	regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • N. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • O. Conduct research that addresses critical white sturgeon uncertainties		
Fisheries and harvest			
• Set harvest guidelines to ensure adequate escapement of harvestable-size fish to broodstock	• P. In consultation with the appropriate state agencies and tribes, fund intensive sustainable white sturgeon fishery management • Q. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • R. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • S. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • T. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • U. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Piscine Predation			
• Investigate the need and potential measures for minimizing egg and	• V. Operate the FCRPS to provide flows consistent with aggressive non-	Immediate	1 – 5 years

juvenile white sturgeon predation by native and introduced resident fishes.	breach hydrosystem operations. • W. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • X. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • Y. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • Z. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • AA. Conduct research that addresses critical white sturgeon uncertainties		
Water Temperature			
• Create habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• BB. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • CC. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • DD. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • EE. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately	Immediate	1 – 5 years

	implement Master Plan processes • FF. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • GG. Conduct research that addresses critical white sturgeon uncertainties		
Flow and flow variation			
• Obtain consistent annual spawning and recruitment of white sturgeon in Bonneville Reservoir	• HH. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • II. In consultation with the appropriate state agencies and tribes, fund intensive sustainable white sturgeon fishery management • JJ. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • KK. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • LL. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • MM. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • NN. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

Sediments			
• Achieve habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• OO. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • PP. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • QQ. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • RR. Identify and quantify regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • SS. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • TT. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years
Loss of prey base			
• Increase habitat connectivity	• UU. Operate the FCRPS to provide flows consistent with aggressive non-breach hydrosystem operations. • VV. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • WW. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs • XX. Identify and quantify	Immediate	1 – 5 years

	regional white sturgeon hatchery augmentation needs and immediately implement Master Plan processes • YY. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • ZZ. Conduct research that addresses critical white sturgeon uncertainties		
Non-native species			
• Characterize white sturgeon interactions with introduced species.	• AAA. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • BBB. Monitor and evaluate, a) mitigative white sturgeon restoration actions, and b) population responses to environmental conditions • CCC. Conduct research that addresses critical white sturgeon uncertainties	Immediate	1 – 5 years

Section 4.2.2 Small Oregon Gorge Tributaries

A. Rainbow Trout

Section 4.2.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Tributaries	At least 50% of historic habitat		NA	NA	NA
	Adult Abundance				
	Naturally produced spawners > 25% of average abundance		NA	NA	NA

	over most recent 30 year period				
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Distribution	Adult Abundance
Tributaries	Unknown	Unknown

Section 4.2.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Highway and railroad corridor development, and inundation due to Bonneville Dam
Habitat access	Current land use	Highway and railroad corridor development

Section 4.2.2A.3 Strategies and Measures for Small Oregon Tributary Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and restore existing instream and riparian habitat (reduce reservoir inundation)	• A. Implement habitat restoration and protection measures described in the Lower Columbia River Recovery Plan	Immediate	1-5 years
Habitat Access			
• Restore unimpeded access that has been blocked by anthropogenic factors	• B. Implement habitat restoration and protection measures described in the Lower Columbia River Recovery Plan	Immediate	1-5 yeasr

B. Fifteenmile Coastal Cutthroat Trout

Section 4.2.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Fifteenmile	At least 50% of historic habitat		NA	NA	NA
	Adult Abundance				
	Naturally produced spawners > 25% of average abundance over most recent 30 year period		NA	NA	NA
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Adult Abundance
Fifteenmile	Unknown

Section 4.2.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture, forestry, road building
Water quality	Current land use	Agriculture, forestry, road building
Water quantity	Current land use	Agriculture, forestry, road building

Section 4.2.2B.3 Strategies and Measures for Fifteenmile Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and restore aquatic and riparian habitats	• A. Encourage land owners and managers to utilize best management practices that both protect and restore aquatic habitat • B. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents	Immediate	1-5 years
Water Quality			
• Reduce stream temperatures	• C. Encourage land owners and managers to utilize best management practices that do not increase temperatures, and cause point source pollution issues • D. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• E. Implement water conservation and efficiency programs that reduce stream water withdrawals, and upland conservation measures designed to effect runoff • F. Implement of water conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents	Immediate	1-5 years

C. Fifteenmile Rainbow Trout

Section 4.2.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local	Number of	Total number

			populations	adults	of adults
Fifteenmile	At least 50% of historic habitat		NA	NA	NA
	Abundance				
	Naturally produced spawners > 25% of average abundance over most recent 30 year period		NA	NA	NA
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Adult Abundance
Fifteenmile	Unknown

Section 4.2.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture, forestry, road building
Water quality	Current land use	Agriculture, forestry, road building
Water quantity	Current land use	Agriculture, forestry, road building

Section 4.2.2C.3 Strategies and Measures for Fifteenmile Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect and restore aquatic and riparian habitats	• A. Encourage land owners and managers to utilize best management practices that both protect and restore	Immediate	1-5 years

	aquatic habitat • B. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents		
Water Quality			
• Reduce stream temperatures	• C. Encourage land owners and managers to utilize best management practices that do not increase temperatures, and cause point source pollution issues • D. Implement conservation strategies developed in Mid-Columbia Steelhead Recovery Plan	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• E. Implement water conservation and efficiency programs that reduce stream water withdrawals, and upland conservation measures designed to effect runoff • F. Implement of water conservation strategies developed in Mid-Columbia Steelhead Recovery Plan and other planning documents	Immediate	1-5 years

Section 4.2.3 Hood Subbasin

A. Hood Bull Trout

Section 4.2.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Hood River	--			--	
	Number of local populations				
	3 or more		3 or more		

	Total number of adults				
	500				500

Status:

Population	Number of local populations	Number of adults/population	Total number of adults
Hood River			93 upstream of Laurance Lake (2007)

Section 4.2.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Current land use	Increased temperatures and sedimentation due to agricultural, domestic, and hydroelectric uses
Water quantity	Current land use	Agricultural, domestic, and hydroelectric diversions reduce streamflow
Habitat access	Current land use	Road, water diversion structures, and other artificial impediments limit access into historic habitat
Habitat quality/quantity	Current and historic land use	Agriculture, forestry, and domestic

Section 4.2.3A.3 Strategies and Measures for Hood River Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water Quality			
• Restore natural hydrograph	• A. Implement water conservations measures described in the Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents to reduce water diversion	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• B. Implement water conservations measures described in the Lower Columbia River Recovery Plan, Hood River	Immediate	1-5 years

	Subbasin/Management Plans, and other planning documents to reduce water diversion		
Habitat Access			
• Restore access to all historic habitats	• C. Implement measures described in the Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	1-5 years
Habitat Quality/Quantity			
• Protect and restore instream and riparian habitat	• D. Implement measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	1-5 years

B. Hood Coastal Cutthroat Trout

Section 4.2.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Hood	At least 50% of historic habitat		NA	NA	NA
	Abundance				
	Naturally produced spawners > 25% of average abundance over most recent 30 year period		NA	NA	NA
	In years when total spawner abundance is less than average abundance over 30 years, ensure rate of population increase is at least 1.2 adult offspring per parent		NA	NA	NA

Status:

Population	Adult Abundance
Hood	Unknown

Section 4.2.3B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Current land use	Increased temperatures and sedimentation, resulting from domestic, hydroelectric, and agricultural water usage
Water quantity	Current land use	Agricultural, domestic, and hydroelectric diversions reduce streamflow
Habitat access	Current land use	Road, water diversion structures, and other artificial impediments limit access to historic habitat
Habitat quality/quantity	Current and historic land use	Agriculture, forestry and domestic practices

Section 4.2.3B.3 Strategies and Measures for Hood Coastal Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water Quality			
• Restore natural hydrograph	• A. Implement water conservations measures described in the Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents to reduce water diversion	Immediate	1-5 years
Water Quantity			
• Restore natural hydrograph	• B. Implement water conservations measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents to reduce water diversion	Immediate	1-5 years

Habitat Access			
• Restore access to all historic habitats	• C. Implement measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	1 – 5 years
Habitat Quality/Quantity			
• Protect and restore instream and riparian habitat	• D. Implement measures described in Lower Columbia River Recovery Plan, Hood River Subbasin/Management Plans, and other planning documents	Immediate	1-5 years

Section 4.2.4 Klickitat Subbasin

A. Klickitat Bull Trout

Section 4.2.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Klickitat River	Unknown			Unknown	
	Number of local populations				
	4		4		
	Total number of adults				
	Unknown				Unknown

Status:

Population	Number of local populations	Number of adults/population	Total number of adults
Klickitat	Unknown	Unknown	Unknown

Section 4.2.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat and water quality and quantity	Climate change	

Population traits	Population information	Lack population density, distribution and genetic information

Section 4.2.4A.3 Strategies and Measures for Klickitat Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Create population database	• A. Implement biological surveys to evaluate population density and composition • B. Identify migration patterns through telemetry studies • C. Implement mark-recapture studies to estimate population size	Immediate	5-10 years

Section 4.3 Columbia Plateau Province

Section 4.3.1 Columbia Lower Middle Subbasin

A. Columbia Lower Middle White Sturgeon

Section 4.3.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Consumptive Harvest		Number of local populations	Number of adults	Total number of adults
The Dalles, John Day, and McNary/Hanford Reach	5 kg/ha		NA	NA	NA
	Target Harvest Exploitation				
	21% fish 42-60" (sport) 25% fish 45-60" (commercial)		NA	NA	NA
	Annual Recruitment (Productivity)				
			NA	NA	NA
	Broodstock Abundance				
			NA	NA	NA

Status:

Population	Consumptive Harvest	Sport Exploitation 42-60"	Commercial Exploitation 45-60"	Annual Recruitment	Broodstock Abundance
The Dalles Reservoir					
John Day Reservoir					
McNary Reservoir / Hanford	429 (1988-2005 average) trend is for	N/A	N/A	Sporadic and low (1999-	1,300 (1995)

Population	Consumptive Harvest	Sport Exploitation 42-60”	Commercial Exploitation 45-60”	Annual Recruitment	Broodstock Abundance
Reach	declining sport harvest			2007)	

Section 4.3.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Dams	Because white sturgeon generally do not use fish ladders, Columbia River dams connectivity, habitat access, and access to prey
Contaminants	Current land use	Significant levels of dioxins/furans, DDT, and metals have been identified in lower Columbia River fish and sediment samples. White sturgeon may uptake contaminants through direct contact or bioaccumulation through the food chain.
Hydro-operations	Flows	
Harvest	Over-harvest	Commercial, sport, and illegal harvest
Competition/ Predation	Native and non-native species	There is some evidence from predation studies that white sturgeon eggs and age-0 white sturgeon are vulnerable to fish predators, including larger sturgeon, found in the reservoirs. Hundreds of species introductions, both intentional and unintentional, have occurred in the Columbia River mainstem Effects on white sturgeon may be a decrease in prey quality (lipid content, energy, etc) associated with replacement of native/historic forage with invasive prey. Although non-native Asiatic clams (*Corbicula fluminea*) and American shad (*Alosa sapidissima*) now make up a considerable part of the white sturgeon diet in The Dalles and John Day reservoirs; relatively little is known about the food value of these

		species compared to native prey items. Also, some introduced species, such as shad and other game fish, may compete for food sources with juvenile white sturgeon.
Population traits	Dams	Columbia River dams have led to the creation of a series of isolated sub-populations for which downstream gene flow may be the only direction of genetic exchange. Columbia River dams limit white sturgeon to redistribute individuals from areas of high densities or poor resources to seek out the best conditions for survival. Construction of hydropower dams throughout the basin have negatively impacted spawning and subsequent recruitment.
Water quantity	Dams	Historic flow records demonstrate that spring freshet flows have been reduced by about 50%, as water is stored for power generation and irrigation, and winter flows have increased about 30%. Reduced flows during spring and early summer (the spawning time of white sturgeon in the Columbia River basin) have been correlated to reduced recruitment of age-0 white sturgeon.
Habitat quality/quantity	Dams	Deposition of fine sediments in the preferred spawning habitats may result in white sturgeon egg hypoxia.

Section 4.3.1A.3 Strategies and Measures for Columbia Gorge White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore upstream and downstream movement	• A. Develop a regionally accepted White Sturgeon Conservation and Management Plan. • B. Conduct annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. • C. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. • D. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the	Immediate	10+ years

	construction and operation of the FCRPS and b) population responses to environmental conditions • E. Conduct assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Bonneville, The Dalles, or John Day Reservoirs every three (3) years and McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years. • F. Indexing annual levels of, and variation in, white sturgeon recruitment in the free-flowing Columbia River downstream of Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. • G. Conduct research that addresses critical uncertainties, such as white sturgeon broodstock genetic contribution to recruits, identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS		
Contaminants			
• Ensure water quality and contaminant loads in river substrates meet existing guidelines and regulations	• H. Development of a regionally accepted White Sturgeon Conservation and Management Plan. • I. Monitor and evaluate a) restoration actions	Immediate	10+ years

	designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions • J. Conducting assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Bonneville, The Dalles, or John Day Reservoirs every three (3) years and McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years. • K. Indexing annual levels of, and variation in, white sturgeon recruitment in the free-flowing Columbia River downstream of Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. • L. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans pertaining to quantification of contaminant accumulation in waters and sediments upstream of Bonneville Dam and their effects upon overall white sturgeon productivity.		
Harvest			
• Set harvest guidelines to ensure adequate	• M. In consultation with the appropriate state	Immediate	10+ years

escapement of harvestable-size fish to broodstock	agencies and tribes, fund intensive white sturgeon fishery management • N. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance; • O. Conduct annual recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels. • P. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • Q. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. • R. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by: • S. Conducting assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Bonneville, The Dalles, or John Day Reservoirs every three (3) years and McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years.		

	• T. Indexing annual levels of, and variation in, white sturgeon recruitment in the free-flowing Columbia River downstream of Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. • U. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans pertaining to Bio-energetic modeling of Bonneville Reservoir white sturgeon removal scenarios and their effects upon overall white sturgeon productivity due to the construction and operation of the FCRPS.		
Competition/Predation			
• Minimize egg and juvenile white sturgeon predation by native and introduced resident fishes • Characterize white sturgeon interactions with introduced species. • Document the usage of available prey species, including introduced species, and the food value of these species in comparison with native species they have replaced.	• V. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam • W. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. X. Implement annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs	Immediate	10+ year

	to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. • Y. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. • Z. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. • AA. Conduct research that addresses critical		

	uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS.		
Population Traits			
• Obtain consistent annual spawning and recruitment	• BB. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam. • CC. In consultation with the appropriate state agencies and tribes, fund intensive white sturgeon fishery management • DD. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance; • EE. Conduct annual recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels. • FF. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • GG. Develop a regionally accepted White Sturgeon Conservation and Management Plan. II. Implement annual juvenile white sturgeon	Immediate	10+ years

	transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. • JJ. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. • KK. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite		

	reservoirs in the Snake River. • LL. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include (but are not limited to): - White sturgeon maturation work (in conjunction with and support of white sturgeon recovery in the Kootenai and upper Columbia rivers). Assessment of white sturgeon broodstock contribution to recruitment via genetic analysis.		
Water Quality			
• Create habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• MM. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam. This flow regime is consistent with aggressive non-breach hydrosystem operations. • NN. Develop a regionally accepted White Sturgeon Conservation and Management Plan. OO. Conduct annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to	Immediate	10+ years

	recruitment failures in either of these reservoirs. • PP. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. [Specific and detailed background, objectives and tasks are described in FY 2007- • QQ. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. • RR. Conduct research that addresses critical		

	uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS		
Water Quantity			
• Obtain consistent annual spawning and recruitment of white sturgeon in Bonneville Reservoir	• SS. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam In consultation with the appropriate state agencies and tribes, fund intensive white sturgeon fishery management TT. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance; • UU. Conduct annual recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels. • VV. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • WW. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. XX. Conduct annual	Immediate	

	juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. • YY. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Concurrent with the development of the previously described White Sturgeon Conservation and Management Plan, begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. • ZZ. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam,		

	Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. • AAA. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include (but are not limited to): • BBB. White sturgeon maturation work (in conjunction with and support of white sturgeon recovery in the Kootenai and upper Columbia rivers). CCC. Assessment of white sturgeon broodstock contribution to recruitment via genetic analysis. • DDD. Determination of minimum spawning flows for successful white sturgeon recruitment throughout the Columbia River Basin in areas where they are not currently defined.		
Habitat Quality/Quantity			
• Achieve habitat conditions that will aid survival and development of white sturgeon eggs and larvae	• EEE. Operate the Federal Columbia River Power System (FCRPS) to provide white sturgeon spawning habitat in Bonneville, The Dalles and John Day reservoirs by providing a minimum average April through July flow of 250 KCFS at McNary Dam In consultation with the	Immediate	10+ years

	appropriate state agencies and tribes, fund intensive white sturgeon fishery management FFF. Identify annual sustainable recreational and commercial harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance; • GGG. Conduct annual recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels. • HHH. Conduct annual tribal commercial and subsistence fishery monitoring that enables active in-season management to attain annual pre-determined sustainable harvest levels. • III. Develop of a regionally accepted White Sturgeon Conservation and Management Plan. JJJ. Conduct annual juvenile white sturgeon transplant activities from below Bonneville Dam and/or from Bonneville Reservoir to John Day and The Dalles reservoirs to compensate for years when operations of the FCRPS contributes to recruitment failures in either of these reservoirs. • KKK. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, quantify regional hatchery augmentation needs and describe a flexible, adaptive approach to phasing in hatchery		

	production to augment natural production of depressed populations in the impounded portions of the Columbia and Snake rivers. Begin commensurate Hatchery Master Planning processes required for the construction, operation and maintenance of hatchery production facilities. • LLL. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by indexing annual levels of, and variation in, white sturgeon recruitment in Bonneville Dam, Bonneville, The Dalles, John Day, and McNary reservoirs in the Columbia River, and in Ice Harbor, Lower Monumental, Little Goose, and Lower Granite reservoirs in the Snake River. • MMM. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans pertaining to quantification of contaminant accumulation in waters and sediments upstream of Bonneville Dam and their effects upon overall white sturgeon productivity.		

Section 4.3.2 Crab Subbasin

A. Crab Kokanee

Section 4.3.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Recruitment		Number of local populations	Number of adults	Total number of adults
Banks and Bill Clapp lakes	1 million age-3+/annually		NA	NA	NA
	Standing Crop				
	3.5 million (125/acre) of age 1-4		NA	NA	NA
	Annual Harvest				
	500,000		NA	NA	NA
	Catch Rate				
	2.5 fish/hour		NA	NA	NA
	Egg Take				
	5+ million		NA	NA	NA

Status:

Population	Recruitment	Standing Crop	Annual Harvest	Catch Rate	Egg Take
Banks and Billy Clapp lakes	--	--	--	--	--

Section 4.3.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Dams	Operations of dams limit spawning habitat and productivity; increase entrainment
Competition	Other fish species	Lake whitefish compete for secondary productivity
Predation	Fish and birds	Walleye, smallmouth bass, and cormorants

Section 4.3.2A.3 Strategies and Measures for Crab Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Enhance population to compensate for lost natural spawning opportunity and entrainment losses	• A. Stock up to 5 million fingerlings or 3 million 1.5 year.olds • B. Identify productivity peaks spatially and temporally • C. Provide additional hatchery space or net pens to increase size/condition of released fish • D. Install barrier nets at outlet structures to avoid entraining recruited fish • E. Operate hydro-system to allow for a higher pool elevation during the fall (spawning period)	Immediate	0-5 years
Competition			
• Remove whitefish, especially broodstock	• F. Liberalize harvest regulations • G. Educate anglers regarding the opportunity and methods to harvest over-abundant species • H. Implement wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary	Immediate	5-10 years
Predation			
• Control predator populations	• I. Monitor predator population size and composition • J. Liberalize harvest regulations on walleye and smallmouth bass populations as appropriate • K. Educate anglers regarding the opportunity and methods for predator harvest • L. Stock larger kokanee.	Immediate	5-10 years

	Wholesale capture (nets, traps, electrofish, etc) of walleye and smallmouth bass populations during concentrations on spawning grounds if necessary • M. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation • N. Work with federal and state authorities to define management goals for cormorant populations		

B. Crab Largemouth Bass

Section 4.3.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Moses, Potholes, Banks, and Billy Clapp lakes	2,000 (minimum)		NA	NA	NA
	Catch Rates				
	0.5 fish/hour		NA	NA	NA
	Catch-and-release catch rates				
	3 fish/hour		NA	NA	NA

Population	Harvest	Catch rates	Catch-and-release catch rates
Moses, Potholes, Banks, and Billy Clapp lakes	--	--	--

C. Crab Smallmouth Bass

Section 4.3.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Moses, Potholes, Banks, and Billy Clapp lakes	5,000 (minimum)		NA	NA	NA
	Catch Rates				
	1 fish/hour		NA	NA	NA

Status:

Population	Harvest	Catch rates
Moses, Potholes, Banks, and Billy Clapp lakes	--	--

D. Crab Bluegill

Section 4.3.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Moses and Potholes lakes	90,000 (minimum)		NA	NA	NA
	Catch Rates				
	2 fish/hour		NA	NA	NA

Status:

Population	Annual Harvest	Catch Rates
Moses and Potholes lakes	--	--

E. Crab Yellow Perch

Section 4.3.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Billy Clapp, Moses, and Potholes lakes	4,000,000 (minimum)		NA	NA	NA
	Catch Rate				
	4 fish/hour		NA	NA	NA

Status:

Population	Annual Harvest	Catch Rates
Banks, Billy Clapp, Moses, and Potholes lakes	--	--

F. Crab Walleye

Section 4.3.2F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Billy Clapp, Moses, and Potholes lakes	5,000 (Minimum)		NA	NA	NA
	Catch Rate				
	1 fish/hour		NA	NA	NA

Population	Annual Harvest	Catch Rate
Banks, Billy Clapp, Moses, and Potholes lakes	--	--

G. Crab Crappie

Section 4.3.2G.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Moses, and Potholes lakes	180,000 (Minimum)		NA	NA	NA
	Catch Rate				
	3 fish/hour		NA	NA	NA

Population	Annual Harvest	Catch Rate
Banks, Billy Clapp, Moses, and Potholes lakes	--	--

Section 4.3.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Fish and bird species	Largemouth bass, walleye, smallmouth bass, and cormorants[1,2,3,4,5,6]
Predation	Fish species	Walleye and smallmouth bass[1,3,4,6]
Habitat quality/quantity	Current land use and fish species	Residential development and carp[1,3,4,6]
Population traits	Smallmouth bass	Overpopulation of smallmouth bass[2]
	Walleye	Overpopulation of walleye[5]

[1]Largemouth bass, [2]Smallmouth bass, [3]Bluegill, [4]Yellow perch, [5]Walleye, [6]Crappie

Section 4.3.2 Strategies and Measures for Crab Largemouth Bass, Smallmouth Bass, Bluegill, Yellow Perch, Walleye, and Crappie

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Control predators[1,2]	• A. Monitor species' condition, relative densities, and harvest rates[1,2,5] • B. Use harvest regulations to adjust population densities[1,2,5] • C. Educate anglers regarding the opportunity and methods to harvest over-abundant species[1,2,5] • D. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary[1,2,5] • E. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation[1,2,5] • F. Work with federal and state authorities to define management goals for cormorant populations[1,2,5]	Immediate	5-10 years
• Maintain balanced mixed species populations[1,2,3,4,6]	• G. Monitor species' condition, relative densities, and harvest rates[1,2,3,4,6] • H. Monitor system secondary productivity[1,2,3,4,6] • I. Use harvest regulations to adjust population densities[1,3,4,6] • J. Educate anglers regarding the opportunity and methods to harvest over-abundant species[1,2,3,4,6] • K. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary[1,2,3,4,6]	Immediate	5-10 years

Predation			
• Control size of walleye, and smallmouth bass populations as appropriate[1,3,4,6]	• L. Monitor predator population size and composition[1,3,4,6] • M. Liberalize harvest regulations as appropriate[1,3,4,6] • N. Educate anglers regarding the opportunity and methods for predator harvest[1,3,4,6] • O. Wholesale capture (nets, traps, electrofish, etc) of predators during concentrations on spawning grounds if necessary[1,3,4,6]	Immediate	5-10 years
Habitat Quality/Quantity			
• Protect critical spawning and rearing habitats[1,4]	• P. Promote carp harvest through angler education[1,4,6] • Q. Wholesale capture (nets, traps, electrofish, etc) of carp during concentrations on spawning grounds if necessary[1,4,6] • R. Isolate spawning and rearing habitats from carp intrusion where feasible through use of fish barriers[1,4,6] • S. Work with state and local shoreline management authorities to limit development impacts[1,4,6] • T. Install barrier nets at outlet structures to avoid entraining recruited fish[1,4,6] • U. Monitor species' condition, relative densities, and harvest rates[4] • V. Monitor system second productivity[4]	Immediate	5-10 years
Population Traits			
• Control size of smallmouth bass population[2]	• W. Monitor predator population size and composition[2] • X. Liberalize harvest regulations as appropriate[2] • Y. Educate anglers regarding		5-10 years

	the opportunity and methods for predator harvest[2] • Z. Wholesale capture (nets, traps, electrofish, etc) of predators during concentrations on spawning grounds if necessary[2]		
• Control size of walleye population[5]	• AA. Monitor predator population size and composition[5] • BB. Liberalize harvest regulations as appropriate[5] • CC. Educate anglers regarding the opportunity and methods for predator harvest[5] • DD. Wholesale capture (nets, traps, electrofish, etc) of predators during concentrations on spawning grounds if necessary[5]		

[1]Largemouth bass, [2]Smallmouth bass, [3]Bluegill, [4]Yellow perch, [5]Walleye, [6]Crappie

H. Crab Rainbow Trout

Section 4.3.2H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Banks, Billy Clapp, Moses, and Potholes lakes	300,000 (Minimum)		NA	NA	NA
	Catch Rate				
	2.5 fish/hour		NA	NA	NA
	Annual recruitment (age-1+) (all waters)				
	450,000 (standing crop				

	of 750,00 (75/acre)				

Status

Population	Annual Harvest	Catch Rate
Banks, Billy Clapp, Moses, and Potholes lakes	--	--

Section 4.3.2H.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Hydro-operations	Hydro-operations limit productivity and increase entrainment
Predation	Fish and birds	Walleye, smallmouth bass and cormorants
Competition	Fish	Competition for secondary productivity with other prey species

Section 4.3.2H.3 Strategies and Measures for Crab Crappie

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Stock rainbow to compensate for lack of natural spawning opportunity and entrainment losses. • Adjust stocking size and timing to take advantage of available productivity and minimize entrainment.	• A. Stock up to 100,000 fingerlings where feasible and 4-500,000 1+ yr.olds. • B. Provide additional hatchery space or net pens to increase size/condition of released fish. • C. Install barrier nets at outlet structures to avoid entraining recruited fish. • D. Identify productivity peaks spatially and temporally	Immediate	5-10 years
Predation			
• Increase the size of stocked rainbow. • Control size of walleye and smallmouth bass populations as	• E. Monitor predator population size and composition. • F. Liberalize harvest regulations on walleye and smallmouth bass populations as appropriate.	Immediate	5-10 years

appropriate. • Limit concentrated feeding by cormorants	• G. Educate anglers regarding the opportunity and methods for predator harvest. • H. Stock larger rainbow. • I. Wholesale capture (nets, traps, electrofish, etc) of walleye and smallmouth bass populations during concentrations on spawning grounds if necessary. • J. Use non-lethal means to harass cormorants to spread impacts evenly over all waters or direct impacts to waters capable of sustaining the predation. • K. Work with federal and state authorities to define management goals for cormorant populations.		
Competition			
• Maintain balanced mixed species populations	• L. Monitor species' condition, relative densities, and harvest rates. • M. Monitor system secondary productivity. • N. Use harvest regulations to adjust population densities. • O. Educate anglers regarding the opportunity and methods to harvest over-abundant species. • P. Wholesale capture (nets, traps, electrofish, etc) of over-abundant species during concentrations on spawning grounds if necessary.		5-10 years

Section 4.3.3 Deschutes Subbasin

A. Deschutes Bull Trout

Section 4.3.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Lower Deschutes	--			--	
	Local Populations				
	5 or more		5 or more		
	Total number of adults				
	1,500-3,000				1,500-3,000

Status:

Population	Number of adults/population	Number of local populations	Total Number of Adults
Lower Deschutes		2 (does not include Shitike Creek, Warm Springs River, and Whitewater River)	1,382 (estimate)

Section 4.3.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Residential and commercial development; unscreened water diversions
Population traits	Current land use	Agriculture and forestry practices have led to low population abundance
Competition	Non-native species	Brook trout and brown trout
Water quality	Current land use	Basin ground water extraction - Agriculture, industry, forestry, and residential

Water quantity	Current land use	Basin ground water extraction - Agriculture, industry, forestry, and residential

Section 4.3.3A.3 Strategies and Measures for Deschutes Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• See Water Quality/Quantity	• A. See Water Quality/Quantity.	Immediate	1-5 years
• Screen water diversions	• B. Work with Landowners, OWRD, Watershed Council and OWRD to screen diversions		
Population Traits			
• Maintain current management strategies	• C. Monitor population genetic parameters • D. Develop/implement additional population abundance index measures • E. Conduct five year update/review on genetic characteristics of population	Immediate	1-5 years
Competition			
• Remove or decrease number of non-native predators	• F. Actively remove through snorkeling or electro-fishing	Immediate	1-5 years
Water Quality			
• Enforce groundwater protection measures. (Oregon State Water Resources)	• G. Monitor stream/spring flows, Legislative or OWRD groundwater rules in place that adequately preserve the spring flows in the Metolius Basin	Immediate	1-5 years
Water Quantity			
• Enforce groundwater protection measures. (Oregon State Water Resources)	• H. Monitor stream/spring flows, Legislative or OWRD groundwater rules in place that adequately preserve spring/surface flows in the Metolius Basin	Immediate	1-5 years

B. Deschutes Redband Trout

Section 4.3.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Density (fish > 8 inches/mile)		Number of local populations	Number of adults	Total number of adults
Pelton Dam to Sherars Falls	1,500 – 2,500		NA	NA	NA
Below Sherars Falls	750-1,000		NA	NA	NA

Status:

Population	Density	Density
Pelton Dam to Sherars Falls	Unknown	
Below Sherars Falls		Unknown

Section 4.3.3B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	
Population traits	Introgression	Hatchery releases
Habitat quality/quantity	Current and historic land use, hydro-operations	Agriculture, forestry, residential, industrial and hydro-operations
Water quality	Current and historic land use, hydro-operations	Agriculture, forestry, residential, industrial and hydro-operations have increased temperatures, pollutants, and sedimentation
Water quantity	Current and historic land use, hydro-operations	Agriculture, forestry, residential, industrial, and hydro-operations have altered flows and natural hydrograph
Habitat access	Current and historic land use, hydro-development	Hydroelectric, agricultural, roads, and other anthropogenic sources that limit access to historic fish habitats

Section 4.3.3B.3 Strategies and Measures for Deschutes Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Prevent further introduction and spread of introduced species	• A. Ensure compliance with state and federal policies on introduced species	Immediate	1-5 years
Population Traits			
• Reduce the incidence of stray hatchery steelhead escaping into the Deschutes and reduce residualism of hatchery steelhead released into the Deschutes	• B. Adhere to state and federal hatchery protocols described in the Round Butte Hatchery HGMP • C. Investigate magnitude, cause, effects of out of basin stray hatchery steelhead	Immediate	1-5 years
Habitat Quality/Quantity			
• Protect and restore aquatic and riparian habitats	• D. Encourage land owners and managers to utilize best management practices that both protect and restore aquatic habitat • E. Implement conservation strategies developed in Mid-C steelhead recovery plan and other planning documents	Immediate	1-5 years
Water Quality			
• Reduce stream temperatures, and the influence of pollutants	• F. Encourage land owners and managers to utilize best management practices that do not increase temperatures, and cause point source pollution issues	Immediate	1-5 years
Water Quantity			
• Replicate natural hydrograph	• G. Implement water conservation and efficiency programs that reduce stream water withdrawals, and upland conservation measures designed to replicate the natural hydrograph • H. Implement water conservation strategies	Immediate	1-5 years

	developed in Mid-Columbia Steelhead Recovery Plan and other planning documents		
Habitat Access			
• Return fish to their historic habitats	• I. Implement measures identified in the Mid-Columbia Steelhead Recovery Plan, and other planning documents designed to return fish to previous utilized habitats	Immediate	1-5 years

Section 4.3.4 John Day Subbasin

A. John Day Bull Trout

Section 4.3.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of Adults/population		Number of local populations	Number of adults/population	Total number of adults
John Day	--			--	
	Number of Local Populations				
	12 or more		12 or more		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/population	Number of local populations	Total number of adults
John Day			Unknown

Section 4.3.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams and diversions
Water quality	Current land use	Agriculture

Water quantity	Current land use	Agriculture
Nutrients	Anadromous fish returns	Loss of adult steelhead and Chinook salmon
Population traits	Hybridization	Brook trout

Section 4.3.4A.3 Strategies and Measures for John Day Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat	• A. Increase amounts of large wood • B. Effectively manage grazing by livestock within riparian areas • C. Reduce width to depth ratios • D. Restore floodplain function and connectivity • E. Increase the amount of canopy cover and shade • F. Increase habitat diversity • G. Reintroduce beaver where they are absent and habitat conditions will support them	Immediate	1-5 years
• Protect existing high quality habitat	• H. Acquire through either fee title or through conservation easements critical high quality habitats • I. Sign cooperative management agreements with private landowners who voluntarily want to protect high quality habitats • J. Implement special management designations on public lands	Immediate	1-5 years

Habitat Access			
• Restore passage at non-natural barriers	• K. Replace culverts that do not meet fish passage criteria • L. Replace irrigation push up dams with permanent structures that meet fish passage criteria • M. Restore streamflow in streams that flow intermittently because of water withdrawals	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• N. Increase shading of streams • O. Lease water rights from willing sellers • P. Implement more efficient irrigation systems • Q. Reduce the amount of irrigation water that returns overland to the river	Immediate	1-5 years
Water Quantity			
• Restore stream flows during low flow periods	• R. Lease water rights from willing sellers • S. Convert flood irrigation systems to more efficient methods • T. Require measurement of water use • U. Investigate feasibility and effectiveness of floodplain aquifer recharge projects • V. Improve hydrologic connectivity of springs to streams where poorly designed roads, small impoundments and other disturbances have redirected spring flows away from drainages • W. Determine feasibility of off-stream storage, including ecological effects	Immediate	1-5 years

Nutrients			
• Increase abundance of juvenile and adult steelhead and Chinook	• X. Implement habitat restoration program Y. Improve water quality, restore streamflows, and same as habitat restoration above	Immediate	1-5 years
Population Traits			
• Remove brook trout	• Z. Prohibit stocking of brook trout in drainages where bull trout are present • AA. Investigate effective methods of brook trout removal • BB. Stock bull trout from select donor populations into areas with suitable habitat above naturally occurring barriers	Immediate	1-5 years

B. John Day Redband Trout

Section 4.3.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
John Day	None		NA	NA	NA

Status:

Population	Adult Abundance
John Day	Unknown

C. John Day Westslope Cutthroat Trout

Section 4.3.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
John Day	None		NA	NA	NA

Status:

Population	Adult Abundance
John Day	Unknown

Section 4.3.4 Primary Limiting Factors and Threats:

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry practices[1,2]
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions[1,2]
Water quality	Current land use	Agriculture[1,2]
Water quantity	Current land use	Agriculture[1,2]
Competition	Non-native species	Brook trout and rainbow trout competition[2]
Population traits	Hybridization	Hybridization with native redband trout, steelhead, or historically stocked rainbow trout[2]

[1]Redband trout and [2]Westslope cutthroat trout

Section 4.3.4 Strategies and Measures for John Day Redband Trout and Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat[1,2]	• A. Increase amounts of large wood[1,2] • B. Effectively manage grazing	Immediate	1-5 years

	by livestock within riparian areas[1,2] • C. Reduce width to depth ratios[1,2] • D. Restore floodplain function and connectivity[1,2] • E. Increase the amount of canopy cover and shade[1,2] • F. Increase habitat diversity[1,2] • G. Reintroduce beaver where they are absent and habitat conditions will support them[1,2]		
• Protect existing high quality habitat[1,2]	• H. Acquire through either fee title or through conservation easements critical high quality habitats[1,2] • I. Sign cooperative management agreements with private landowners who voluntarily want to protect high quality habitats[1,2] • J. Implement special management designations on public lands[1,2]	Immediate	1-5 years
Habitat Access			
• Restore passage at non-natural barriers[1,2]	• K. Replace culverts that do not meet fish passage criteria[1,2] • L. Replace irrigation push up dams with permanent structures that meet fish passage criteria[1,2] • M. Restore streamflow in streams that flow intermittently because of water withdrawals[1,2]	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months[1,2]	• N. Increase shading of streams[1,2] • O. Lease water rights from willing sellers[1,2] • P. Implement more efficient irrigation systems[1,2] • Q. Reduce the amount of irrigation water that returns overland to the river[1,2]	Immediate	1-5 years
Water Quantity			
• Restore stream flows during low flow periods[1,2]	• R. Lease water rights from willing sellers[1,2]	Immediate	1-5 years

	• S. Convert flood irrigation systems to more efficient methods[1,2] • T. Require measurement of water use[1,2] • U. Investigate feasibility and effectiveness of floodplain aquifer recharge projects[1,2] • V. Improve hydrologic connectivity of springs to streams where poorly designed roads, small impoundments and other disturbances have redirected spring flows away from drainages[1,2] • W. Determine feasibility of off-stream storage, including ecological effects[1,2]		
Competition			
• Remove brook trout[2]	• X. Prohibit stocking of brook and rainbow trout in drainages where cutthroat trout are present[2] • Y. Investigate effective methods of brook trout removal where their distribution overlaps with cutthroat trout[2]	Immediate	1-5 years
Population Trait			
• Determine origin of hybridization[2]	• Z. Investigate options to minimize hybridization[2]	Immediate	1-5 years

D. Snake Lower White Sturgeon

Section 4.3.4D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increasing Productivity		Number of local populations	Number of adults	Total number of adults
Ice Harbor, Lower Monumental, and Little Goose reservoirs	Harvest Rate		NA	NA	NA
	Annual Recruitment (Productivity)				

	Increasing		NA	NA	NA
	Broodstock Abundance				
	Increasing		NA	NA	NA

Status:

Population	Productivity	Annual Recruitment	Broodstock Abundance
Ice Harbor Reservoir	N/A	Close to zero (measurable level only 1 out of 8 years from 1997-2005)	20
Lower Monumental Reservoir	N/A	N/A (has not been measured)	100
Little Goose Reservoir	N/A	Close to zero (measurable level only 2 out of 8 years from 1997-2005)	600

Section 4.3.4D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Dams	Creation of the mainstem dams has inundated historic spawning habitat
Population traits	Dams	Extensive development of hydropower dams throughout the Columbia River Basin have blocked sturgeon movement, which in turn, have isolated populations and disrupted genetic flow and recruitment of individuals from healthier downstream environments.
Harvest	Sport fishing	Vulnerable to unintended negative impacts resulting from inadequate harvest management.

Section 4.3.4D.3 Strategies and Measures for Columbia Snake Lower White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Provide suitable spawning and rearing habitat	• A. Operate the Federal Columbia River Power System (FCRPS) to provide suitable white sturgeon spawning and rearing habitat in Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs by providing a minimum average April through July flow that translates to 250 KCFS at McNary Dam	Immediate	Immediate to 5 years
Population Traits			
• Develop a regionally-accepted white sturgeon management plan framework	• B. Develop a regionally accepted White Sturgeon Conservation and Management Plan.	Immediate	10+ years
• Evaluate the need for and monitor the success of restoration efforts	• C. Monitor and evaluate a) restoration actions designed to mitigate for lost white sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by:	Immediate	10+ years
	• D. Conducting assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in McNary, Ice Harbor, Lower Monumental and Little Goose reservoirs every five (5) years.	Immediate	Immediate to 5 years
	• E. Indexing annual levels of, and variation in, white sturgeon recruitment in McNary reservoirs in the	Immediate	Immediate to 5 years

	Columbia River, and in Ice Harbor, Lower Monumental, and Little Goose reservoirs in the Snake River.		
• Identify and quantify the level of hatchery augmentation that will restore and enhance sturgeon populations and implement the Master Planning process to initiate the construction, operation and maintenance of regional facility(ies)	• F. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies and tribes, identify and quantify regional hatchery augmentation needs and immediately implement Master Plan processes necessary to construct, operate and maintain hatchery production facilities to augment natural production of depressed white sturgeon populations in the impounded portions of the Columbia and Snake rivers.	Immediate	Immediate to 5 years
• Address critical uncertainties	• G. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include	Immediate	
	• H. Determination of minimum spawning flows for successful white sturgeon recruitment throughout the Columbia River Basin in areas where they are not currently defined.	Immediate	6-10 years
	• I. Assessment of white sturgeon broodstock contribution to recruitment via genetic analysis.	6-10 years	6-10 years
	• J. Quantification of		

	contaminant accumulation in waters and sediments upstream of McNary Dam and their effects upon white sturgeon productivity.	6-10 years	10+ years
Harvest			
• Identify and maintain sustainable harvest levels to ensure adequate escapement of fish to broodstock	• K. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, and tribes, fund white sturgeon fishery management including:	Immediate	Immediate to 5 years
	• L. Identify sustainable recreational and Tribal harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance;	Immediate	Immediate to 5 years
	• M. Conduct recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels	Immediate	Immediate to 5 years
	• N. Conduct Tribal commercial and subsistence fishery monitoring that enables active in-season management to attain pre-determined sustainable harvest levels	Immediate	Immediate to 5 years

Section 4.3.5 Tucannon Subbasin

A. Tucannon Bull Trout

Section 4.3.5A.1 Biological Objectives and Status

	Subbasin/Management Plans		2004 Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Tucannon	--			--	
	Number of Local Populations				
			unknown	unknown	
	Total Number of Adults				
	1,000				1,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Tucannon	Unknown	unknown	230 redds (2004 surveys)

Section 4.3.5A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Nutrients	Current land use and hydro-operations	Lack of spring Chinook carcasses
Population Traits/monitoring	Current Land Use	Population abundance, genetic structure, and general distribution are not well understood Agriculture, Forestry, Roads
Harvest	Sport fishing	Poaching
Habitat quality/quantity	Current land use	Agriculture, forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture

Section 4.3.5A.3 Strategies and Measures for Tucannon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat	• A. Improve stream flows in reaches partially dewatered for irrigation • B. Increase sinuosity • C. Restore large wood in the system • D. Protect, or restore riparian zones • E. Increase protective status of priority habitats in landuse regulations • F. Modify channel and increase flood-plain function, • G. Increase habitat diversity	Immediate	1-25 yrs
Habitat Access			
• Restore passage at non-natural barriers	• H. Restore stream flows in reaches dewatered for irrigation use • I. Replace culverts or bridges not meeting fish passage guidelines, • J. Screen irrigation diversions, maintain passage efficiency through ongoing O&M or additional activities, implement irrigation efficiency projects, and replace irrigation diversion structures with improved structures meeting fish passage standards • K. Continue to monitor and remove dams and barriers made by recreationists	Immediate	1-10 yrs
Water Quality			
• Reduce water temperatures during summer months	• L. Restore priority restoration and protection reach attributes to improve downstream conditions, • M. Modify channel and increase flood-plain function • N. Modify detrimental land	Immediate	10-25 yrs

	use activities.		
Water Quantity			
• Restore stream flows during low flow periods	• O. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-15 yrs
Nutrients			
• Increase nutrients	• P. Increase spring Chinook returns • Q. Outplant hatchery spring chinook carcasses or fish cubes	Immediate	1-25 yrs
Population Traits			
• Identify population parameters	• A. Conduct population estimates and evaluate distribution and genetic structure		
Harvest			
• Curtail poaching	• R. Continue and enhance WDFW, USFS and USFWS enforcement to prevent illegal harvest/harassment of bull trout	Immediate	1-5 yrs
• Monitoring Population Identification genetic structure, abundance, movements and general distribution are not well understood. Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• S. Conduct DNA analysis to identify populations and set recovery goals • T. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • U. Expand Electrofishing or snorkeling to determine • V. Determine habitat conditions and trends • W. Complete the draft recovery plan	Immediate	1-10 yrs

Section 4.3.6 Umatilla Subbasin

A. Umatilla Bull Trout (North Fork Umatilla, South Fork Umatilla, and North Fork Meacham Creek)

Section 4.3.6A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Umatilla	--			--	
	Number of Local Populations				
	3		3		
	Total Number of Adults				
	500 – 5,000				500 – 5,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Umatilla			25 redds (2006)

Section 4.3.6A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.6A.3 Strategies and Measures for Umatilla Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore habitat	• A. Restore stream flows in reaches dewatered for irrigation • B. Restore large wood in the system • C. Fence and plant riparian zones • D. Increase protective status of priority habitats • E. Modify channel and flood-plain function, and increase habitat diversity	Immediate	1-5 years
Habitat Access			
• Restore passage at non-natural barriers	• F. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project, restore stream flows in reaches dewatered for irrigation use, replace culverts not meeting fish passage guidelines, screen irrigation diversions, maintain passage efficiency through ongoing O&M activities, implement irrigation efficiency projects, and replace temporary irrigation diversion dams with structures that meet fish passage standards	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• G. Restore headwater attributes to improve downstream conditions, modify channel and flood-plain function, and modify detrimental land use activities.	Immediate	1-5 years

Water Quantity			
• Restore stream flows during low flow periods	• H. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project, increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-5 years

B. Freshwater Mussels (western pearlshell, western ridged mussel, and *Anodonta spp.*)

Section 4.3.6B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Distribution		Number of local populations	Number of adults	Total number of adults
Umatilla	Re-establish self-sustaining populations of all three species in at least 50% of historical habitat		NA	NA	NA
	Abundance (all life stages)				
	Achieve reproduction and recruitment in all three species				

Status:

Population	Distribution	Abundance
Umatilla	The western ridged mussel is known to occur at only 2 downstream sites and no tributaries; *Anodonta spp*. are known from 3 downstream sites and several tributaries; the western pearlshell has not been recently found in the Umatilla River drainage (2006), but based on shell material it probably historically occurred in the river.	Unknown

Section 4.3.6B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agricultural and forestry practices
Water quality	Land use	Agricultural and forestry practices
Population traits	Lack of host fish	Specific host fish and population levels unknown
	Taxonomic resolution	Genera unknown

Section 4.3.6B.3 Strategies and Measures for Umatilla Mussels

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Determine and restore preferred habitat	• A. Conduct field studies and re-location efforts to identify preferred physical habitat of all three genera, determine optimal stream flows, especially in reaches dewatered for irrigation, determine habitat preferences through re-location experiments; increase habitat diversity	Immediate	0-5 years
Water quality			
• Determine if existing water quality in Umatilla will maintain viable and self-sustaining mussel populations	• B. Conduct physiological and condition experiments to determine lethal limits for mussels in regards to summer temperatures, dislodging flows, food availability and composition, and overall water quality requirements	Immediate	0-5 years
Population traits			
• Determine host fish and minimum host fish population levels needed to maintain self-sustaining mussel populations	• C. Determine host fish through laboratory experiments, culture juvenile mussels in hatchery setting for possible re-introduction trials, determine optimal habitats for both fish hosts and mussel species.	Immediate	0-5 years
• Determine which genera and species occur in	• D. Determine genetically which genera of *Anodonta* occur in the Umatilla River (a	Immediate	0-5 years

Umatilla drainage, and which stocks of the western pearlshell may be best suited for reintroduction efforts.	recent new genus has been discovered) • E. Determine where stocks of western pearlshell can be obtained that are best suited for reintroduction efforts • F. Match existing genetic makeup of Umatilla populations of western ridge mussel and *Anodonta* spp. with extant populations in nearby drainages to find most suitable candidates for re-introduction efforts		

C. Umatilla Redband Trout

Section 4.3.6C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Umatilla	None		NA	NA	NA

Status:

Population	Adult Abundance
Umatilla	Unknown

Section 4.3.6C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Culverts, irrigation push-up dams, and diversions
Habitat access	Current land use	Agriculture and forestry practices
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.6C.3 Strategies and Measures for Umatilla Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore degraded habitat	• A. Restore stream flows in reaches dewatered for irrigation • B. Restore large wood in the system, fence and plant riparian zones • C. Increase protective status of priority habitats • D. Restore floodplain function and channel complexity, and increase habitat diversity	Immediate	1-5 years
Habitat Access			
• Restore passage at non-natural barriers	• E. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project • F. Restore stream flows in reaches dewatered for irrigation use • G. Replace culverts not meeting fish passage guidelines • H. Screen irrigation diversions • I. Maintain passage efficiency through ongoing O&M activities • J. Implement irrigation efficiency projects • K. Replace temporary irrigation diversion dams with structures that meet fish passage standards	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• L. Restore headwater attributes to improve downstream conditions • M. Modify channel and flood-plain function • N. Modify detrimental land use activities	Immediate	1-5 years

Water Quantity			
• Restore stream flows during low flow periods	• O. Maintain Phase I and II and implement Phase III of the Umatilla Basin Project • P. Increase water conservation and irrigation efficiency • Q. Purchase or lease water rights from willing landowners	Immediate	1-5 years

Section 4.3.7 Walla Walla Subbasin

A. Walla Walla Bull Trout (Oregon – Walla Complex, Mill Creek, and Touchet Complex)

Section 4.3.7A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Walla Walla					
	Number of Local Populations				
	3 or more		3 or more		
	Total Number of Adults				
	3,000 – 5,000				3,000-5,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Walla Walla			209 redds (2006, Walla Walla Complex only)

Section 4.3.7A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Culverts, irrigation push-up dams, and diversions
Habitat quality/quantity	Current land use	Agriculture and forestry practices
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.7A.3 Strategies and Measures for Walla Walla Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore passage at non-natural barriers	• A. Restore stream flows in reaches dewatered for irrigation use • B. Replace culverts not meeting fish passage guidelines • C. Screen irrigation diversions • D. Monitor fish passage improvement projects • E. Implement irrigation efficiency projects • F. Replace temporary irrigation diversion dams with structures meeting fish passage standards	Immediate	1-5 years
Habitat Quality/Quantity			
• Restore degraded habitat	• G. Restore stream flows in reaches dewatered for irrigation • H. Restore large wood in the system • I. Reduce grazing impacts • J. Restore floodplain function and channel complexity, and increase habitat diversity	Immediate	1-5 years
Water Quality			
• Reduce water temperatures during summer months	• K. Increase stream flows • L. Lease water rights from willing sellers	Immediate	1-5 years

	• M. Implement more efficient irrigation systems, and improve watershed function		
Water Quantity			
• Restore stream flows during low flow periods	• N. Implement irrigation efficiency project • O. Initiate point of diversion transfers • P. Evaluate shallow aquifer recharge projects • Q. Lease or purchase water rights	Immediate	1-5 years

Section 4.3.8 Walla Walla Subbasin

A. Walla Walla Bull Trout (Washington)

Section 4.3.8A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Walla Walla					
	Number of Local Populations				
	Total Number of Adults				
Mill Creek					
Touchet					

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Walla Walla	Unknown	Unknown	209 redds (2006) Where? This looks too low to include SF Walla Walla, Mill Creek and Touchet River, and all tribs?

Section 4.3.8A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Culverts, irrigation push-up dams, diversions and water quality or quantity
Habitat quality/quantity	Current land use	Agriculture, forestry practices, development
Water quality	Current land use	Agriculture, rural and urban development, roads
Population Traits/monitoring	Current land use	Population adundance, genetic structure, and general distribution are not well understood Agriculture, Forestry, Roads
Nutrients	Current land use and Hydro actions	Lack of adequate salmon carcasses
Predation	Current land use and exotic species	Exotic species
Harvest	Sport Fishing	Poaching

Section 4.3.8A.3 Strategies and Measures for Walla Walla Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore passage at non-natural barriers	• A. Restore stream flows in reaches dewatered for irrigation use • B. Replace irrigation diversion structures with improved structures meeting fish passage standards	Immediate	1-10 yrs

	• C. Replace culverts not meeting fish passage guidelines • D. Screen irrigation diversions, maintain passage efficiency through on-going O&M or additional activities, • E. Monitor effectiveness of fish passage improvement projects • F. Implement irrigation efficiency projects • G. Replace temporary irrigation diversion dams with structures meeting fish passage standards • H. Continue to monitor and remove dams and barriers made by recreationists		
Habitat Quality/Quantity			
• Restore degraded habitat	• I. Improve stream flows in reaches partially or completely dewatered for irrigation • J. Increase sinuosity • K. Restore large wood in the system • L. Protect, or restore riparian zones • M. Restore floodplain function and channel complexity, and increase habitat diversity • N. Increase protective status of priority habitats in landuse regulations	Immediate	1-25
Water Quality			
• Reduce water temperatures during summer months	• O. Increase stream flows • P. Restore priority restoration and protection reach attributes to improve downstream conditions • Q. Modify channel and increase floodplain functions • R. Reduce detrimental land use activities	Immediate	1-25 yrs

	• S. Lease water rights from willing sellers • T. Implement more efficient irrigation systems, and improve watershed function		
Water Quantity			
• Restore stream flows during low flow periods	• U. Implement irrigation efficiency projects • V. Initiate point of diversion transfers • W. Evaluate shallow aquifer recharge projects • X. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-15 yrs
Nutrients			
• Increase nutrients	• Y. Increase spring chinook returns • Z. Outplant hatchery spring chinook carcasses or fish cubes	Immediate	1-25 yrs
Harvest			
• Curtail Poaching and fishery impacts	• AA. Continue and enhance WFDW, CTUIR, and USFWS enforcement	Immediate	1-5 yrs
Predators			
• Decrease predators and exotic species	• BB. Increase stream flows • CC. Restore priority restoration and protection reach attributes to improve downstream conditions • DD. Modify channel and increase floodplain functions • EE. Reduce detrimental land use activities • FF. Lease water rights from willing sellers • GG. Implement more efficient irrigation systems, and improve watershed function • HH. Decrease water temperatures	Immediate	1-25 yrs

	• II. Evaluate shallow aquifer recharge projects • JJ. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners • KK. Liberalize fishing regulations on exotic species		
Population Traits			
• Monitoring • Populations identification, genetic structure, abundance, movements and general distribution are not well understood Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• LL. Conduct DNA analysis to identify populations and set recovery goals • MM. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • NN. Expand Electrofishing or snorkeling to determine distribution • OO. Determine habitat conditions and trends • PP. Complete the draft recovery plan	Immediate	1-10 yrs

B. Walla Walla Whitefish

Section 4.3.8B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Walla Walla	None		NA	NA	NA

Status:

Population	Adult Abundance
Walla Walla	Apparently very uncommon and limited distribution

Section 4.3.8B.2 Primary Limiting Factors and Threats

Unknown, but presumed to be the same as for salmon and steelhead.

C. Walla Walla Redband Trout (Oregon)

Section 4.3.8C.1 Biological Objectives and Status

Biological Objectives:

	Subbasin Plan		Draft Recovery Plan		
Population			Number of local populations	Number of adults	Total number of adults
Walla Walla	None		NA	NA	NA

Status:

Population	Abundance
Walla Walla	Unknown

Section 4.3.8C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Passage barriers
Habitat quality/quantity	Current land use	Culverts, irrigation push-up dams, and diversions
Water quality	Current land use	Agriculture
Water quantity	Current land use	Agriculture

Section 4.3.8C.3 Strategies and Measures for Walla Walla Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Restore passage at non-natural barriers	• A. Restore stream flows in reaches dewatered for irrigation use • B. Replace culverts not meeting fish passage guidelines • C. Screen irrigation diversions • D. Monitor fish passage improvement projects	Immediately	1-5years

	• E. Implement irrigation efficiency projects • F. Replace temporary irrigation diversion dams with structures meeting fish passage standards		
Habitat Quality/Quantity			
• Restore habitat	• G. Restore stream flows in reaches dewatered for irrigation • H. Restore large wood in the system • I. Reduce grazing impacts • J. Restore floodplain function and channel complexity • K. Increase habitat diversity	Immediately	1-5years
Water Quality			
• Reduce water temperatures during summer months	• L. Increase stream flows • M. Lease water rights from willing sellers • N. Implement more efficient irrigation systems • O. Improve watershed function	Immediately	1-5years
Water Quantity			
• Restore stream flows during low flow periods	• P. Implement irrigation efficiency projects • Q. Transfer point(s) of diversion • R. Evaluate shallow aquifer recharge projects • S. Lease or purchase water rights	Immediately	1-5years

Section 4.3.9 Yakima Subbasin

A. Yakima Bull Trout

Section 4.3.9A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Yakima	100 spawners (min.)			100 spawners	

				(min.)	
	Number of Local Populations				
	16		16		
	Total Number of Adults				
	3,350				3,350

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Yakima	3 populations with average spawners >100 (2 populations average = 50-100 spawners)	14	1,082 spawners (1998-2007 arithmetic mean)

Section 4.3.9A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Livestock grazing, private forestland residential development, and federal/state forestland management (primarily road management);
Water quality	Current land use	U.S. Bureau of Reclamation irrigation storage development
Habitat access	Current land use	Storage dams, irrigation diversion dams and dispersed recreational dams in tributaries have disrupted migrations and fragmented bull trout populations
Harvest	Illegal fishing; mis-identification with other trout species	Poaching has been identified as a serious concern in Gold Creek (Keechelus Lake tributary), Box Canyon Creek (Kachess Lake tributary), Deep Creek (Bumping Lake tributary), South Fork Tieton River and Indian Creek (Rimrock Lake tributaries); also

		misidentification of bull trout by recreational anglers who confuse with eastern brook trout

Section 4.3.9A.3 Strategies and Measures for Yakima Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Protect properly functioning habitat	• A. Utilize conservation agreements and/or fee simple acquisition opportunistically to protect local bull trout population habitat that meets the definition of "properly functioning condition",	Immediate	Ongoing
	• B. Negotiate provisions in the USFS – Naches Ranger District lease renewal for the S.F. Tieton River grazing allotment to reduce or prevent livestock damage in bull trout spawning areas,		0-5 years
	• C. Negotiate with the USFS – Naches Ranger District for the permanent abandonment of F.S. Rd. 1800 west of the Deep Cr. culvert crossing for motorized vehicle traffic		0-5 years
	• D. Remove the culverts, restore the creek bed and provide a suitable ford for horses and non-motorized recreational use (hiking, mountain biking) of the road west of Deep Creek		0-5 years
Water Quality			
• Modify reservoir and flow regime	• E. Use the ESA Section 7 consultation process between the USFWS and the Bureau of Reclamation (Reclamation) to develop a new Biological Assessment (BA) with proposed actions that substantively address specific reservoir and flow regime problems that adversely impact local bull trout populations	Immediate	0-5 years
	• F. USFWS shall issue a		

	Biological Opinion (BiOp) that obligates Reclamation to implement negotiated proposed actions to recover bull trout local populations with certainty and in a timely manner • G. Improve irrigation and other water user efficiency that moves flow toward normative conditions • H. Return flow regimes to more normative conditions through increased natural and artificial storage • I. Modify or eliminate the annual "Flip-flop" flow operation		0-5 years Ongoing 5-10 years (optimistic); 10+ years (realistic) 0-5 years
Habitat Access			
• Provide effective fish passage to restore connectivity between the sixteen local bull trout populations and restore anadromous fish runs to boost ecosystem productivity	• J. Participate in and support Reclamation's efforts to develop technically feasible and economically viable engineering designs for upstream and downstream fish passage facilities at Cle Elum Dam, Bumping Lake Dam and Clear Lake Dam (and other storage dams in future years) • K. Assist BOR in securing funding from Congress, NPCC/BPA and other federal, state and local partners for passage facility construction, operation and maintenance • L. The fish co-managers, WDFW and Yakama Nation, shall implement an anadromous fish re-introduction plan using hatchery supplementation to accelerate restoration of salmon populations upstream of Reclamation storage dams equipped with fish passage • M. Investigate the potential of a pilot bull trout hatchery supplementation project (or capture and redistribution of	Immediate	0-5 years 0-5 years 0-5 years (Cle Elum and Bumping Dams); other BOR storage dams 5-10+ years 0-5 years

	adult bull trout spawners from "healthy" local populations to "critical" populations (SaSI definitions)), to accelerate restoration of critical and depressed local populations • N. Work with the USFS (Naches and Cle Elum R.D.'s) and DNR (Ahtanum Cr. basin) to educate the public about the threat to bull trout populations caused by constructing numerous low rock dams in spawning tributaries during the summer months immediately prior to spawning migrations • O. WDFW and USFS monitor spawning tributaries adjacent to campgrounds and other areas of high recreation use during the summer and de-construct recreational dams to restore upstream passage for adult bull trout • P. Monitor passage conditions at the mouths of Reclamation storage reservoir bull trout spawning tributaries (Gold Cr., Box Canyon Cr., Indian Cr., S.F. Tieton R.) and take measures to concentrate flow and assure passage across the reservoir lakebed during summer drawdown • Q. Coordinate with Reclamation to fund the deployment of labor and materials to accomplish this measure		0-5 years 0-5 years 0-5 years 0-5 years
Harvest			
• Improve compliance with conservation-oriented fishing regulations that close bull trout spawning/rearing areas in tributaries to fishing year-round	• R. Continue and enhance WDFW and USFWS enforcement to prevent illegal harvest/harassment of bull trout • S. Close the regulatory "loophole" unique to the Yakima Basin adfluvial populations (Deep Cr., S.F.	Immediate	0-5 years Completed Feb. 2008

	Tieton R., Indian Cr., N.F. Tieton R., Gold Cr., Box Canyon Cr., Kachess R.) that some fishermen have exploited. Extend the "closed water" rule downstream in these tributaries to include those portions of the creek flowing across the dry lakebed during irrigation season reservoir drawdown • T. Continue to publish the "bull trout vs. brook trout" identification illustration in WDFW's annual sport fishing rules pamphlet • U. Continue to produce and post the bull trout vs. brook trout identification sign prominently in areas where bull trout and brook co-exist		Ongoing Ongoing

Section 4.4 Columbia Cascade Province

Section 4.4.1 Columbia Upper Middle Subbasin

A. Columbia Upper Middle Bull Trout

Section 4.4.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Columbia Upper Middle	NA		NA	NA	NA

Status:

Population	Number of adults/populations	Number of local populations	Total number of adults
Columbia Upper Middle	Unknown	Unknown	Unknown

Section 4.4.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use; dams	Mainstem hydrosystem
Population traits	Lack of information	Population density, composition, and distribution unknown

Section 4.4.1A.3 Strategies and Measures for Columbia Upper Middle Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Evaluate passage at hydro-facilities	• A. Conduct telemetry studies to determine migration patterns and potential problems at hydro-facilities	Immediate	1-5 years
Population Traits			
• Identify status and distribution	• B. Conduct surveys to determine population density,	Immediate	1-5 years

	composition, and distribution		

B. Columbia Upper Middle White Sturgeon

Section 4.4.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Productivity		Number of local populations	Number of adults	Total number of adults
Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs	Increasing		NA	NA	NA
	Annual Recruitment (Productivity)				
	Natural reproduction reached via natural recruitment		NA	NA	NA
	Broodstock Abundance				
	Increase the white sturgeon population in project reservoirs to a level commensurate with available habitat.		NA	NA	NA

Status:

Population	Productivity	Annual Recruitment	Broodstock Abundance
Priest Rapids Reservoir	Essentially zero (based on stock structure)	Essentially zero (based on stock structure)	125 (1999-2001)
Wanapum Reservoir	Sporadic and extremely low	Sporadic and extremely low	330 (1999-2001)
Rock Island Reservoir	Zero (based on stock structure)	Zero (based on stock structure)	Just a few fish
Rocky Reach Reservoir	Essentially zero (based on stock structure)	Essentially zero (based on stock structure)	13 (2001-2002)

Well Reservoir	Essentially zero (based on stock structure)	Essentially zero (based on stock structure)	18 (2001-2002)

Section 4.4.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Dams	Creation of the mainstem dams has inundated historic spawning habitat, eliminated upstream and downstream adult and sub-adult movement, and impedes juvenile downstream passage.
Population traits	Dams	Natural production has been reduced to such an extent that population extirpation is likely in this reach of the Columbia River
Harvest	Sport fishing	Vulnerable to unintended negative impacts resulting from inadequate harvest management

Section 4.4.1B.3 Strategies and Measures for Columbia Upper Middle White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Provide suitable spawning and rearing habitat	• A. Operate the Federal Columbia River Power System (FCRPS) to provide suitable white sturgeon spawning and rearing habitat in Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs by providing a minimum average April through July flow that translates to 250 KCFS at McNary Dam	Immediate	Immediate to 5 years
• Conduct research to addresses critical uncertainties	• B. Conduct research that addresses critical uncertainties identified in existing and future regional white sturgeon conservation and management plans related	Immediate	6-10 years

	to loss of white sturgeon productivity due to the construction and operation of the FCRPS. These studies shall include (but are not limited to) determination of minimum spawning flows for successful white sturgeon recruitment throughout the Columbia River Basin in areas where they are not currently defined		
Population Traits			
• Implement hatchery based white sturgeon augmentation program(s)	• C. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, tribes, and PUDs, implement regional hatchery augmentation to restore white sturgeon populations in the impounded portions of the Columbia River upstream of Priest Rapids Dam. [Specific and detailed background, objectives and tasks are described in FERC Relicensing documents – Priest Rapids Project Final 401 Certification, as amended, March 2008; Grant PUD FLA 2003, White Sturgeon Conservation Aquaculture Plan; Chelan PUD Rocky Reach Settlement Agreement, White Sturgeon Management Plan, 2005]	Immediate	10+ years
• Evaluate and monitor white sturgeon population restoration efforts	• Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, tribes, and PUDs, monitor and evaluate a) restoration actions designed to mitigate for lost white	Immediate	10+ years

	sturgeon production due to the construction and operation of the FCRPS and b) population responses to environmental conditions by conducting periodic assessments of the status of white sturgeon populations (e.g., abundance, size distribution, length-weight relationship, etc.) in Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells reservoirs. [Detailed objectives and tasks are described in FERC Relicensing documents –]		
• Develop a regionally-accepted white sturgeon management plan framework	• Develop a regionally accepted White Sturgeon Conservation and Management Plan.	Immediate	10+ years
Harvest			
• Identify and maintain sustainable harvest levels to ensure adequate escapement of fish to broodstock	• D. Consistent with existing and any future regional conservation and management plans, and in consultation with the appropriate state agencies, tribes, and PUDs, fund white sturgeon fishery management including:	10+ years	10+ years
	• E. Identify sustainable recreational and Tribal harvest levels through population simulation that accounts for variable natural production, growth rate, and abundance;	10+ years	10+ years
	• F. Conduct recreational creel surveys that enable active in-season management to attain pre-determined sustainable harvest levels	10+ years	10+ years
	• G. Conduct Tribal subsistence fishery monitoring that enables active in-season management to attain pre-determined sustainable	10+ years	10+ years

	harvest levels		

Section 4.4.2 Entiat Subbasin

A. Entiat Bull Trout

Section 4.4.2A.1 Biological Objective and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Entiat	--			--	
	Number of Local Populations				
	2		2		
	Total Number of Adults				
	836 – 1,364				836 – 1,364

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Entiat			77 redds (2005)

Section 4.4.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Competition with brook trout
Population traits	Non-native species	Hybridization with brook trout
Habitat quality/quantity	Current land use	forestry
Harvest	Current and past fishing	Overharvest and poaching

Section 4.4.2A.3 Strategies and Measures for Entiat Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			

• Reduce non-natives	• A. Remove brook trout through harvest or other means (e.g., chemical and trapping) • B. Increase agency presence through creel surveys and enforcement	Immediate	0-5 years
Population Traits			
• Reduce non-natives	• C. Remove brook trout through harvest or other means (e.g., chemical and trapping) • D. Increase agency presence through creel surveys and enforcement	Immediate	0-5 years
Habitat Quality/Quantity			
• Evaluate habitat and current use	• E. Quantify habitat needs and implement restoration measures	Immediate	5-10 years
Harvest			
• Curtail poaching activities	• F. Evaluate and control harvest activities	Immediate	10+ years

B. Entiat Westslope Cutthroat Trout

Section 4.4.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Entiat	None		NA	NA	NA

Status:

Population	Adult Abundance
Entiat	Unknown

Section 4.4.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Rainbow trout
Habitat quality/quantity	Current land use	Forestry
Harvest	Current and past fishing	Overharvest

Section 4.4.2B.3 Strategies and Measures for Entiat Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Non-Native Species			
• Reduce non-native species	• A. Reduce rainbow trout population through harvest or other means (e.g., chemical and trapping) • B. Increase agency presence through creel surveys and enforcement	Immediate	0-5 years
Habitat Quality/Quantity			
• Evaluate habitat and current use	• C. Quantify habitat needs and implement restoration measures	Immediate	5-10 years

C. Entiat Rainbow Trout

Section 4.4.2C.1 Biological Objectives

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Entiat	None		NA	NA	NA

Status:

Population	Adult Abundance
Entiat	Unknown

Section 4.4.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Population traits	Population structure	Overpopulation or size-specific harvest

Section 4.4.2C.3 Strategies and Measures for Entiat Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Improve population structure (i.e., age and growth)	• A. Conduct biological and creel surveys • B. Implement regulation changes to reduce rainbow trout population or limit harvest of larger fish • C. Determine best options in relation to westslope cutthroat trout objectives	Immediate	0-5 years

Section 4.4.3 Lake Chelan Subbasin

A. Lake Chelan Bull Trout

Section 4.4.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Lake Chelan	Likely extirpated	Likely extirpated	Likely extirpated

Section 4.4.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population size	Probable extirpation
Predation	Non-native species	Lake trout
Harvest	Fishing	Overharvest and poaching

Section 4.4.3A.3 Strategies and Measures for Lake Chelan Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Seek/create a refuge population	• A. Survey for remnant populations in Stehekin • B. Identify reason for population crash or extirpation • C. Identify stock for reintroduction to Stehekin refuge population	Immediate	0-5 years
Predation			
• Reduce predator populations	• D. Reduce lake trout populations through harvest or other means where feasible • E. Evaluate regulation modifications	Immediate	5-10 years

B. Lake Chelan Westslope Cutthroat Tout

Section 4.4.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Adult Abundance
Lake Chelan	Unknown

Section 4.4.3B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population trait	Population structure	Lack of broodstock and age-0 fish
Competition/predation	Non-native species	Lake trout and rainbow trout
Habitat access	Hydro-operations	Reservoir operations block access to spawning and rearing habitat

Section 4.4.3B.3 Strategies and Measures for Lake Chelan Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Trait			
• Enhance numbers of broodstock and age-0 fish	• A. Obtain better estimate of production, especially for Stehekin • B. Stock 100,000 catchable-sized fish annually or use net pen rearing to attain desirable size • C. Deploy remote site incubators and/or fry stocking in tributaries	Immediate	5-10 years
Competition/Predation			
• Reduce introduced species	• D. Reduce predator populations through harvest or other means where feasible • E. Regulation evaluation and consider closing tributary sections	Immediate	5-10 years
Habitat Access			
• Enhance access to tributaries	• F. Modify current hydro-operations to preserve access to spawning/rearing tributaries • G. Remove alluvial barriers	Immediate	5-10 years

C. Lake Chelan Kokanee

Section 4.4.3C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Escapement		Number of local populations	Number of adults	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Adult Escapement
Lake Chelan	94,039 (2005)

Section 4.4.3C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits		
Competition/predation	Non-native species	Mysis shrimp, lake trout, and rainbow trout

Section 4.4.3C.3 Strategies and Measures for Lake Chelan Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Develop a management plan	• A. Conduct population surveys to better estimate natural production and adjust stocking for proper harvest size and catch per unit effort • B. Conduct genetic surveys to identify the best broodstock source for culture purposes	Immediate	5-10 years
Competition/Predation			
• Reduce introduced species	• C. Reduce introduced species (i.e., mysis shrimp, lake trout, and rainbow trout) through harvest or other means where feasible	Immediate	5-10 years

D. Lake Chelan Burbot

Section 4.4.3D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lake Chelan	None		NA	NA	NA

Status:

Population	Adult Abundance
Lake Chelan	Unknown

Section 4.4.3D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population characteristics	Lack comprehensive baseline data

Section 4.4.3D.3 Strategies and Measures for Lake Chelan Burbot

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Develop a management plan	• A. Conduct extensive surveys to obtain baseline population data, habitat use information, and pathology data	Immediate	0-5 years

Section 4.4.4 Methow Subbasin

A. Methow Bull Trout

Section 4.4.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Methow	--			--	
	Number of Local Populations				
	8		8		
	Total Number of Adults				
	3,600-5,886				3,600-5,886

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Methow			215 redds (2005)

Section 4.4.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Competition with brook trout
Population trait	Non-native species	Hybridization with brook trout
Habitat quality/quantity	Legacy land use	Forest management practices and roads
Harvest (Lost River Population)	Sport fishing	Poaching

Section 4.4.4A.3 Strategies and Measures for Methow Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Reduce competitive species populations	• A. Evaluate species interactions and status • B. Remove brook trout through harvest or other means (e.g. chemical, trapping) • C. Increase agency presence through creel surveys and enforcement • D. Evaluate regulation effectiveness	Immediate	0-5 years
Population Traits			
• Reduce hybridizing species populations	• E. Evaluate species interactions and status • F. Remove brook trout through harvest or other means (e.g. chemical, trapping) • G. Increase agency presence through creel surveys and enforcement • H. Evaluate regulation effectiveness	Immediate	0-5 years
Habitat Quality/Quantity			
• Improve spawning and rearing conditions	• I. Survey current habitat, quantify needs, and evaluate current uses • J. Implement appropriate restoration actions	Immediate	5-10 years
Harvest (Lost River Population)			
• Estimate impact of harvest	• K. Conduct yearly surveys to determine population health • L. Develop a population estimate to management purposes • M. Work with federal biologists to develop a database for the Lost River population	Immediate	0-5 years

B. Methow Westslope Cutthroat Trout

Section 4.4.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Methow	None		NA	NA	NA

Status:

Population	Adult Abundance
Methow	Unknown

Section 4.4.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Non-native species	Rainbow trout competition
Population traits	Non-native species	Hybridization with rainbow trout
Harvest	Sport fishing	Current and past overharvest
Habitat quality/quantity	Legacy land use	Forest management practices and roads

Section 4.4.4B.3 Strategies and Measures for Methow Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) • B. Investigate re-introduction to increase distribution	Immediate	0-5 years
Population Traits			
• Reduce hybridizing species populations	• C. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) and investigate re-introduction to increase distribution	Immediate	0-5 years

Harvest			
• Control harvest practices	• D. Evaluate harvest practices through increased agency presence using creel surveys and law enforcement	Immediate	0-5 years
Habitat Quality/Quantity			
• Improve spawning and rearing conditions	• E. Survey current habitat, quantify needs, and evaluate current uses • F. Implement appropriate restoration actions	Immediate	5-10 years

Section 4.4.5 Okanogan Subbasin

A. Okanogan Rainbow Trout

Section 4.4.5A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	CPUE		Number of local populations	Number of adults	Total number of adults
Rufus Woods	1.0 fish/hour		NA	NA	NA
	Annual fry production				
	2.8-11.5 million		NA	NA	NA
	Annual par production				
	826,000-3.4 million		NA	NA	NA
	Annual recruitment of adults				
	5,000-20,000		NA	NA	NA
	CPUE				
Other waters	0.5-1.0 fish/hour		NA	NA	NA

Status:

Population	CPUE
Rufus Woods	0.3 (2007)
Other waters	--

Section 4.4.5A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population structure	Data gaps lead to insufficient information to make all management decision needed
Water quality	Current land use	Agriculture, forestry, and roads
Water quantity	Current land use	Agriculture, forestry, and roads

Section 4.4.5A.3 Strategies and Measures for Okanogan Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Address population and reservoir-specific data gaps to better inform decision making processes	• A. Implement a feminized triploid rainbow trout stocking and creel survey program for Lake Rufus Woods	Immediate	Continuous
	• B. Monitor fishery to determine angler catch rates, optimal number and size of fish to be released		0-5 years
	• C. Determine origin of fish caught with marking identification, stomach content analysis, and radio isotope studies		0-5 years
	• D. Determine primary factors affecting the quality of the Rufus Woods fishery including the study of the primary productivity of the reservoir		5-10 years
Water Quality			
• Modify actions associated with current land-use activities	• E. Work with local ranchers to develop cost share projects with Natural Resource and Conservation Service (NRCS) that will stabilize streams and stream banks	Implementing	5-10 years
	• F. Re-establish riparian vegetation, and exclude cattle from riparian zones	Immediate	5-10 years
	• G. Work with Colville Tribes integrated review process and land use board to reduce	Immediate	5-10 years

	impacts from proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and water quality impacts from proposed projects and land uses		
Water Quantity			
• Protect and enhance in-stream flows	• H. Work with Colville Tribes integrated review process and land use board to reduce impacts from proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and water quality impacts from proposed projects and land uses • I. Work with Colville Tribal Council to purchase water rights and protect and enhance in-stream flows	Implementing Immediate	5-10 years 10+ years

B. Okanogan Lahotan Cutthroat Trout

Section 4.4.5B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	CPUE		Number of local populations	Number of adults	Total number of adults
Omak Lake	1 fish/hour		NA	NA	NA
	Broodstock Release				
	100 males and 100 females				

Status:

Population	CPUE
Omak Lake	0.46 fish/hour (2006)

Section 4.4.5B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Diversion of flows for agricultural irrigation and altered hydrology from timber harvest and road construction reduces in-stream flows during spawning preventing access into tributaries
Population traits	Population structure	Poor year-class representation

Section 4.4.5B.3 Strategies and Measures for Okanogan Lahotan Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Improve flows to provide access to spawning habitat	• A. Coordinate the participation, planning, and implementation of proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and hydrological impacts from proposed projects and land uses	Implementing	5-10 years
	• B. Purchase property, water rights, and conservation agreements, for the protection and enhancement of in-stream flows	Immediate	5-10 years
	• C. Continue collection of brood stock and harvest of fertile eggs to be raised in the hatchery and planted into Omak Lake annually and monitor harvest		0-5 years (continuous)
Population Traits			
• Enhance Omak Lake population	• D. Continue collection of brood stock and harvest of fertile eggs to be raised in the hatchery and planted into Omak Lake annually	Immediate	0-5 years (continuous)
	• E. Monitor harvest		5-10 years

C. Okanogan Kokanee

Section 4.4.5C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Recruitment		Number of local populations	Number of adults	Total number of adults
Lake Rufus Wood and Nespelem River	5,000-20,000 adults		NA	NA	NA
	Annual fry production				
	2.8-11.5		NA	NA	NA
	Annual parr production				
	862,000-3.4 million		NA	NA	NA

Status:

Population	Adult Abundance
Lake Rufus Wood and Nespelem River	25 in the Nespelem (2006)

Section 4.4.5C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Population structure	Information on kokanee population lacking and strictly limited to the spawning population in Nespelem River
Competition/predation	Non-native species	Walleye and smallmouth bass
Hydro-operations	Dams	Entrainment at Chief Joseph Dam
Habitat quality/quantity	Current land use	Agriculture, grazing, and logging

Section 4.4.5C.3 Strategies and Measures for Okanogan Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Address reservoir-specific population data gaps to better inform decision making processes	• A. Continue monitoring Nespelem River and develop sampling and monitoring plan for entire reservoir addressing key factors such as limnology, primary productivity, secondary productivity, and fish productivity	Immediate	5-10 years
Predation			
• Identify magnitude of predatory impacts on natural origin kokanee	• B. Investigate predators effects on kokanee in Lake Rufus Woods	Immediate	0-5 years
Hydro-operation			
• Assess entrainment at Chief Joseph Dam determine corrective measures	• C. Develop and implement an assessment addressing entrainment at Chief Joseph Dam	Immediate	5-10 years
Habitat Quality/Quantity			
• Modify current land-use practice	• D. Work with local ranchers to develop cost share projects with Natural Resource Conservation Service (NRCS) that will stabilize streams and stream banks, re-establish riparian vegetation, and exclude cattle from riparian zones • E. Work with Colville Tribes integrated review process and land use board to reduce impacts from proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and water quality impacts from proposed projects and land uses	Immediate	10+ years 10+ years
• Improve habitat	• F. Work with Colville Tribal	Immediate	5-10 years

conditions	Council and NRCS to identify conservation actions that protect and enhance in stream habitat. Determine the feasibility of constructing spawning channels in the Nespelem sub basin and other areas • G. Coordinate the participation, planning, and implementation of proposed timber harvest, range plans and projects, and road construction projects to reduce road densities and hydrological impacts from proposed projects and land uses. Purchase property, water rights, and conservation agreements and easements, for the protection and enhancement of in-stream habitat		10+ years

Section 4.4.6 Wenatchee Subbasin

A. Wenatchee Bull Trout

Section 4.4.6A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Wenatchee				--	
	Number of Local Populations				
	6		6		
	Total Number of Adults				
	1,876 – 3,176				1,876 – 3,176

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Wenatchee			342 redds (2005)

Section 4.4.6A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Native and non-native species	Brook trout and pikeminnow competition
Habitat quality/quantity	Legacy land use	Forest management practices and roads
Population traits	Non-native species	Hybridization with brook trout
Harvest	Sport fishing	Poaching

Section 4.4.6A.3 Strategies and Measures for Wenatchee Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Evaluate species interactions and status • B. Remove brook trout through harvest or other means (e.g. chemical, trapping)	Implementation	0-5 years
Habitat Quality/Quantity			
• Increase/improve spawning and rearing habitat	• C. Quantify habitat needs • D. Identify habitat currently being used • E. Implement restoration measures	Implementation	5-10 years
Population Traits			
• Reduce hybridizing species populations	• F. Evaluate species interactions and status • G. Conduct biological surveys (population estimates) in Lake Wenatchee, the Wenatchee River and its tributaries • H. Remove brook trout through harvest or other	Implementation	0-5 years

	means (e.g. chemical, trapping)		
Harvest			
• Reduce poaching activities	• I. Evaluate harvest practices through creel surveys and the presence of law enforcement • J. Evaluate regulation effectiveness and modify if warranted	Implementation	5-10 years

B. Wenatchee Westslope Cutthroat Trout

Section 4.4.6B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Wenatchee	None		NA	NA	NA
Headwater	None		NA	NA	NA

Status:

Population	Adult Abundance
Wenatchee	Unknown
Headwater	Unknown

Section 4.4.6B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Non-native species	Rainbow trout and brook trout competition
Population traits	Non-native species	Hybridization with rainbow trout
Harvest	Sport fishing	Overharvest
Habitat quality/quantity	Legacy land use	Past forest management practices and roads

Section 4.4.6B.3 Strategies and Measures for Wenatchee Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) • B. Investigate re-introduction to increase distribution	Implementation	0-5 years
Population Trait			
• Reduce hybridizing species populations	• C. Reduce rainbow trout populations through harvest or other means (e.g., chemical and trapping) • D. Investigate re-introduction to increase distribution	Implementation	0-5 years
Harvest			
• Control harvest practices	• E. Evaluate harvest practices through increased agency presence using creel surveys and law enforcement	Implementation	5-10 years
Habitat Quality/Quantity			
• Improve spawning and rearing conditions	• F. Survey current habitat, quantify needs, and evaluate current uses • G. Implement appropriate restoration actions	Implementation	5-10 years

C. Wenatchee Rainbow Trout (redband) Trout

Section 4.4.6C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Wenatchee	None		NA	NA	NA

Status:

Population	Adult Abundance
Wenatchee	Unknown

Section 4.4.6C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/predation	Introduced species	Cutthroat trout competition
Population traits	Introduced species	Hybridization with cutthroat trout emigrating from high lakes into headwater streams

Section 4.4.6C.3 Strategies and Measures for Wenatchee Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			
• Reduce competitive species populations	• A. Perform population surveys • B. Reduce cutthroat trout populations through harvest or other means (e.g., chemical and trapping) • C. Reduce or eliminate high lakes stocking program	Implementation	0-5 years
Population Trait			
• Reduce hybridizing species populations	• D. Perform population and genetic surveys	Implementation	5-10 years

Section 4.5 Intermountain Province

Section 4.5.1 Coeur d'Alene Subbasin

A. Coeur d'Alene Bull Trout

Section 4.5.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Coeur d'Alene Lake	--			--	
	Number of Local Populations				
	8 (5 local populations in Red Ives Creek and 3 local populations from Ives Creek downstream to Big Creek)		8 (5 local populations in Red Ives Creek and 3 local populations from Ives Creek downstream to Big Creek)		
	Total Number of Adults				
	800 (500 above and/or in Red Ives Creek and 300 From Red Ives Creek downstream to Big Creek)				800 (500 above and/or in Red Ives Creek and 300 From Red Ives Creek downstream to Big Creek)

Coeur d'Alene River	Number of adults/population				
	Number of Local Populations				
	At least 3		At least 3		
	Total Number of Adults				
	300				300

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Coeur d'Alene Lake			
Coeur d'Alene River			--
St. Joe River			301 redds

Section 4.5.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Loss or destruction of important floodplain/riparian habitat and excess sediment delivery due to agriculture, forestry, and residential practices
Competition/predation	Non-native species	Northern pike, smallmouth bass, and brook trout
Water quality	Current and legacy land use	Elevated heavy metal concentrations in the South Fork Coeur d'Alene River and Coeur d'Alene River. Elevated water temperatures in smaller low elevation tributaries in the Coeur d'Alene and St. Joe Rivers
Habitat access	Current land uses	Roads, railroads and dikes

Section 4.5.1A.3 Strategies and Measures for Coeur d'Alene Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Reduce impacts from past mining operations and development along river and stream corridors and reduce sediment delivery to the stream network	• A. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe, Forest Service, other agencies, private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions • B. Incorporate evaluations of existing habitat into project plans whenever possible. • C. Develop a database to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • D. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe, Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality, and others to insure mitigation of habitat loss or restoration of habitat whenever possible • E. Promote lessons learned from past research to improve habitat critical to bull trout survival	Immediate	10+ years
Competition /Predation			
• Reduce impacts from introduced species	• F. Set liberal regulations on northern pike, smallmouth bass and brook trout to reduce their numbers and limit their spread • G. Develop informational	Immediate	10+ years

	programs to educate anglers and the public to risks of random introductions of exotic species • H. Through planning, use enforcement efforts to curtail illegal introductions • I. Work with anglers to reach a balance between exotic species and bull trout		
Water Quality			
• Reduce heavy metal concentrations. Restore functional riparian habitat	• J. Work with Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Department of Environmental Quality, Environmental Protection Agency, U.S. Fish and Wildlife Service, Bureau of Land Management and other agencies in reducing heavy metal loading into the Coeur d'Alene River watershed. Monitor the fish populations to show benefits from reductions in heavy metal concentrations and water temperatures	Immediate	10+ years
Habitat Access			
• Restore connectivity to important spawning, rearing and refugia habitat	• K. Work with the Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Idaho Department of Lands, other agencies, private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land-use decisions. Incorporate evaluations of roads, railroads and dikes in survey projects to assess where access to important habitat has been lost • L. Develop a data base to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • M. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe,	Immediate	10+ years

	Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality and others to insure mitigation of habitat loss or to restore access whenever possible		

B. Coeur d'Alene Kokanee

Section 4.5.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Population Estimate		Number of local populations	Number of adults	Total number of adults
Coeur d'Alene Lake	7.5 million		NA	NA	NA
	Harvest				
	200,000		NA	NA	NA

Status:

Population	Population Estimate	Harvest
Coeur d'Alene Lake	34,200 age-3 (2007)	

Section 4.5.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Non-native species	Smallmouth bass and Chinook salmon
Harvest	Sport fishing	Overharvest
Habitat quality/quantity	Current lands use	Lakeshore encroachment, pollution, and nutrient loading

Section 4.5.1B.3 Strategies and Measures for Coeur d'Alene Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response

			Timeframe
Predation			
• Reduce impacts from introduced species	• A. Set liberal regulations on smallmouth bass to reduce their numbers and limit their spread • B. Determine habitat use, movement and feeding habits of smallmouth bass to assess impacts on kokanee and other desired game fishes • C. Evaluate chinook survival and recruitment to the fishery by monitoring chinook derbies and conducting redd count surveys • D. Adjust chinook stocking as necessary to meet kokanee goals	Immediate	0-10+ years
Harvest			
• Modify angler harvest to meet kokanee abundance and size goals	• E. Evaluate angler harvest of kokanee through creel surveys • F. Continue to evaluate kokanee abundance and size through trawling and/or hydroacoustics. • G. Seek public input on whether anglers desire to harvest more kokanee of smaller size or fewer kokanee of a larger size • H. Develop a model that uses kokanee exploitation, Chinook abundance and the number and size of spawning kokanee to predict the expected number and size of mature kokanee three years later. This model could be used to help adjust angler harvest of kokanee and introductions of Chinook salmon to maintain the desired size and number of mature kokanee	Immediate	0-10+ years
Habitat Quality/Quantity			
• Minimize impacts to lake fisheries due to lakeshore encroachment, pollution and	• I. Work with Idaho Department of Fish and Game, Coeur d'Alene Tribe, county planners and Department of Lands to make protection of	Immediate	0-10+ years

nutrient loading	fish habitat and water quality a primary concern in land use decisions		

C. Coeur d'Alene Westslope Cutthroat Trout

Section 4.5.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
St. Joe River, Coeur d'Alene River, and St. Maries River	1.0 fish/hour		NA	NA	NA
	Harvest				
Coeur d'Alene Lake	>1,000		NA	NA	NA

Status:

Population	Catch rates	Harvest
St. Joe River, Coeur d'Alene River, and St. Maries River	--	--
Coeur d'Alene Lake	--	--

Section 4.5.1C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Residential development
Competition/predation	Non-native species	Northern pike, smallmouth bass, brook trout, and rainbow trout
Harvest	Fishing	Illegal harvest
Habitat access	Current land uses	Roads, railroads and dikes
Water quality	Current land use	Elevated heavy metal concentrations in the South Fork Coeur d'Alene River and Coeur d'Alene River. Elevated water temperatures in the smaller tributaries of Coeur d'Alene Lake the Coeur d'Alene and St. Joe Rivers.

Section 4.5.1C.3 Strategies and Measures for Coeur d'Alene Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Reduce impacts from development along river and stream corridors and reduce sediment delivery to the stream network	• A. Collaboratively work with all agencies (including Forest Service, Coeur d'Alene Tribe and Idaho Fish and Game), private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions • B. Incorporate evaluations of existing habitat into project plans whenever possible • C. Develop a database to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • D. Work with the Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality, Coeur d'Alene Tribe, Idaho Department of Fish and Game and others to insure mitigation of habitat loss or restoration of habitat whenever possible • E. Promote lessons learned from cutthroat trout research in the Coeur d'Alene Subbasin to improve habitat critical to cutthroat trout survival	Immediate	10+ years
Competition/Predation			
• Reduce impacts from introduced species	• F. Set liberal regulations on northern pike, smallmouth bass, brook trout and rainbow trout to reduce their numbers and limit their spread • G. Develop informational programs to educate anglers and the public to risks of random introductions of exotic species • H. Through planning, use enforcement efforts to curtail illegal	Immediate	10+ years

	introductions • I. Evaluate potential impacts that high kokanee densities may have on restoration of adfluvial cutthroat trout • J. Work with anglers to reach a balance between exotic species and cutthroat trout		
Harvest			
• Reduce illegal harvest	• K. Work with the Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Idaho Department of Lands, other agencies, private developers and landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions • L. Incorporate evaluations of roads, railroads and dikes into survey projects to assess where access to important habitat has been lost • M. Develop a database to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • N. Work with the Idaho Fish and Game, Coeur d'Alene Tribe, Forest Service, Department of Transportation, Silver Valley Natural Resource Trustees, Environmental Protection Agency, Department of Lands, Department of Environmental Quality, and others to insure mitigation of habitat loss or to restore access whenever possible.	Immediate	10+ years
Water Quality			
• Reduce heavy metal concentrations	• O. Work with the Idaho Department of Fish and Game, Coeur d'Alene Tribe, Department of Environmental Quality, Environmental Protection Agency, U.S. Fish and Wildlife Service, Bureau of Land Management and other agencies in reducing heavy metal loading into the Coeur d'Alene River watershed.	Immediate	10+ years
• Reduce in-stream water temperatures during the warm summer months	• P. Work to restore functional riparian areas in order to facilitate lower summer temperatures with higher mean flows	Immediate	10+ years

	• Q. Monitor the fish populations to show benefits to reductions in heavy metal concentrations and water temperatures		

Section 4.5.2 Columbia Upper Subbasin

A. Columbia Upper Redband/Rainbow Trout

Section 4.5.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Harvest Rate		Number of local populations	Number of adults	Total number of adults
Lake Roosevelt	0.15 fish/hour (hatchery fish)		NA	NA	NA
	Adult Abundance				
			NA	NA	NA

Status:

Population	Harvest Rate	Adult Abundance
Lake Roosevelt	0.15	Unknown

B. Columbia Upper Kokanee

Section 4.5.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	CPUE		Number of local populations	Number of adults	Total number of adults
Upper Columbia, Sheep Creek, and Barnaby Creek	1 fish/hour this value is not realistic WDFW doesn't agree		NA	NA	NA
	Annual Harvest				
	10,000 – 40,000 adults from the San Poil		NA	NA	NA

	this should be in the San Poil sub-basin				

Status:

Population	CPUE	Annual Harvest
Upper Columbia, Sheep Creek, and Barnaby Creek	0-5 less than 0.1 fish per hour currently	0-5 current harvest estimate is unknown.

C. Columbia Upper Kokanee

Section 4.5.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Lake Roosevelt and other lakes	300,000		NA	NA	NA
	Harvest Rate				
	0.5 fish/hour (excluding Lake Roosevelt)		NA	NA	NA

Status:

Population	Annual Harvest	Harvest Rate
Lake Roosevelt and other lakes	less than 0.1	less than 3000

D. Columbia Upper Burbot

Section 4.5.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Lake Roosevelt	Unknown		NA	NA	NA
	Relative Weight				

	75-85		NA	NA	NA
	Harvest Rate				
	0.04 fish/hour				
	Mean Length				
	490 mm				

Status:

Population	Adult Abundance	Relative Weight
Lake Roosevelt	Stable	Wr less than 75

E. Columbia Upper Westslope Cutthroat Trout

Section 4.5.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Columbia Upper	stable or increasing		NA	NA	NA

Status:

Population	Adult Abundance
Columbia Upper	Unknown

F. Columbia Upper White Sturgeon

Section 4.5.2F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Columbia Upper	5,000		NA	NA	NA

Status:

Population	Adult Abundance
Columbia Upper	3000 adults

Section 4.5.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Entrainment at Grand Coulee and reservoir level fluctuations[1,2,3,5]
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations[1,2,3,4,5]
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations[1,2,3,4,5]
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations[1,2,3,5]
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations[1,2,3,5]
Contaminants	Legacy land use	Industry, agriculture, and forestry[1,2,3,4,5]
Competition/Predation	Non-native species	Walleye and smallmouth bass[1,2,2,4,5]
Population traits	Stocking	Hybridization of wild fish with hatchery releases[1,2,4]
Harvest	Sport fishing	Overharvest[1,2,5]
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem[1,2,5]

[1]Redband/rainbow trout, [2]Kokanee, [3]Burbot, [4]Westslope cutthroat trout, [5]White sturgeon

Section 4.5.2 Strategies and Measures for Columbia Upper White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations[1,2,3,5]	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations[1,2,3]	Immediate	5-10 years
	• B. Quantify levels of primary, secondary and		5-10 years

	benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas for habitat protection, enhancement, and restoration[1,2,3,5] • C. Experiment with release strategies to maximize recruitment to fishery[1,2,5] • D. Maximize water retention times to increase rearing capacity and maintain high water elevation[2] • E. Conduct research to examine the relationships between spring and summer discharge and recruitment (in relation to increase mean daily discharge at the international border in the spring and summer)[5] • F. Conduct research to determine if delayed reservoir refill results in more riverine habitat and/or recruitment[5]		5-10 years 5-10 years 0-5 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat[1,2,3,4,5]	• G. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat[1,2,3,4,5] • H. Enhance and restore physical in-stream and riparian habitat[1,2,3,4,5]	Immediate	5-10 years 10+ years
• Increase available habitat[2]	• I. Develop a habitat improvement plan that identifies specific sites, action, and prioritization for each action[2] • J. Develop a community outreach plan[2]	Immediate	0-5 years 0-5 years

Water Quantity			
• Ensure adequate water for all life stages[1,2,3]	• K. Establish minimum in-stream flow rules for tributaries and all life stages[1,2,3] • L. Purchase water rights[3] • M. Develop water conservation program and public outreach and education about water conservation[3] • N. Maintain current hydrograph with a peak during the freshet to cue spawning[5]	Immediate	10+ years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Lake Roosevelt[1,2,3,5]	• O. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios[1,2,3,5] • P. Experiment with release strategies to maximize recruitment to fishery[1,2,5] • Q. Negotiate hydro-operations and facility improvements[1,2,3,5]	Immediate	10+ years 5-10 years 10+ years
• Increase dissolved oxygen levels[4]	• R. Identify lakes with hypolimnetic anoxia[4] • S. Develop strategies to address dissolved oxygen limitation[4]	Immediate	0-5 years 0-5 years
Nutrients			
• Increase nutrients[1,2,3,5]	• T. Identify streams and populations that would benefit from nutrient enhancement[1,2,3] • U. Implement a nutrient addition program[1,2,3] • V. Modify hydro-operations to increase retention times to allow for nutrient assimilation and increased primary and secondary production[1,2,3] • W. Develop a nutrient enhancement program including levels needed,	Immediate	5-10 years 10+ years 10+ years 10+ years

	application strategy, monitoring and evaluation, and public outreach and education[1,2,3,5] • X. Quantify impacts of hydro-operations on primary and secondary production related to retention times[1,2,3,5] • Y. Negotiate hydro-operations[1,2,3,5]		5-10 years 10+ years
• Reduce nutrient loading[1,2]	• Z. Identify sources of point and non-point nutrient addition[1,2,3] • AA. Develop strategies and programs to reduce nutrient additions[1,2,3]	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants[1,2,3,4,5]	• BB. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources[1,2,3,4,5]	Immediate	5-10 years
Competition/Predation			
• Reduce or eliminate non-native predators[1,2,3,4,5]	• CC. Quantify rates of predation/competition by non-native predators[1,2,3,4,5] • DD. Develop fishing regulation changes[1,2,3,5] • EE. Experiment with release strategies to maximize recruitment to fishery[1,2,5] • FF. Establish a removal/ reduction program[1,3,4,5] • GG. Increase removal efficiency by liberalizing bag limits for non-native species (walleye and smallmouth bass)[2]	Immediate	0-5 years 0-5 years 0-5 years 5-10 years

Population Traits			
• Maintain wild-type genetic diversity and minimize hybridization[1,2]	• HH. Utilize triploid/sterile hatchery fish for stocking programs[1,2] • II. Maximize harvest of hatchery fish[1,2] • JJ. Use marking methods to differentiate hatchery and wild fish for regulation of angler harvest[1,2] • KK. Develop a breeding program to ensure only pure native stocks are used[1,2]	Immediate	0-5 years 0-5 years 0-5 years 0-5 years
• Modify stocking strategy[4]	• LL. Experiment with release strategies to maximize recruitment to fishery[4]	Immediate	0-5 years
Harvest			
• Reduce harvest on sensitive stocks[1,2,5]	• MM. Quantify angling impacts on wild stocks[1,2,5] • NN. Develop fishing regulation changes[1,2,5] • OO. Increase enforcement to prevent poaching, and Increase public outreach and education[1,2,5] • PP. Decrease bag limit from 2 to 0 (natural origin) in Lake Roosevelt[2]	Immediate	0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats[1,2]	• QQ. Identify critical areas for tributary access / passage protection, enhancement, and restoration[1,2] • RR. Identify barriers preventing access to tributaries under different hydro-operation scenarios[1,2] • SS. Enhance or restore access as appropriate[1,2] • TT. Identify barriers preventing access to habitat[1,2]	Immediate	0-5 years 0-5 years 5-10 years 0-5 years 5-10 years

	• UU. Negotiate hydro-operations[1]		

[1]Redband/rainbow trout, [2]Kokanee, [3]Burbot, [4]Westslope cutthroat trout, [5]White sturgeon

Section 4.5.3 Pend Oreille Subbasin

A. Pend Oreille Bull Trout

Section 4.5.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Lake Pend Oreille	>100			>100	
	Number of Local Populations				
	At least 6		At least 6		
	Total Number of Adults				
	2,500				2,500
Priest Lakes	Number of adults/populations			>100	
	>100				
	Number of Local Populations				
	At least 5		At least 5		
	Total Number of Adults				
	1,000				1,000
Pend Oreille River	Number of adults/populations				
	Number of Local Populations				

	8		8		
	Total Number of Adults				
	1,575-2,625				1,575-2,625

Status:

Population	Number of adults/populations	Number of Local Populations	Total Number of Adult Abundance Estimate
Lake Pend Oreille			4,173 (2007)
Priest Lakes			7 redds (2007)
Pend Oreille River			--

Section 4.5.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/Predation	Non-native species	Bull trout, lake trout, and rainbow trout are competing for an increasingly limited forage base of kokanee in Lake Pend Oreille. If kokanee are extirpated, lake trout will likely replace bull trout in the lake. In addition, lake trout predation on young bull trout will likely increase as forage becomes scarce.
Habitat access	Dams	Albeni Falls Dam (federal) and Cabinet Gorge Dam (private) are barriers to bull trout migration above and below Lake Pend Oreille, and block access to historic spawning areas.

Section 4.5.3A.3 Strategies and Measures for Pend Oreille Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition/Predation			

• Remove non-native predators (lake trout and rainbow trout)	• A. Continue program of removing lake trout by trap netting and gillnetting • B. Locate concentrations of lake trout by sonic telemetry to improve harvest • C. Keep liberal regulations for the sport fishery on lake and rainbow trout (no harvest limits, no season, and no size limits) • D. Pay anglers to harvest lake trout and rainbow trout to increase harvest • E. Allow harvest of rainbow trout in tributary streams where rainbow trout spawn • F. Evaluate removal program through an adaptive management approach and change methodology as needed • G. Research the potential for lake level changes to impact lake trout spawning • H. Monitor predator and kokanee populations in the lake to determine if measures are working • I. Research and implement other alternatives for lake trout and rainbow trout management as they are developed in an attempt to reduce the forage demand of predators	Immediate	0-10+ years
Habitat Access			
• Provide passage	• J. The US Army Corps of Engineers, the State of Idaho, Bonneville Power Administration, and US Fish and Wildlife Service shall work cooperatively to evaluate, develop and implement a method to allow bull trout passage at Albeni Falls Dam • K. At Cabinet Gorge Dam, Avista Corps, the State of Idaho, and US Fish and	Immediate	0-10+ years

	Wildlife Service should continue its efforts for the evaluation and implementation of bull trout passage		

Section 4.5.4 Pend Oreille Subbasin

A. Pend Oreille Bull Trout (Northeast Washington)

Section 4.5.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Pend Oreille (Northeast Washington)	--			--	
	Number of Local Populations		At least 9		
	At least 9				
	Total Number of Adults				
	1,575-2,625				1,575-2,625

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Pend Oreille (Northeast Washington)	Unknown	1 potential	Unknown

Section 4.5.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use;	Agriculture, forestry, and hydro-

	dams	operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Brook trout
Population traits	Stocking	Hybridization of wild fish with hatchery releases
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem

Section 4.5.4A.3 Strategies and Measures for Pend Oreille Bull Trout (Northeast Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	0-5 years
	• B. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas for habitat protection, enhancement, and restoration,		0-5 years
	• C. Experiment with release strategies to maximize recruitment to fishery		5-10 years
Habitat Quality/Quantity			
• Provide adequate water temperatures and dissolved oxygen levels	• D. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat	Immediate	0-5 years
	• E. Enhance and restore		10+ years

	physical in-stream and riparian habitat		
Water Quality			
Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Pend Oreille River	• F. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • G. Experiment with release strategies to maximize recruitment to fishery • H. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 5-10 years 5-10 years
Nutrients			
• Reduce nutrient loading	• I. Identify sources of point and non-point nutrient addition • J. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• K. Determine types, extent, and impacts of all potential contaminants • L. Develop cleanup strategies for pollution sources	Immediate	0-5 years 5-10 years
Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Experiment with release strategies to maximize recruitment to fishery • P. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 5-10 years 5-10 years
Population Traits			
• Minimize hybridization	• Q. Maximize harvest of hatchery fish • R. Modify stocking strategies to reduce potential genetic	Immediate	0-5 years 0-5 years

	interaction • S. Limit non-native species expansion		10+ years
Harvest			
• Reduce take on sensitive stocks	• T. Quantify angling impacts on wild stocks • U. Increase enforcement to stop poaching • Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage and habitat connectivity for all life history stages	• V. Identify barriers preventing access to tributaries under different hydro-operations • W. Where appropriate install fish passage at hydropower projects to provide access to tributaries to allow for expression of all life histories • X. Implement fish passage program where appropriate • Y. Negotiate hydro-operations	Immediate	0-5 years 10+ years 10+ years 5-10 years

B. Pend Oreille Kokanee

Section 4.5.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Annual Harvest		Number of local populations	Number of adults	Total number of adults
Lake Pend Oreille	300,000		NA	NA	NA
	Catch Rate				
	1.5 fish/hour by 2015		NA	NA	NA
Pend Oreille River	Catch Rate				
	0.5 fish/hour		NA	NA	NA

Status:

Population	Annual Harvest	Catch Rate
Lake Pend Oreille	Closed	Closed
Pend Oreille River	Unknown	Unknown

Section 4.5.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Non-native species	Lake trout and rainbow trout
Habitat quality/quantity	Hydro-operations	Hydropower operations affect spawning habitat and egg incubation

Section 4.5.4B.3 Strategies and Measures for Pend Oreille Kokanee (Lake Pend Oreille)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Predation			
• Reduce predation on kokanee by non-native predators until kokanee recover	• A. Continue the program of removing lake trout by trap netting and gillnetting. • B. Locate concentrations of lake trout by sonic telemetry to improve harvest • C. Maintain liberal regulations for the sport fishery for predatory fish (no harvest, no season, and no size limits) • D. Pay anglers to harvest lake trout and rainbow trout • E. Allow harvest of rainbow trout in tributary streams where rainbow trout spawn • F. Monitor the abundance of lake trout, rainbow trout, bull trout and kokanee to determine the effectiveness of the recovery efforts • G. Evaluate removal program through an adaptive management approach and change methodology as needed. Investigate establishing a commercial lake whitefish fishery and increasing by-catch of lake	Immediate	0-10+ years

	trout as one additional way to suppress lake trout abundance and predation on kokanee • H. Research the potential for lake level changes to impact lake trout spawning. • I. Assess potential benefits of fertilizing a section of the lake to: 1) increase kokanee growth to help them avoid predation, and 2) change their distribution in the lake and avoid the north end where lake trout are more numerous • J. Implement a fertilization project if the evaluation shows potential benefits and acceptable risks • K. Research kokanee stocking strategies for methods to improve kokanee recovery		

Hydro-operations			
• Modify hydro-operations	• L. In some years, lower the winter elevation of the lake to the minimum pool level to allow wave action to clean and re-sort shoreline gravel. Then in subsequent years, hold the lake 4 feet higher to allow kokanee to spawn in the previously cleaned gravel. In any given year consideration should be given to adult kokanee abundance, precipitation forecast, the success of chum salmon spawning during the previous year, and previous frequency of draw downs in deciding on a winter lake level • M. Annually, during August or September, the IDFG, USACE, BPA, USFWS, NOAA, and the Lakes Commission should meet to decide on winter lake elevations that benefit both kokanee and chum salmon below Bonneville Dam. A decision tree has been developed to assist in the section of a pool level. To assist in the selection of a lake level, the abundance of kokanee spawners should be estimated annually. • N. Examine kokanee spawning habitat annually by core sampling to determine if lake level changes are having the desired effect of improving habitat quality	Immediate	0-10+ years
Habitat Quality/Quantity			
• Protect and improve shoreline spawning habitat	• O. Work with regulatory agencies to ensure kokanee spawning areas are protected by the established regulatory process • P. Establish a fund for purchasing land or obtaining conservation easements to kokanee spawning areas that occur on private property, and to do habitat work on the	Immediate	0-10+ years

	shoreline to protect nearby spawning areas		

Section 4.5.4B.4 Strategies and Measures for Pend Oreille Kokanee (Washington portion)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	0-5 years
	• B. Quantify levels of primary, secondary and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios, and identify critical areas for habitat protection, enhancement, and restoration,		0-5 years
	• C. Experiment with release strategies to maximize recruitment to fishery		0-5 years
Habitat Quality/Quantity			
• Provide adequate water temperatures and dissolved oxygen levels	• D. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat	Immediate	0-5 years
	• E. Enhance and restore physical in-stream and riparian habitat		10+ years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels throughout Pend Oreille River Drainage	• F. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios	Immediate	0-5 years
	• G. Experiment with release strategies to		0-5 years

	maximize recruitment to fishery • H. Negotiate hydro-operations and facility improvements		5-10 years
Nutrients			
• Reduce nutrient loading	• I. Identify sources of point and non-point nutrient addition • J. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• K. Determine types, extent, and impacts of all potential contaminants • L. Develop cleanup strategies for pollution sources	Immediate	0-5 years 5-10 years
Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Experiment with release strategies to maximize recruitment to fishery • P. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 0-5 years 5-10 years
Population Traits			
• Minimize hybridization	• Q. Maximize harvest of hatchery fish • R. Modify stocking strategies to reduce potential genetic interaction • S. Limit non-native species expansion	Immediate	0-5 years 0-5 years 10+ years

Harvest			
• Reduce take on sensitive stocks	• T. Quantify angling impacts on wild stocks • U. Increase enforcement to stop poaching • V. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years
Habitat Access			
• Restore fish passage and habitat connectivity for all life history stages	• W. Identify barriers preventing access to tributaries under different hydro-operations • X. Where appropriate install fish passage at hydropower projects to provide access to tributaries to allow for expression of all life histories • Y. Implement fish passage program where appropriate • Z. Negotiate hydro-operations	Immediate	0-5 years 10+ years 10+ years 5-10 years

C. Pend Oreille Mountain Whitefish (Idaho)

Section 4.5.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	None		NA	NA	NA

Status:

Population	Adult Abundance
Pend Oreille	Unknown

Section 4.5.4C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use; hydropower	Dams, culverts, and other man-made barriers
Habitat quality/quantity	Current land use; hydropower	Forestry, agriculture, residential, and hydro-operations

Section 4.5.4C.3 Strategies and Measures for Pend Oreille Whitefish (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			
• Improve passage	• A. Prioritize streams with habitat access problems and implement projects to remove the barrier	Immediate	0-10+ years
Habitat Quality/Quantity			
• Improve the habitat in tributary streams	• B. Prioritize streams where the most benefit for mountain whitefish and other native species can be obtained • C. Conduct stream improvement projects to repair damaged habitat	Immediate	0-10+ years

D. Pend Oreille Mountain Whitefish (Washington)

Section 4.5.4D.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	None		NA	NA	NA

Status:

Population	Adult Abundance
Pend Oreille	Unknown

Section 4.5.4D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality./quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	All introduced species
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Harvest	Sport fishing	Overharvest

Section 4.5.4D.3 Strategies and Measures for Pend Oreille Whitefish (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Identify critical areas for habitat protection, enhancement, and restoration • B. Negotiate hydro-operations	Immediate	0-5 years 5-10 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• C. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • D. Enhance and restore physical in-stream and riparian habitat	Immediate	5-10 years 10+ years

Water Quantity			
• Ensure adequate water for all life stages	• E. Establish minimum in-stream flow rules for tributaries and all life stages • F. Purchase water rights • G. Develop water conservation program, and public outreach and education about water conservation	Immediate	5-10 years 10+ years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels	• H. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • I. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 5-10 years
• Increase dissolved oxygen in lakes	• J. Identify lakes with hypolimnetic anoxia and develop strategies to address dissolved oxygen limitation	Immediate	0-5 years
Nutrients			
• Reduce nutrient loading	• K. Identify sources of point and non-point nutrient addition • L. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 0-5 years
Contaminants			
• Remove point and non-point sources of contaminants	• M. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Predation/Competition			
• Reduce non-native predator densities	• N. Quantify rates of predation/competition by non-native predators • O. Develop fishing regulation changes • P. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 5-10 years

Harvest			
• Reduce harvest on sensitive stocks	• Q. Quantify angling impacts on wild stocks	Immediate	0-5 years
	• R. Develop fishing regulation changes		0-5 years
	• S. Increase enforcement to prevent poaching		0-5 years
	• T. Increase public outreach and education		0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• U. Identify critical areas for tributary access/passage protection, enhancement, and restoration	Immediate	0-5 years
	• V. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate, identify barriers preventing access to habitat		0-5 years
	• W. Negotiate hydro-operations		5-10 years
	• X. Implement fish passage restoration programs where appropriate		5-10 years
	• Y. Where appropriate, install volitional fish passage facilities at all hydropower projects to provide access to tributaries to allow for expression of all life histories		10+ years

E. Pend Oreille Westslope Cutthroat Trout (Idaho)

Section 4.5.4E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or enhance existing populations of westslope cutthroat trout and insure their persistence. Expand indigenous pure strain westslope cutthroat trout populations, once determined, to insure genetic integrity and persistence		Number of local populations	Number of adults	Total number of adults
Pend Oreille			NA	NA	NA

Status:

Population	Annual Harvest
Pend Oreille	166 (2007)

Section 4.5.4E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition/Predation	Non-native species	Lake trout and rainbow trout
Habitat access	Hydropower facilities	Cabinet Gorge Dam blocks access to spawning and rearing habitat in the Clark Fork River. Barriers have eliminated cutthroat trout runs in small drainages critical for reproduction
Habitat quality/quantity	Current land use	Development, logging and mining
Population traits	Non-native species	Introgression with rainbow trout

Section 4.5.4E.3 Strategies and Measures for Pend Oreille Westslope Cutthroat Trout (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe

Predation			
• Reduce the abundance of lake trout in Lake Pend Oreille	• A. Continue the program of removing lake trout by trap netting and gillnetting • B. Locate concentrations of lake trout by sonic telemetry to improve harvest • C. Maintain liberal regulations for the sport fishery on lake trout (no harvest, no season, and no size limits) • D. Pay anglers to harvest lake trout • E. Monitor the abundance of lake trout to evaluate the removal program through an adaptive management approach and change methodologies as needed • F. Investigate establishing a commercial lake whitefish fishery and increasing by-catch of lake trout as one additional way to suppress lake trout abundance and predation on cutthroat • G. Research the potential for lake level changes to impact lake trout spawning	Immediate	0-10+ years
Habitat Access			
• Identify options for fish passage above Cabinet Gorge Dam	• H. Idaho Fish and Game will work with Montana Fish Wildlife and Parks and Avista Corps to evaluate the benefits and risks of passing fish above Cabinet Gorge Dam. If benefits outweigh the risks, begin passing fish around the dam. The results of these efforts should be monitored to determine their effectiveness	Immediate	0-10+ years
• Identify/correct barriers	• I. Inventory migration barriers on cutthroat spawning streams, and prioritize their importance to improve stream and population connectivity	Immediate	0-10+ years
Habitat Quality/Quantity			

• Address habitat limitations where feasible	• J. Inventory cutthroat habitat throughout the subbasin • K. Develop a prioritized list of habitat improvement projects that gives priority to genetically pure populations and economically feasible solutions to habitat problems • L. Implement habitat projects and evaluate cutthroat population response to habitat improvement efforts	Immediate	0-10+ years
Population Traits			
• Identify pure westslope cutthroat trout populations and implement measures to protect the genetic integrity of remaining pure populations	• M. Conduct a drainage-wide inventory to evaluate the distribution, population status and genetic purity of westslope cutthroat trout populations • N. Implement a program to expand genetically pure populations in cutthroat trout in key spawning tributaries and monitor the effectiveness of these efforts	Immediate	0-10+ years

F. Pend Oreille Westslope Cutthroat Trout (Washington)

Section 4.5.4F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Harvest Rate (healthy wild stocks)		Number of local populations	Number of adults	Total number of adults
Pend Oreille	0.15 fish/hour		NA	NA	NA
	Harvest Rate (hatchery origin)				
	0.5 fish/hour		NA	NA	NA

Status:

Population	Harvest Rate (wild)	Harvest Rate (hatchery)
Pend Oreille	Unknown	est. 0.1 fish per hours (lakes)

Section 4.5.4F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	Introduced species
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem
Population traits	Stocking	Hybridization of wild fish with hatchery releases
Harvest	Sport fishing	Overharvest

Section 4.5.4F.3 Strategies and Measures for Pend Oreille Westslope Cutthroat Trout (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	0-5 years
	• B. Quantify impacts of hydro-operations on		0-5 years

	primary and secondary production related to retention times (Boundary Reservoir) • C. Identify critical areas for habitat protection, enhancement, and restoration • D. Experiment with release strategies to maximize recruitment to fishery, • E. Negotiate hydro-operations		0-5 years 0-5 years 5-10 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• F. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • G. Enhance and restore physical in-stream and riparian habitat	Immediate	0-5 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages	• H. Establish minimum in-stream flow rules for tributaries and all life stages • I. Purchase water rights • J. Develop water conservation program, and public outreach and education about water conservation	Immediate	0-5 years 5-10 years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels	• K. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios • L. Experiment with release strategies to maximize recruitment to fishery • M. Negotiate hydro-operations and facility improvements	Immediate	0-5 years 0-5 years 5-10 years

• Increase dissolved oxygen in lakes	• N. Identify lakes with hypolimnetic anoxia and develop strategies to address dissolved oxygen limitation		0-5 years
Nutrients			
• Reduce nutrient loading	• O. Identify sources of point and non-point nutrient addition • P. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 0-5 years
Contaminants			
• Remove point and non-point sources of contaminants	• Q. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Competition/Predation			
• Reduce non-native predator densities	• R. Quantify rates of predation/competition by non-native predators • S. Develop fishing regulation changes • T. Experiment with release strategies to maximize recruitment to fishery • U. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 0-5 years 5-10 years
Habitat Access			
• Restore fish passage for all life stages to all habitats	• V. Identify critical areas for tributary access/passage protection, enhancement, and restoration • W. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate • X. Identify barriers preventing access to habitat • Y. Negotiate hydro-operations • Z. Implement fish passage	Immediate	0-5 years 0-5 years 0-5 years 5-10 years

	restoration programs where appropriate • AA. Where appropriate, install volitional fish passage facilities at all hydropower projects to provide access to tributaries to allow for expression of all life histories		10+ years 10+ years
Population Traits			
• Minimize hybridization	• BB. Utilize triploid/sterile hatchery fish for stocking programs • CC. Maximize harvest of hatchery fish • DD. Modify stocking strategies to reduce potential genetic interaction • EE. Limit non-native species expansion • FF. Use marking methods to differentiate hatchery and wild fish for regulation of angler harvest • GG. Develop a breeding program to ensure only pure native stocks used, and establish an active removal/reduction program		0-5 years 0-5 years 0-5 years 5-10 years 0-5 years 0-5 years
Harvest			
• Reduce harvest on sensitive stocks	• HH. Quantify angling impacts on wild stocks • II. Develop fishing regulation changes • JJ. Increase enforcement to prevent poaching • KK. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years

G. Pend Oreille Gerrard Trout (Idaho)

Section 4.5.4G.1 Biological Objectives and Status

	Subbasin/Management		Draft Recovery Plan

	Plans				
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Lake Pend Oreille	30 hours/fish		NA	NA	NA
	Annual Harvest				
	3,000 fish > 24 inches and 3% (90) over 20 pounds by 2015		NA	NA	NA

Status:

Population	Catch Rate	Annual Harvest
Lake Pend Oreille	--	3,761 (2007)

Section 4.5.4G.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Competition	Non-native species	Lake trout, rainbow trout, and bull trout are collapsing the kokanee forage base, which is forcing fish managers to limit the rainbow trout population and reduce the number of trophy rainbow trout in the sport fishery.
Habitat access	Hydro-operations	Cabinet Gorge Dam and Albeni Falls Dam limit rainbow trout access to tributary streams for spawning and rearing

Section 4.5.4G.3 Strategies and Measures for Pend Oreille Gerrard Trout (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Competition			
• Implement a short-term reduction of the rainbow trout population such that age 1-2 kokanee survival	• A. Reduction efforts include maintaining liberalized fishing regulations for rainbow trout on the lake and in the tributaries. Investigate and implement other means of population control	Immediate	0-10+ years

is over 50% by 2010. Continue efforts to reduce the predation of kokanee by lake trout to reduce lake trout-rainbow trout competition	(tributary weiring, redd removal) if a sport fishery is not successful at reducing rainbow trout abundance. • B. Annually estimate the kokanee abundance within Lake Pend Oreille and calculate survival rates, production, and yield from the previous year as well as periodically estimating the abundance of lake trout and rainbow trout to see if efforts to reduce predacious fish are having the desired effect. • C. Once kokanee are recovered, implement management strategies to restore the trophy rainbow trout fishery in Lake Pend Oreille. Strategies may include special rules on harvest, re-stocking with pure strain Gerrard rainbow trout, or other means necessary to meet stated objectives		
Habitat Access			
• The strategy is to not improve spawning habitat for rainbow trout until kokanee recover	• D. Following kokanee recovery, improve connectivity and condition of Gerrard rainbow trout spawning habitat	Immediate	10+ years

H. Pend Oreille Burbot (Washington)

Section 4.5.4H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	Unknown		2	Unknown	Unknown

Status:

Population	Adult

	Abundance
Pend Oreille	Unknown

Section 4.5.4H.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	All introduced species
Harvest	Sport fishing	Overharvest

Section 4.5.4H.3 Strategies and Measures for Pend Oreille Burbot (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	0-5 years
	• B. Quantify levels of primary, secondary and benthic acroinvertebrate production in near-shore habitats under various hydro-operation scenarios		0-5 years
	• C. Identify critical areas for habitat protection, enhancement, and restoration		0-5 years
	• D. Negotiate hydro-operations		0-5 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian	• E. Identify critical areas for habitat protection,	Immediate	0-5 years

habitat	enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat • F. Enhance and restore physical in-stream and riparian habitat		5-10 years
Water Quality			
• Maintain dissolved oxygen levels	• G. Develop strategies to address potential future dissolved oxygen limitation due to increased development and land use		0-5 years
Nutrients			
• Increase nutrients in Lake Sullivan	• H. Develop a nutrient enhancement program including levels needed, application strategy, monitoring and evaluation, and public outreach and education • I. Quantify impacts of hydro-operations on primary and secondary production related to retention times, negotiate hydro-operations	Immediate	10+ years 0-5 years
• Reduce nutrient loading	• J. Identify sources of point and non-point nutrient addition • K. Develop strategies and programs to reduce nutrient additions	Immediate No reduced nutrient loading to Sullivan lake	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• L. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Establish a removal/	Immediate	0-5 years 0-5 years

	reduction program		5-10 years
Harvest			
• Reduce harvest on sensitive stocks	• P. Quantify angling impacts on wild stocks • Q. Develop fishing regulation changes • R. Increase enforcement to prevent poaching • S. Increase public outreach and education	Immediate	0-5 years 0-5 years 0-5 years 0-5 years

I. Pend Oreille Pygmy Whitefish (Washington)

Section 4.5.4I.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Pend Oreille	None		NA	NA	NA

Status:

Population	Adult Abundance
Pend Oreille	Unknown

Section 4.5.4I.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Dams	Reservoir level fluctuations
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations
Contaminants	Legacy land use	Industry, agriculture, and forestry
Competition/predation	Non-native species	All introduced species

Section 4.5.4I.3 Strategies and Measures for Pend Oreille Pygmy Whitefish (Washington)

Strategy	Measure	Implementation Timeframe	Expected Response

			Timeframe
Hydro-operations			
• Modify hydro-operations	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations	Immediate	0-5 years
	• B. Quantify levels of primary, secondary and benthic acroinvertebrate production in near-shore habitats under various hydro-operation scenarios		0-5 years
	• C. Identify critical areas for habitat protection, enhancement, and restoration		0-5 years
	• D. Negotiate hydro-operations		0-5 years
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat	• E. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat	Immediate	0-5 years
	• F. Enhance and restore physical in-stream and riparian habitat		5-10 years
Water Quality			
• Maintain dissolved oxygen levels in laes	• G. Develop strategies to address potential future dissolved oxygen limitation due to increased development and land use	Immediate	0-5 years
Nutrients			
• Increase nutrients in Lake Sullivan	• H. Develop a nutrient enhancement program including levels needed, application strategy, monitoring and evaluation, and public outreach and education	Immediate	10+ years
	• I. Quantify impacts of hydro-operations on primary and secondary		0-5 years

	production related to retention times, negotiate hydro-operations		
• Reduce nutrient loading	• J. Identify sources of point and non-point nutrient addition • K. Develop strategies and programs to reduce nutrient additions	Immediate	0-5 years 5-10 years
Contaminants			
• Remove point and non-point sources of contaminants	• L. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources	Immediate	5-10 years
Competition/Predation			
• Reduce non-native predator densities	• M. Quantify rates of predation/competition by non-native predators • N. Develop fishing regulation changes • O. Establish a removal/ reduction program	Immediate	0-5 years 0-5 years 5-10 years
Population Traits			
• Reduce incidental impact	• P. Increase public outreach and education	Immediate	0-5 years

Section 4.5.5 Sanpoil Subbasin

A. Sanpoil Rainbow Trout

Section 4.5.5A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Sanpoil	None		NA	NA	NA

Status:

Population	Adult Abundance
Sanpoil	Unknown

Section 4.5.5A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.5.5A.3 Strategies and Measures for Sanpoil Rainbow Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			

B. Sanpoil Kokanee

Section 4.5.5B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Sanpoil	1 fish/hour		NA	NA	NA
	Annual Harvest				
	10,000 - 40,000				

Status:

Population	Catch Rate	Annual Harvest
Sanpoil	--	3 (2007)

Section 4.5.5B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations
Competition/predation	Non-native species	Walleye and smallmouth bass
Hydro-operations	Dams	Water retention time and reservoir level fluctuations
Harvest	Sport fishing	Overharvest

Section 4.5.5B.3 Strategies and Measures for Sanpoil Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			

• Increase available habitat	• A. Develop habitat improvement strategy that identifies specific sites and actions and prioritization of each action • B. Restore fish passage at all major barriers (i.e., dams, dikes, weirs, etc.) and culvert crossing • C. Restore habitat complexity (in-stream and riparian),relocate, obliterate, or reconstruct road segments, restore flow • D. Develop community outreach plan with the primary purpose of educating land owners on land use practices	Immediate	0-5 years
Competition/Predation			
• Reduce non-native population	• E. Increase removal efficiency by liberalizing bag limits for non-native species (walleye and smallmouth bass)	Immediate	0-5 years
Hydro-operations			
• Modify hydro-operations	• F. Maximize water retention times to increase rearing capacity • G. Maintain higher water elevation	Immediate	0-5 years
Harvest			
• Reduce angler harvest	• H. Decrease bag limit from 2 to 0 kokanee/day (natural origin kokanee only) in Lake Roosevelt	Immediate	0-5 years

Section 4.5.6 Spokane Subbasin

A. Spokane Redband Trout

Section 4.5.6A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Abundance		Number of local populations	Number of adults	Total number of adults

	(age 1+)				
Spokane (Upiver Dam to Stateline)	10,000		NA	NA	Na
	Harvest Rate				
	No hatchery fish in this area. Catch and release only		NA	NA	NA
Monroe Street to Nine Mile Dam (includes all Hangman Creek tributaries)	Abundance				
	NA		NA	NA	NA

Status:

Population	Abundance (age 1+)	Harvest Rate
Spokane (Upiver Dam to Stateline)	1100	N/A
Monroe Street to Nine Mile Dam (includes all Hangman Creek tributaries)	Unknown	NA

B. Spokane Mountain Whitefish

Section 4.5.6B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Spokane and tributaries	None		NA	NA	Na

Status:

Population	Adult Abundance
Spokane and tributaries	Unknown

C. Spokane Kokanee

Section 4.5.6C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Harvest Rate (excluding sensitive stocks)		Number of local populations	Number of adults	Total number of adults
Spokane (Chain Lake and Little Spokane River)	0.5 fish/hour		NA	NA	Na

Status:

Population	Harvest Rate
Chain Lake	N/A closed to kokanee harvest
Little Spokane River /Horseshoe Lake	Unknown

D. Spokane Largemouth Bass

Section 4.5.6D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Spokane	1 fish/hour		NA	NA	Na

Status:

Population	Catch Rate
Spokane	1 fish / hr.

Section 4.5.6 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations (does not apply to Hangman Creek)	Dams	Reservoir level fluctuations and water retention times[1,2,3,4]

Habitat quality/quantity	Current land use; dams	Agriculture, forestry, and hydro-operations[1,2,3]
Water quality	Current land use; dams	Agriculture, forestry, and hydro-operations[2,3]
Water quantity	Current land use; dams	Agriculture, forestry, and hydro-operations[2,3]
Nutrients	Current land use; dams	Agriculture, forestry, and hydro-operations[2,3]
Contaminants	Legacy land use	Industry, agriculture, and forestry[2,3,4]
Competition/predation	Non-native species	Walleye and smallmouth bass[1,2,3]
Habitat access	Current and legacy land use	Diversions, culverts, and hydrosystem[2,3]
Harvest	Sport fishing	Overharvest[1,2,3]
Population traits	Stocking	Hybridization of wild fish with hatchery releases[1,2,3]

[1]Redband, [2]Mountain whitefish, [3]Kokanee, [4]Largemouth bass

Section 4.5.6 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Modify hydro-operations[1,2,3,4]	• A. Determine rates of entrainment under different hydro-operation scenarios and negotiate hydro-operations and facility operations[1,2,3]	Immediate	5-10 years
	• B. Identify critical areas for habitat protection, enhancement and restoration[1,2,3]		0-5 years
	• C. Experiment with release strategies to maximize recruitment to fishery[1,2,3]		10+ years
	• D. Negotiate hydropower operations at Post Falls HED to provide optimal discharge for spawning and emergence[1,2]		0-10 years

	• E. Quantify levels of primary, secondary, and benthic macroinvertebrate production in near-shore habitats under various hydro-operation scenarios[4]		
Habitat Quality/Quantity			
• Maintain and improve in-stream and riparian habitat[1,2,3]	• F. Identify critical areas for habitat protection, enhancement, and restoration, purchase lands, easements or conservation agreements to protect and enhance existing habitat[1,2,3] • G. Enhance and restore physical in-stream and riparian habitat[1,2,3]	Immediate	0-5 years 10+ years
Water Quantity			
• Ensure adequate water for all life stages[1,2,3]	• H. Establish minimum in-stream flow rules for tributaries and all life stages[1,2,3] • I. Purchase water rights[1,2,3] • J. Develop water conservation program, and public outreach and education about water conservation[1,2,3]	Immediate	5-10 years 5-10 years 0-5 years
Water Quality			
• Modify hydro-operations to ensure adequate water temperatures and dissolved oxygen levels in the mainstem Spokane River[1,2,3]	• K. Determine water temperature and dissolved oxygen conditions under different hydro-operation scenarios[1,2,3] • L. Experiment with release strategies to maximize recruitment to fishery[1,2,3] • M. Negotiate hydro-operations and facility improvements[1,2,3]	Immediate	0-5 years 10+ years 5-10 years
• Implement TMDL[1,2,3]	• N. Work with DOE to develop and implement TMDL for temperature, dissolved oxygen, and nutrients[1,2,3]	Immediate	0-10 years
Nutrients			
• Reduce nutrient	• O. Identify sources of	Immediate	0-5 years

loading[1,2,3]	point and non-point nutrient addition[1,2,3] • P. Develop strategies and programs to reduce nutrient additions[1,2,3]		5-10 years
Contaminants			
• Remove point and non-point sources of contaminants[1,2,3,4]	• Q. Determine types, extent, and impacts of all potential contaminants, and develop cleanup strategies for pollution sources[1,2,3,4]	Immediate	10+ years
Competition/Predation			
• Reduce non-native predator densities[1,2,3]	• R. Quantify rates of predation/competition by non-native predators[1,2,3] • S. Develop fishing regulation changes[1,2,3] • T. Experiment with release strategies to maximize recruitment to fishery[1,2,3] • U. Establish a removal/ reduction program[1,2,3]	Immediate	0-5 years 0-5 years 10+ years 0-5 years
Habitat Access			
• Restore fish passage for all life stages to all habitats[1,2,3]	• V. Identify critical areas for tributary access / passage protection, enhancement, and restoration[1,2,3] • W. Identify barriers preventing access to tributaries under different hydro-operation scenarios, and enhance or restore access as appropriate[1,2,3] • X. Identify barriers preventing access to habitat[1,2,3] • Y. Negotiate hydro-operations, and implement fish passage restoration programs where appropriate[1,2,3] • Z. Implement fish passage restoration programs where appropriate[3]	Immediate	0-5 years 0-5 years 0-5 years 5-10 years 5-10 years 10+ years
Harvest			
• Reduce harvest on	• AA. Quantify angling	Immediate	0-5 years

sensitive stocks[1,2,3]	impacts on wild stocks[1,2,3] • BB. Develop fishing regulation changes[1,2,3] • CC. Increase enforcement to prevent poaching[1,2,3] • DD. Increase public outreach and education[1,2,3]		0-5 years 0-5 years 0-5 years
Population Traits			
• Minimize hybridization[1,3]	• EE. Utilize triploid/sterile hatchery fish for stocking programs[1] • FF. Maximize harvest of hatchery fish[1] • GG. Modify stocking strategies to reduce potential genetic interaction[1,3] • HH. Limit non-native species expansion, use marking methods to differentiate hatchery and wild fish for regulation of angler harvest[1]	Immediate	0-5 years 0-5 years 0-5 years 0-5
• Maintain wild-type genetic diversity and population structure[1]	• II. Develop a breeding program that ensures wild-type genetic structure and diversity of the target population are fully represented[1]		5-10 years

[1]Redband, [2]Mountain whitefish, [3]Kokanee, [4]Largemouth bass

Section 4.6 Mountain Columbia Province

Section 4.6.1 Flathead Subbasin

A. Flathead Bull Trout

Section 4.6.1A.1 Biological Objectives and Status

	Subbasin Plan		Draft Recovery Plan		
Populations (cores)	Number of Adults		Number of local populations	Number of adults	Total number of adults
Flathead & Swan	2500 individuals per population		21 tributary drainages&32 named streams	>100 individuals per population	2500-Flathead&5000-Swan

	Number of Local Populations				
	At Least 5		At least 5 per core	There are 5 in Flathead with >100 annually	There are currently 4 with >100 in Swan annually
	Total Number of Adults				
	≥ 1,000				≥ 1,000

Status:

Population	Number of Adults	Number of Local Populations	Total Number of Adults
Flathead Lake	2500	21	
Swan Lake	5000	10	
Hungry Horse	4875	11	

Section 4.6.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro Power Operations	Alteration of natural flows/processes; Reservoir drawdown;	Timing, duration, and volume of releases from Hungry Horse; downstream flows and temperatures; Lost in-lake habitat due to Hungry Horse operations; volumetric turnover rates
Competition/Predation	Non-native species	Lake trout predation & competition
Population traits	Non-native species	Hybridization & competition with brook trout; isolation
Habitat quality/quantity	Current land use; loss of habitat associated with construction & inundation of HH Dam	Residential development, forestry, high road density, livestock grazing, floodplain development; loss of over 40% of spawning habitat to the

		interconnected Flathead System due to the construction of HH Dam; loss of 125.8 km of habitat due to inundation caused by HH Dam

Section 4.6.1A.3 Strategies and Measures for Flathead Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydropower Operation			
• Restore natural hyrologic conditions (ie. flow, timing and duration); operate Hungry Horse Dam to minimize negative impacts	• A. Implement integrated rule curves (IRC's) at Hungry Horse Dam • B. Adopt flood control provisions of the IRC's (VAR-Q) approach	Immediate	5-10 years
• Reduce reservoir operational impacts	• C. Reduce reservoir drawdown and reduce frequency of Hungry Horse refill failure to within five feet of full pool • D. Maintain or exceed recommended instream flows in the South Fork Flathead River • E. Consider bull trout and westslope cutthroat trout when developing flood control release patterns	Immediate	5-10 years
• Increase/Improve in-lake habitat	• F. Revegetate top ten feet of varial zone • G. Place artificial habitat structures where they are likely to benefit native fish	Immediate	5-10 years
• Increase seasonal or in-seasonal reservoir retention time	• H. Work with action agencies to adjust operations to increase retention time by five days relative to past	Immediate	5-10 years
Competition/Predation			

• Reduce the level of competition/ predation by non-native lake trout in Flathead Lake	• I. Conduct public-involved lake trout removal efforts in Flathead Lake • J. Monitor lake trout status and harvest levels in Flathead Lake	Immediate	5-10 years
• Identify status of newly discovered lake trout population in Swan Lake •	• K. Quantify lake trout population size and habitat utilization in Swan Lake • L. Develop and implement strategies to reduce or eliminate lake trout • M. Develop a management direction for bull trout protection in the Swan Drainage	Immediate	5-10 years
• Reduce competition with brook trout	• N. Implement liberal harvest regulations on brook trout • O. Develop/Implement fish stocking policies • P. Suppress/eradicate brook trout where feasible •	Immediate	>10 years

Population Traits			
• Minimize risk of brook trout hybridization in critical bull trout spawning and rearing tributaries	• Q. Assess current status and hybridization in bull trout spawning and rearing tributaries • R. Determine the life history and habitat utilization of the hybrid fish • S. Maintain liberal angling regulations for brook trout • T. Increase educational efforts on proper fish identification • U. Develop and enforce fish stocking policies and private fish pond licensing requirements • V. Suppress/eradicate brook trout where feasible	Immediate	>10 years
Habitat Quality/Quantity			
• Protect and maintain spawning and rearing habitat quality and the connectivity necessary for the migratory life history	• W. Work with willing landowners to provide long-term habitat protection through acquisition or easement • X. Implement stream restoration/enhancement projects where feasible • Y. Fulfill statutory obligations relative to streambed and bank protection • Z. Assure that rural residential development of private lands in alluvial valleys does not negatively impact migratory corridors connecting upstream spawning and rearing areas with the lake and river system • AA. Participate in the evaluation of forestry "best management practices" as stipulated	Immediate	5-10 years

	by the legislature		
• Mitigate for the 125.8 km of habitat inundated by the construction of Hungry Horse Dam	• BB. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate	5-10 years
• Mitigate for the loss of over 40% of the spawning habitat blocked by Hungry Horse Dam	• CC. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate	5-10 years

B. Flathead Westslope Cutthroat Trout

Section 4.6.1B.1 Biological Objectives and Status

	Subbasin Plan		Draft Recovery Plan		
Populations	Adults per conservation unit		Number of local populations	Number of adults	Total number of adults
Hungry Horse tributaries and Flathead Drainage	500 individuals per population (minimum of 50 in each subpopulation))		NA	NA	NA
	Genetically pure Populations				
	20		NA	NA	NA

Status:

Population	Adult Abundance	Genetic Purity
Hungry Horse Reservoir Tributaries	NA	95%+
Flathead Drainage	NA	80%
Hungry Horse Reservoir Tributaries	NA	95%+

Section 4.6.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Hydro-operations	Alteration of natural flows/processes; Reservoir drawdown	Timing, duration, and volume of releases from Hungry Horse; downstream flows and temperatures; limnological conditions
Competition/Predation	Non-native species	Lake trout predation; competition with

		rainbow trout and brook trout
Population traits	Non-native species	Hybridization with rainbow trout
Physical habitat quality/quantity	Current land use; loss of habitat associated with construction & inundation of HH Dam	Residential development, forestry, high road density, livestock grazing, floodplain development; loss of over 40% of spawning habitat to the interconnected Flathead System due to the construction of HH Dam; loss of 125.8 km of habitat due to inundation caused by HH Dam

Section 4.6.1B.3 Strategies and Measures for Flathead Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Hydro-operations			
• Restore and maintain natural hydrologic conditions (i.e., flow, timing, and duration), and operate the dam to minimize negative impacts	• A. Implement integrated rule curves (IRCs) for operation of Hungry Horse Dam and pursue adoption of the flood control provisions of the IRCs (VAR-Q approach)	Immediate	5-10 years
• Reduce reservoir operational impacts	• B. Reduce reservoir drawdown and reduce frequency of Hungry Horse refill failure to within five feet of full pool • C. Maintain or exceed recommended instream flows in the South Fork Flathead River • D. Consider bull trout and westslope cutthroat trout when developing flood control release patterns	Immediate	5-10 years
• Increase seasonal or in-seasonal reservoir retention time	• E. Work with action agencies to adjust operations to increase retention time by five days relative to past	Immediate	5-10 years
• Increase/Improve in-lake habitat	• F. Revegetate top ten feet of varial zone; improve shoreline habitat in Flathead Lake by implementing Kerr Project FWIS • G. Place artificial habitat structures where they are likely to benefit native fish	Immediate	>10 years
Competition/Predation			

• Reduce the level of predation by non-native lake trout in Flathead Lake and mainstem Flathead River	• H. Conduct public-involved lake trout removal efforts in Flathead Lake • I. Monitor lake trout status and harvest levels in Flathead Lake	Immediate	0-5 years
• Reduce competition with rainbow & brook trout	• J. Implement liberal harvest regulations on rainbow trout and brook • K. Develop/Implement fish stocking policies • L. Suppress/eradicate rainbow trout where feasible • M. Assess current status of competition with brook trout in westslope cutthroat spawning and rearing tributaries. • N. Increase educational efforts on proper fish identification	Immediate	5-10 years
Population Traits			
• Protect existing genetically pure populations of westslope cutthroat trout in the South Fork Drainage	• O. Remove all of the exotic trout from lakes and their associated streams where possible • P. Rely on genetically pure fish stocked in the headwater lakes to repopulate the stream systems and move them towards a genetically pure state • Q. Increase educational and enforcement activities to discourage illegal fish introduction • R. Characterize, conserve and monitor genetic diversity and gene flow among local populations • S. Conduct genetic inventory to understand the genetic baseline and monitor genetic strategies • T. Establish conservation	Immediate	5-10 years

	refuge areas for stronghold species assemblages • U. Incorporate conservation of genetic and behavioral attributes of westslope cutthroat trout into recovery and management plans • V. Manage local populations to maintain long-term viability		

Section 4.6.2 Kootenai Subbasin

A. Kootenai Bull Trout

Section 4.6.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Lake Koocanusa and Kootenai River/Kootenay Lake	>99			>100	
	Number of Local Populations				
	At least 5 each		5 each		
	Total Number of Adults				
	>999				1,000 each
Bull Lake	Number of adults/population				
	>99				
	Number of Local Populations				
	1				

	Total Number of Adults				
	>99				
Sophie Lake	Number of adults/population				
	>99				
	Number of Local Populations				
	1				
	Total Number of Adults				
	>99				

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Lake Koocanusa	6	6	>1,000 Upper Kootenay
Kootenay Lake and River	6	1	<500
Sophie Lake	1	1	Unknown
Bull Lake	1	1	>100

a: Information based on annual redd counts. Estimates of the total number of adults was based on an expansion of annual redd counts by a factor of 1.55 fish per redd (Baxter and Westover 2000) and averaged over the past five years.

Section 4.6.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime

		Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Gas super saturation during spill Volumetric turnover rate (Libby reservoir) <u>Biological Threats:</u> Reduced nutrients/system productivity Reduced number of individuals and populations Reduced population stability Entrainment at Libby Dam Reduced recruitment
Non-native species introductions	Demographic stress	<u>Biological Threats</u>: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size
Habitat quality/quantity	Current and past land use practices; loss of habitat associated with inundation habitats from the construction of Libby Dam	Physical Threats: Altered thermograph Channel stability Connectivity Habitat diversity Riparian habitat condition Turbidity, sediment regime Quantity of habitat due to the inundation of 240 km of habitat due to the construction of Libby Dam

Section 4.6.2A.3 Strategies and Measures for Kootenai Bull Trout

Strategy (SBP Obj.)	**Measure**	**Implementation Timeframe**	**Expected Response Timeframe**
Physical Habitat Restoration To improve the altered hydrograph: • Bring Libby Dam operations 50% closer to normative conditions during summer and spring while providing flood control (M1a). • Determine opportunities for hydro operations to	• A. Operate Libby Dam and the downstream hydropower system in ways that restore normative river functions in the lower Kootenai River, including hydrograph cycles that promote and maintain habitat diversity, and floodplain	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

remove delta blockages from tributary streams (M1b, T7b). • Improve hydrographs to meet QHA-generated high/low flow habitat restoration scores of reference streams (T7a).	connectivity. • B. Evaluate alternatives for Libby Dam operations to provide more appropriate water temperatures and increased flexibility in flow management, especially during winter and spring. • C. Develop, evaluate, and implement more normative seasonal flow windows and flow ramping rates.		
To improve the altered thermograph: • Modify the mainstem thermal regime to be more normative, within current thermal limitations imposed by Libby Dam and Koocanusa Reservoir, to be more within the tolerance range of all life stages of various aquatic and focal fish species (M4a). • Research, develop, and test new operational strategies for Libby Dam that could expand its role in more effectively providing a more normative downstream thermograph (M4b) • Protect and revegetate riparian areas to maintain shading and cool water temperatures (T5a). • Improve the thermograph to a level equivalent to the QHA-generated thermograph scores of reference and Class 1 streams (T5b)	• D. Use models to evaluate responses of habitat and fish populations to alternative dam operating strategies. • E. Monitor temperatures within the reservoir and downstream sites during flow augmentation and normative flow operations. • F. Develop multi-year experimental discharge agreements for Libby Dam operations to evaluate the effectiveness of restoring more natural thermographs for natural spawning, development, and recruitment for white sturgeon, burbot, bull trout and other important species and ecological functions.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To improve channel stability: • Improve channel stability to a level equivalent to the	See details of the 11 associated measures (listed as strategies) on Page 28 of the Management Plan	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

QHA-generated, channel stability habitat-restoration scores of reference streams (M6). • Improve channel stability to a level equivalent to the QHA-generated channel stability scores of reference and Class 1 streams. (T4).	section of the Kootenai River Subbasin Plan.		
To improve connectivity: • Restore, provide, and maintain passage to migratory fish by removing potential man-caused barriers, i.e. impassable culverts, hydraulic headcuts, water diversion blockages, landslides, and impassable deltas (T8).	• G. Identify, monitor, and maintain existing barriers necessary to keep introduced species at bay install new barriers where necessary to prevent invasion of introduced species. • H. Identify barriers or sites of entrainment for focal species, and implement tasks to provide passage and eliminate entrainment. • I. Eliminate entrainment in diversions and provide fish passage around diversions. • J. Install appropriate fish passage structures around diversions and/or remove related migration barriers. • K. Eliminate culvert barriers. Monitor road crossings for blockages to upstream passage and replace existing culverts that impede passage.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To increase habitat diversity: • Improve habitat diversity to levels equivalent to the QHA-generated habitat diversity habitat restoration scores, and habitat diversity conditions based on ecological primary	• L. Periodically alter Kootenai River hydrograph to restore hydraulic energy needed to create increase habitat diversity. • M. Design and implement re-	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

literature and possible references rivers (M5). • Protect habitat diversity in Class 1 streams and reaches (T6a). • Improve habitat diversity to a level equivalent to the QHA-generated habitat diversity scores of reference streams (T6b).	connection of side channel, slough, backwater and, in-river habitats.		
To restore the hydraulic regime: • Reduce reservoir drawdown and reduce the frequency of Koocanusa Reservoir refill failure to within five feet of full pool as compared to previous post-dam operation. (R1)	• N. Work with action agencies to improve reservoir refill probability and reduce maximum drawdown and increase seasonal and in-seasonal reservoir retention time by at least five days relative to past operations during similar water years.		
For habitat protection: • Protect and maintain prime, functioning tributary habitat identified as Class 1 in QHA analysis (T1).	• O. Implement actions necessary to maintain Class 1 status. • P. Periodically evaluate and update habitat condition.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To improve shoreline condition: • Revegetate the varial zone using best available techniques (R2)	• Q. Plan, coordinate, implement cost-effective means of revegetating the river and reservoir varial zones with appropriate techniques, agencies, and organizations.	Immediately (0-5 yr)	Immediately (0-5 yr) Medium term (5-10 yrs) Long Term (10+ yr)
To improve riparian habitat condition: • Improve riparian function and complexity of mainstem riparian habitat to support or contribute to sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use (M2). • Restore riparian habitats to levels equivalent to the	• R. Develop a consolidated riparian and wetland habitat map for the Kootenai Subbasin. • S. Investigate and analyze historic losses of riparian and wetland habitats in the Kootenai Subbasin. • U. Identify associated losses in biological functions and performance (e.g.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

QHA-generated riparian condition habitat restoration scores of reference streams (T2).	riparian dependent fish, animals, birds). • V. Coordinate efforts with natural resource managers to develop a comprehensive riparian and wetland habitat protection, rehabilitation, and enhancement plan for the Kootenai River mainstem.		
To address turbidity, fine sediments: • Achieve turbidity levels in the mainstem that support sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use (M3a). • Reduce the delivery of fine sediments in the mainstem to support sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use (M3b) • Reduce the delivery of fine sediments to a level equivalent to the QHA-generated fine sediment habitat attribute scores of reference streams or reaches (T3).	See details of the 19 associated measures (listed as strategies) on pages 23 and 24, and the 20 associated measures (listed as strategies) on pages 31-32 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To improve reservoir volumetric turnover rate: • Improve reservoir refill probability and reduce maximum drawdown to increase reservoir retention time by at least five days relative to past operations during similar water years (R1).	• W. Work with action agencies to improve reservoir refill probability and reduce maximum drawdown and increase seasonal and in-seasonal reservoir retention time by at least five days relative to past operations during similar water years.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

Bull Trout - Biological Restoration			
To address number of local populations: • Maintain or increase the total number of identified local populations and maintain the broad distribution of local populations across all four existing core areas (BT1).	See details of the 14 associated measures (listed as strategies) on pages 41-42 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address small population size: • Achieve at least 5 local populations (including British Columbia tributaries) with 100 adults in each of the primary Lake Koocanusa and Kootenai River/Kootenay Lake core areas, with each of these primary core areas containing at least 1,000 adult bull trout (BT2a). • Achieve at least 1 local population of bull trout containing 100 or more adult fish in each of the Bull Lake and Sophie Lake secondary core areas (BT2b).	See details of the 13 measures (listed as strategies) on pages 43-44 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address population stability: • Achieve an overall bull trout population trend in the Kootenai River Recovery Unit that is accepted, under contemporary standards, to be stable or increasing, based on at least 10 years of monitoring data (BT3).	See details of the 13 associated measures (listed as strategies) on pages 44-45 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address affects of non-native species introductions: • Suppress and prevent expansion of populations of non-native fish species beyond current levels in Koocanusa Reservoir (BT4a).	• X. Take actions necessary to suppress and prevent expansion of populations of non-native fish species	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

• Support and coordinate with suppression and removal activities for nonnative fish species in British Columbia waters of the Kootenai Subbasin to reduce relative and total abundance of non-native fishes in the Subbasin (BT4b).			
To address the effects of reduced nutrients/ system productivity: • Restore system productivity (BT5)	• Y. Nutrient restoration in Kootenay Lake and Kootenai River • Z. Implement ongoing annual nutrient addition water quality monitoring program • AA. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • BB. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
• To mitigate for the 240 km of habitat inundated by the construction of Libby Dam	• CC. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
• Address critical uncertainties	• DD. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

B. Kootenai Burbot

Section 4.6.2B.1 Biological Objectives and Status

	Subbasin/Management Plans	Draft Recovery Plan[a]		
Population	Adult Abundance (> 350 mm)	Number of local populations	Number of adults	Total number of adults

Kootenai	9,500	Consistent natural recruitment in at least three different spawning areas with net recruitment and juvenile population size sufficient to support desired adult population size.	Minimum adult number of 2,500 adults in the burbot population of the Kootenai River and South Arm of Kootenay Lake	2,500
	CPUE	NA	NA	NA
	1/24 hr hoop net set	NA	NA	NA

a: Source: KVRI Burbot Committee 2005. Kootenai River/Kootenay Lake Conservation Strategy. Prepared by the Kootenai Tribe of Idaho with assistance from S. P. Cramer and Associates. 77 pp. plus appendices.

Status:

Population	Adult Abundance	CPUE
Lower Kootenai (ID/BC)	47 +/- (2006)[a]	0.002 (2007)
Kootenai River (MT portion)	Unknown	0.01 (2007)
Koocanusa Reservoir	Unknown	0.07 (2005)

a: Source: Pyper et al. 2008

Section 4.6.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir)

		Biological Threats: Reduced nutrients/system productivity Reduced number of individuals and populations Entrainment at Libby Dam Reduced population stability Reduced recruitment Water quality
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2B.3 Strategies and Measures for Kootenai Burbot

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
To address altered winter hydro and thermal regime: • Develop and implement an experimental Kootenai River flow/water temperature operation	• A. Document specific temperature and flow requirements • B. Investigate existing hydrological models to evaluate effects of operational alternatives life stages. • C. Evaluate use of selective withdrawal to affect thermograph • D. Develop and implement multi-year plan for experimental operations	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)

Burbot- Biological Restoration			
To improve reduced nutrients/system productivity: • Restore system productivity (BUR1)	• F. Nutrient restoration in Kootenay Lake and Kootenai River • G. Implement ongoing annual nutrient addition water quality monitoring program • H. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • I. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
To compensate for post-dam community composition shifts: • Rehabilitate mainstem Kootenai River fish community structure and density to better approximate pre-Libby Dam ecological community characteristics (BUR2).	• J. Develop, evaluate, implement, and monitor improvements to hydro operations, physical habitats, and ecological community components to restore ecological and environmental selection pressures to favor native assemblages of fish and wildlife taxa in the mainstem Kootenai River and associated and historical floodplain areas. • K. Restore lower winter water temperatures.	Immediate (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address recruitment failure:		Immediate (0-5 yrs)	Medium (5-10 yr) Long term (10+ yr)

• Achieve consistent natural recruitment in at least three different spawning areas with net recruitment and juvenile population size sufficient to support desired adult population size (BUR3a). • BUR3b. Achieve stable size and age distributions as determined by an upward trend in a 6-year moving average of population abundance (BUR3b).	• L. Restore natural recruitment and/or develop, refine, implement, and evaluate a conservation aquaculture program for burbot.		
To address small population size: • Achieve a minimum number of 2,500 adults in the burbot population (BUR4).	• M. Develop, refine, implement, and evaluate a conservation aquaculture program for burbot.	Immediately Ongoing since early 2000s	Medium (5-10 yr) To Long-term (10+ yr)
To address the effects of contaminants (altered water quality: • Evaluate lethal and sublethal effects of environmental contaminants (including reproductive and behavioral effects) on white sturgeon and burbot (BUR5a) • Seek remedies for contaminant problems if warranted (BUR5b)	See details of the 5 associated measures (listed as strategies) on page 71 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
Address critical uncertainties	• N. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

C. Kootenai Redband Trout

Section 4.6.2C.1 Biological Objectives and Status

	Subbasin/Management Plans	Draft Recovery Plan		
Population	Density	Number of local populations	Number of adults	Total number of adults
Kootenai	150 fish/rkm	NA	NA	NA
	Catch Rate			
	Minimum of 0.5 fish/hour	NA	NA	NA
	Relative Weight			
	95-100	NA	NA	NA
	Genetically Pure Populations			
	2 each with at least 250 fish	NA	NA	NA

Status:

Population	Density	Catch Rate	Relative Weight	Genetically Pure Populations
Kootenai				5

Section 4.6.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) <u>Biological Threats:</u>

		Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	<u>Biological Threats</u>: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size
Habitat quality/quantity	Current and past land use practices; loss of habitat associated with inundation of habitats from the construction of Libby Dam	Physical Threats: Altered thermograph Channel stability Connectivity Habitat diversity Riparian habitat condition Turbidity, sediment regime Quantity of habitat due to the inundation of 240 km of habitat due to the construction of Libby Dam

Section 4.6.2C.3 Strategies and Measures for Kootenai Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
Redband Trout-Biological Restoration			
To address number of local populations: • Maintain and/or increase the total number of genetically pure local populations (RBT1a). • Replicate genetically pure redband stocks for use in restoration actions throughout their historic range (RBT1b).	• A. Protect remaining redband populations by enacting conservation measures in sport angling regulations and fisheries management plans, guidelines, and policies to minimize unintentional mortality of redband trout in Kootenai River tributaries. • B. Evaluate potential effects of introduced fishes on bull trout recovery, westslope cutthroat trout, redband trout, and kokanee conservation and implement tasks to minimize negative effects. • C. Evaluate effects of existing and proposed sport harvest regulations on redband trout. • D. Characterize, conserve, and monitor genetic diversity in isolate populations. • E. Incorporate conservation of genetic and behavioral attributes of redband trout into recovery and management plans. • F. Maintain long-term viability of conservation populations (numbers and lifecycle strategies) and establish wild populations where native stocks have been extirpated.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)

To address small population size: • Achieve a minimum of two genetically pure conservation populations, each containing at least 250 adult redband trout (including British Columbia tributaries). In Kootenai Subbasin redband trout populations that have subpopulations, subpopulations should contain at least 50 adult individuals to improve the probability of subpopulation persistence (RBT2).	• G. Rear genetically pure redband trout in restored natural rearing habitat at the Libby Area Office. • H. Use F1 progeny for restoration projects within their historic range. • I. Evaluate effects of existing and proposed sport harvest regulations on redband trout populations. • J. Maintain long-term viability of conservation populations. • L. Where necessary, isolate pure populations to prevent invasion of nonnative species or genetically introgressed populations • M. Evaluate available over-winter rearing habitat for young redband trout and determine means of improving or optimizing available over winter rearing	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address affects of non-native species introductions: • Suppress and prevent expansion of populations of non-native fish species (RBT3a). • Support and coordinate with suppression and removal activities for nonnative fish species in British Columbia waters of the Kootenai Subbasin to reduce relative and total abundance of non-native fishes in the Subbasin (RBT3b).	• N. Take actions necessary to suppress and prevent expansion of populations of non-native fish species • O. Rehabilitate habitat to favor native species assemblages.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address the effects of reduced nutrients/ system productivity: • Restore system	• P. Nutrient restoration in Kootenay Lake and Kootenai River • Q. Implement ongoing	Immediate, 0-5 yrs. Ongoing 5-year experimental	Nutrient Addition Response timeframe by trophic level: Within years:

productivity	annual nutrient addition water quality monitoring program • R. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • S. Implement annual fish survey.	period (2005-2009) By/during 2009: Recommendation/ decision made regarding continued nutrient addition after 2009	1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community /productivity Months to years
To mitigate for the 240 km of habitat inundated by the construction of Libby Dam	• T. Acquire and restore the equivalent amount of habitat lost by acquiring fee title and/or conservation easements at fair market value	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
Address critical uncertainties	• U. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

D. Kootenai Kokanee

Section 4.6.2D.1 Biological Objectives and Status

	Subbasin/Management Plans	Draft Recovery Plan		
Population	Adult Abundance	Number of local populations	Number of adults	Total number of adults
Kootenai (lower Kootenai River reservoirs and tributaries)	>100 (2020), >250 (2030)	NA	NA	NA

Status:

Population	Adult Abundance
Kootenai (lower Kootenai River reservoirs and tributaries)	200 (Smith Creek), 150 (Long Canyon Creek Creek), 10 (Parker Creek), 325 (Trout Creek), and 2 (Myrtle Creek)

Section 4.6.2D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	Physical Threats Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) Biological Threats: Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2D.3 Strategies and Measures for Kootenai Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
Kokanee: Biological Restoration			
To address the effects of reduced nutrients/ system productivity: • Restore system productivity (KOK1)	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton

	• C. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.	continued nutrient addition after 2009	accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
To address the effects of community composition shifts: • Rehabilitate tributary fish community structure and density to better approximate pre-Libby Dam ecological community characteristics (KOK2).	• E. Develop, evaluate, implement, and monitor improvements to hydro operations, physical habitats, and ecological community components to restore ecological and environmental selection pressures to favor native assemblages of fish & wildlife in the mainstem Kootenai R. and associated historical floodplain areas.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address small population size: • Document greater than 50 adult spawning kokanee in each tributary by 2007. • Document greater than 100 adult spawning kokanee in each tributary by 2020. • Develop a multi-year average of 250 adult spawning kokanee in each tributary by 2030 (KOK3).	• F. Implement a combination of nutrient addition, habitat restoration, and reintroduction efforts.	Immediately (0-5 yr) (Ongoing, success in 2007 returns, highest by orders of magnitude in up to 6 ID streams).	Immediate (0-5 yr) and Medium (5-10 yr)
Address critical uncertainties	G. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

E. Kootenai Westslope Cutthroat Trout

Section 4.6.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Genetically Pure Populations		Number of local populations	Number of adults	Total number of adults
Kootenai	5		NA	NA	NA
	Adults/ Subpopulation				
	50		NA	NA	NA
	Adults/ Conservation Population				
	500		NA	NA	NA

Status:

Population	Genetically Pure Populations	Adults/Subpopulation	Adults/Conservation Population
Kootenai	Unknown	Unknown	Unknown

Section 4.6.2E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) <u>Biological Threats:</u> Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment

Non-native species introductions	Demographic stress	Biological Threats: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size
Habitat quality/quantity	Current and past land use practices; loss of habitat associated with inundation habitats from the construction of Libby Dam	Physical Threats: Altered thermograph Channel stability Connectivity Habitat diversity Riparian habitat condition Turbidity, sediment regime Quantity of habitat due to the inundation of 240 km of habitat due to the construction of Libby Dam

Section 4.6.2E.3 Strategies and Measures for Kootenai Westslope Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
Westslope Cutthroat Trout: Biological restoration			
To address number of local populations: • Maintain or increase the total number of genetically pure local populations, and maintain the broad distribution of local populations in existing metapopulations (WCT1).	See details of the 12 associated measures (listed as strategies) on pages 52-53 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address small population size: • Achieve at least five genetically pure conservation populations (including British Columbia tributaries) with 50	See details of the 5 associated measures (listed as strategies) on page 54 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)

adults in each of the subpopulations in Lake Koocanusa, Kootenai River and Kootenay Lake, with each of these conservation populations containing at least 500 adult westslope cutthroat trout (WCT2).			
To address the effects of non-native species introductions: • Suppress and prevent expansion of populations of non-native fish species (WCT3a). • Support and coordinate with suppression and removal activities for nonnative fish species in British Columbia waters of the Kootenai Subbasin to reduce relative and total abundance of non-native fishes in the Subbasin (WCT3b).	See details of the 10 associated measures (listed as strategies) on pages 54-55 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediately (0-5 yrs)	Medium (5-10 yr) and Long-term (10+ yrs)
To address the effects of reduced nutrients/ system productivity: • Restore system productivity	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program • C. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
To mitigate for the 240 km of habitat inundated by the construction of Libby Dam	• E. Acquire and restore the equivalent amount of habitat lost by	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

	acquiring fee title and/or conservation easements at fair market value		
Address critical uncertainties	• F. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

J. Kootenai White Sturgeon

Section 4.6.2F.1 Biological Objectives and Status

	Subbasin/Management Plans	Recovery Plan (1999 USFWS down listing recovery criteria)		
Population	Adult Abundance	Frequency of recruitment	Definition	
Kootenai	7,000			
	Minimum Year-class Recruitment	Achieve natural production of white sturgeon in at least 3 different years of a 10 year period	20 juveniles > Age 1	
	40 Age 1 recruits per 100 adults			

Status:

Population	Adult Abundance	Year-Class Recruitment	Year-class Capture
Kootenai	< 500 +/-	None to insignificant	Insignificant

Section 4.6.2F.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby

		reservoir) Altered water quality <u>Biological Threats:</u> Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	<u>Biological Threats</u>: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2F.3 Strategies and Measures for Kootenai White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Physical Habitat Restoration			
SAME FOR ALL FOCAL SPECIES (See physical habitat restorations strategies and measures for bull trout above)			
White sturgeon: Biological Restoration			
To address the effects of reduced nutrients/ system productivity: • Restore system productivity (WST1)	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program • C. Implement ongoing Biomonitoring Program to measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks 2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/ productivity Months to years
To address recruitment failure: • Implement	See details of the 27 associated measures (listed as strategies) on pages 730-	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

conservation aquaculture and habitat restoration efforts (WST2)	732 of the Management Plan section of the Kootenai River Subbasin Plan.		
To address small population size: • Achieve an estimated white sturgeon population that is stable or increasing with juveniles reared through a conservation aquaculture program available to be added to the wild population each year for a 10-year period. For this purpose, a year class will be represented by the equivalent of 1,000 one-year old fish from each of 6 to 12 families, i.e. 3 to 6 female parents. Each of these year classes must be large enough to produce 24 to 120 white sturgeon surviving to sexual maturity (WST3a). • Evaluate establishment of experimental non-essential white sturgeon population (WST3b).	• E. Implement conservation aquaculture and habitat restoration efforts See details of the 5 associated measures (listed as strategies) on page 63 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)
To address the effects of contaminants (altered water quality: • Evaluate lethal and sublethal effects of environmental contaminants (including reproductive and behavioral effects) on white	See details of the 5 associated measures (listed as strategies) on page 64 of the Management Plan section of the Kootenai River Subbasin Plan.	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

sturgeon and burbot (WST4a) • Seek remedies for contaminant problems if warranted (WST4b)			
• Address critical uncertainties	• F. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr) Long term (10+ yr)

G. Kootenai Mountain Whitefish

Section 4.6.2G.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Abundance		Number of local populations	Number of adults	Total number of adults
Kootenai (Hemlock Bar Reach)	14,000 – 16,000		NA	NA	NA
	CPUE				
	850 fish/hour		NA	NA	NA
	BPUE				
	165 kg/hour		NA	NA	NA
	Relative Weight				
	90-95		NA	NA	NA

Status:

Population	Abundance	CPUE	BPUE	Relative Weight
Kootenai River (MT portion RKM 325-328))	5,224 fish per mile (2008)			

Section 4.6.2G.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Impoundment and Hydro Operations	Altered in-river physical, biological, and ecological conditions	<u>Physical Threats</u> Altered hydrograph Altered thermograph Channel stability Connectivity Habitat diversity Hydraulic regime Habitat protection Shoreline condition Riparian habitat condition Turbidity, sediment regime Volumetric turnover rate (Libby reservoir) <u>Biological Threats:</u> Reduced nutrients/system productivity Reduced number of populations Reduced population stability Reduced recruitment
Non-native species introductions	Demographic stress	<u>Biological Threats</u>: Introgression, competition, and/or displacement Reduced population stability Reduced recruitment Reduced population size

Section 4.6.2G.3 Strategies and Measures for Kootenai Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
		Immediate (0-5 yrs)	Medium (5-10 yr) Long term (10+ yr)
To address the effects of reduced nutrients/ system productivity: • Restore system productivity	• A. Nutrient restoration in Kootenay Lake and Kootenai River • B. Implement ongoing annual nutrient addition water quality monitoring program • C. Implement ongoing Biomonitoring Program to	Immediate, 0-5 yrs. Ongoing 5-year experimental period (2005-2009) By/during 2009: Recommendation/decision made regarding continued nutrient addition after 2009	Nutrient Addition Response timeframe by trophic level: Within years: 1) Water quality, nutrient availability: days to weeks

	measure water quality, algal accrual, macroinvertebrate community condition. • D. Implement annual fish survey.		2) Algal, periphyton accrual/primary productivity: Days to weeks 3) Macroinvertebrates (Secondary productivity): Weeks-months 4) Fish community/productivity Months to years
• Address critical uncertainties	• E. Conduct research needed to address critical uncertainties	Immediate (0-5 yrs)	Immediate (0-5 yr) Medium (5-10 yr)

Section 4.7 Blue Mountain Province

Section 4.7.1 Asotin Subbasin

A. Asotin Bull Trout

Section 4.7.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Asotin					
	Number of Local Populations				
	Total Number of Adults				
	700				700

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Asotin	Unknown	Unknown	12 redds in 2006

Section 4.7.1A.2 Primary Limiting Factors and Threats and Status

Limiting Factor	General Threat	Specific Threats
Population traits	Current land use	Population abundance, genetic structure, and general distribution not well understood
Water quantity	Current land use	Agriculture practices and rural development
Water quality	Current Land use	Agriculture and Forestry practices, Roads, rural development
Habitat Access	Current Land use	Culverts, diversions, water quality and quantity
Habitat quality/quantity	Current land use	Agriculture and forestry

		practices, roads, rural development
Nutrients	Current land use and hydro-operations	Lack of salmon carcasses

Section 4.7.1A.3 Strategies and Measures for Asotin Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Identify populations, and assess abundance, distribution, genetic similarities, and populations status/tends	• A. Conduct genetic analyses to map genetic similarities and differences within and among populations • B. Expand redd counts to better assess spawning distribution and relative abundance • C. Expand electrofishing and snorkeling to further define bull trout distribution and relative abundance • D. Complete the Draft Recovery Plan	Immediate	1-5 yrs
Water Quantity			
• Restore stream flows during low flow periods	• E. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners	Immediate	1-15 yrs
	• F. Implement irrigation efficiency projects	Immediate	1-10 yrs
Nutrients			
• Increase nutrients	• G. Increase spring Chinook returns • H. Complete a spring chinook reintroduction plan	Immediate	1-15 yrs
Habitat Access			
• Restore passage at non-natural barriers	• I. Restore stream flows in reaches dewatered for irrigation use • J. Replace irrigation diversion structures with improved structures meeting fish passage standards • K. Replace culverts not	Immediate	

	meeting fish passage guidelines • L. Screen irrigation diversions, maintain passage efficiency through on-going O&M or additional activities, • M. Monitor effectiveness of fish passage improvement projects • N. Implement irrigation efficiency projects • O. Continue to monitor and remove dams and barriers made by recreationists		
Habitat Quality/Quantity			
• Restore degraded habitat	• P. Improve stream flows in reaches partially or completely dewatered for irrigation • Q. Increase sinuosity • R. Restore large wood in the system • S. Protect, or restore riparian zones • T. Restore floodplain function and channel complexity, and increase habitat diversity • U. Increase protective status of priority habitats in landuse regulations	Immediate	
Water Quality			
• Reduce water temperatures during summer months	• V. Increase stream flows to decease temperatures • W. Restore priority restoration and protection reach attributes to improve downstream conditions • X. Modify channel and increase floodplain functions • Y. Reduce detrimental land use activities • Z. Lease water rights from willing sellers • AA. Implement more	Immediate	

	efficient irrigation systems, and improve watershed function		
Nutrients			
• Increase nutrients	• BB. Increase spring chinook returns • CC. Outplant hatchery spring chinook carcasses or fish cubes	Immediate	
Harvest			
• Curtail Poaching and fishery impacts	• DD. Continue and enhance WFDW, CTUIR, and USFWS enforcement	Immediate	
Monitoring			
• Monitoring • Populations identification, genetic structure, abundance, movements and general distribution are not well understood Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• EE. Conduct DNA analysis to identify populations and set recovery goals • FF. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • GG. Expand Electrofishing or snorkeling to determine distribution • HH. Determine habitat conditions and trends • II. Complete the draft recovery plan	Immediate	

Section 4.7.2 Grande Ronde Subbasin

A. Grande Ronde Bull Trout (Oregon)

Section 4.7.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Populations (cores)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Grande Ronde	>100 individuals per population			>100	
	Number of Local				

	Populations				
	8		8		
	Total Number of Adults				
	5,000				5,000
Little Minam	Number of Adults				
	>100 individuals per population			>100	
	Number of Local Populations				
	1		1		
	Total Number of Adults				
	1,000				1,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Grande Ronde			Unknown
Little Minam			Unknown

Section 4.7.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry
Water quantity	Current land use	Agriculture
Water quality	Current land use	Agriculture practices
Habitat access	Current land use	Culverts
Competition	Non-native species	Brook Trout

Section 4.7.2A.3 Strategies and Measures for Grande Ronde Bull Trout (Oregon)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Improve grazing management	• A. Provide infrastructure and develop agreements to address grazing related issues on Catherine and Indian creeks and upper Grande Ronde River	Immediate	1-5 years
Water Quantity			
• Increase summer streamflow	• B. Water conservation or lease (Little Bear, Indian and Catherine creeks)	Immediate	1-5 years
Water Quality			
• Improve grazing management	• C. Protect existing good quality riparian and watershed areas, provide infrastructure and develop agreements to address grazing related issues on Catherine and Indian creeks and the upper Grande Ronde River	Immediate	1-5 years
Habitat Access			
• Improve passage at road crossings	• D. Improve passage conditions on Deer and Sage creeks at USFS Road crossings, and address passage issues in Catherine, Indian and Lookingglass (hatchery) creeks	Immediate	1-5 years
Competition			
• Reduce incidence of brook trout	• E. Focus harvest on brook trout, restrict stocking of brook trout, and manage brook trout introduction at Langdon Lake/Lookingglass Creek	Immediate	1-5 years

B. Grande Ronde Bull Trout (Washington and Oregon (according to WDFW)

Section 4.7.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Populations (cores)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Grande Ronde					
	Number of Local Populations				
	8		8		
	Total Number of Adults				
	5,000				5,000
Little Minam	Number of Adults				
	Number of Local Populations				
	1		1		
	Total Number of Adults				
	1,000				1,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Grande Ronde	unknown	8+	unknown
Little Minam			

Section 4.7.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture and forestry
Water quantity	Current land use	Agriculture

Water quality	Current land use	Agriculture practices
Habitat access	Current land use	Culverts
Competition	Non-native species	Brook Trout
Population traits	Current land use	Population density, genetic structure, and general distribution not well understood
Nutrients	Current land use and hydro-operations	Lack of spring Chinook salmon carcasses
Harvest	Sport fishing	Poaching

Section 4.7.2B.3 Strategies and Measures for Grande Ronde Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population Traits			
• Identify species distribution, genetic similarities, and status/tends	• A. Conduct genetic analyses to map genetic similarities and differences within and among populations • B. Expand reed counts to better assess spawning distribution and relative abundance • C. Expand electrofishing and snorkeling to further define bull trout distribution and relative abundance • D. Complete the Draft Recovery Plan	Immediate	1-10 yrs
Nutrients			
• Increase nutrients	• E. Increase spring Chinook returns • F. Outplant hatchery chinook carcasses	Immediate	1-25 yrs
Harvest			
• Curtail poaching	• G. Continue and enhance USFS and USFWS enforcement to prevent illegal harvest/harassment of bull trout	Immediate	1-10 yrs
Habitat Access			
• Restore passage at non-natural	• H. Restore stream flows in reaches dewatered for	Immediate	

barriers	irrigation use • I. Replace irrigation diversion structures with improved structures meeting fish passage standards • J. Replace culverts not meeting fish passage guidelines • K. Screen irrigation diversions, maintain passage efficiency through on-going O&M or additional activities, • L. Monitor effectiveness of fish passage improvement projects • M. Implement irrigation efficiency projects • N. Continue to monitor and remove dams and barriers made by recreationists		
Improve passage at road crossings	• O. Improve passage conditions on Deer and Sage creeks at USFS Road crossings, and address passage issues in Catherine, Indian and Lookingglass (hatchery) creeks	Immediate	
Habitat Quality/Quantity			
• Restore degraded habitat	• P. Improve stream flows in reaches partially or completely dewatered for irrigation • Q. Increase sinuosity • R. Restore large wood in the system • S. Protect, or restore riparian zones • T. Restore floodplain function and channel complexity, and increase habitat diversity • U. Increase protective status of priority habitats in land use regulations	Immediate	
Improve grazing management	• V. Provide infrastructure and develop agreements to address grazing related issues	Immediate	

	on Catherine and Indian creeks and upper Grande Ronde River		
Water Quality			
• Reduce water temperatures during summer months	• W. Increase stream flows • X. Restore priority restoration and protection reach attributes to improve downstream conditions • Y. Modify channel and increase floodplain functions • Z. Reduce detrimental land use activities • AA. Lease water rights from willing sellers • BB. Implement more efficient irrigation systems, and improve watershed function	Immediate	
Improve grazing management	• CC. Protect existing good quality riparian and watershed areas, provide infrastructure and develop agreements to address grazing related issues on Catherine and Indian creeks and the upper Grande Ronde River	Immediate	
Water Quantity			
• Restore stream flows during low flow periods	• DD. Implement irrigation efficiency projects • EE. Initiate point of diversion transfers • FF. Evaluate shallow aquifer recharge projects • GG. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners • HH. Water conservation or lease (Little Bear, Indian and Catherine creeks)	Immediate	
Predators			
• Decrease predators and exotic species	• II. Increase stream flows • JJ. Restore priority restoration and protection	Immediate	

	reach attributes to improve downstream conditions • KK. Modify channel and increase floodplain functions • LL. Reduce detrimental land use activities • MM. Lease water rights from willing sellers • NN. Implement more efficient irrigation systems, and improve watershed function • OO. Decrease water temperatures • PP. Increase water conservation and irrigation efficiency, and purchase or lease water rights from willing landowners • QQ. Liberalize fishing regulations on exotic species		
Monitoring			
• Monitoring Populations identification, genetic structure, abundance, movements and general distribution are not well understood Population status and trend information is needed to appropriately set criteria for recovery and to determine recovery status	• RR. Conduct DNA analysis to identify populations and set recovery goals • SS. Continue, and expand, spawning surveys to determine relative spawning abundance and distribution • TT. Expand Electrofishing or snorkeling to determine distribution • UU. Determine habitat conditions and trends • VV. Complete the draft recovery plan	Immediate	
Competition			
• Reduce incidence of brook trout	• WW. Focus harvest on brook trout, restrict stocking of brook trout, and manage brook trout introduction at Langdon Lake/Lookingglass Creek	Immediate	

C. Grande Ronde Kokanee

Section 4.7.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Catch Rate		Number of local populations	Number of adults	Total number of adults
Wallowa Lake	1 fish/angler/hour		NA	NA	NA

Status:

Population	Catch Rate
Wallowa Lake	Unknown

Section 4.7.2C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Current land use	residential, commercial, and recreational development	Along the Wallowa River above the lake and the lake shoreline
Habitat quality/quantity	Current land use	Bedload accumulation and movement associated with recent landslide is reducing channel capacity and causing instability in the Wallowa River above the lake.
Competition/predation	Non-native species	Mysid shrimp

Section 4.7.2C.3 Strategies and Measures for Wallowa Lake Kokanee

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Current land-use			
• Enforce land use regulations and ordinances	• A. Work with County, State, and Federal regulators to assure that existing regulations are applied in a way that reduces potential for impact to aquatic resources in the river and lake	Immediate	1-5 years
Habitat Quality/Quantity			

• Develop a comprehensive approach to address channel conditions in the river above the lake	• B. Recruit a fluvial geomorphologist to design and implement a project to address channel and bedload problems in the Wallowa River above Wallowa Lake	Immediate	1-5 years
Competition/Predation			
• Evaluate effects of non-native species	• C. Conduct annual monitoring of Mysid population in Wallowa Lake • D. Monitor abundance and species composition of zooplankton and conduct investigations of trophic dynamics in Wallowa Lake • E. Determine lake trout population dynamics, size and age structure, and kokanee consumption rates as part of investigation of Wallowa Lake trophic dynamics, • F. Modify angling regulations, if necessary, to achieve management objectives for kokanee and lake trout	Immediate	1-5 years

D. Grande Ronde Redband Trout

Section 4.7.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Grande Ronde	None		NA	NA	NA

Status:

Population	Adult Abundance
Grande Ronde	Unknown

Section 4.7.2D.2 Primary Limiting Factors and Threats:

Section 4.7.2D.3 Strategies and Measures for Grande Ronde Redband Trout

Note: Limiting factors, Threats and Measures for redband trout are the same as those for steelhead in the Grande Ronde.

Section 4.7.3 Imnaha Subbasin

A. Imnaha Bull Trout

Section 4.7.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Imnaha	--			--	
	Number of Local Populations		--		
	--				
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Imnaha			Unknown

Section 4.7.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agriculture practices
Water quantity	Current land use	Agriculture practices

Section 4.7.3A.3 Strategies and Measures for Imnaha Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe

Habitat Quality/Quantity			
• Protection/ Restoration	• A. Improve grazing management (Big Sheep/ Little Sheep system) • B. Restore channel complexity (Big Sheep system)	Immediate	1-5 years
Water Quantity			
• Increase summer streamflow	• C. Implement water conservation and water lease/purchases	Immediate	1-5 years

B. Imnaha Redband Trout

Section 4.7.3B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Imnaha	Maintain population distribution and abundance		NA	NA	NA

Status:

Population	Adult Abundance
Imnaha	Adequate

Section 4.7.3B.2 Primary Limiting Factors and Threats

Section 4.7.3B.3 Strategies and Measures for Imnaha Redband Trout

Strategy and Measures: Same as Imnaha summer steelhead

Section 4.7.4 Snake Hells Canyon Subbasin

A. Snake Hells Canyon Bull Trout

Section 4.7.4A.1Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local	Number of adults/population	Total number

			populations		of adults
Snake Hells Canyon	--			--	
	Number of Local Populations				
	17		17		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/populations	Number of Local Populations	Total Number of Adults
Snake Hells Canyon			

Section 4.7.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Land use	Agriculture and forestry practices
Habitat quality/quantity	Land use	Agriculture and forestry practices
Water quality	Land use	Agriculture and forestry practices

Section 4.7.4A.3 Strategies and Measures for Snake Hells Canyon Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore connectivity, food base, and nutrients to historic levels.	• A. Provide funding for on-the-ground actions to restore habitat connectivity. Provide funding to determine the feasibility of using nutrients to improve food base.	Immediate	0-10+ years
Habitat quality/quantity			
• Increase fish productivity and	• B. Provide funding for on-the-ground actions to restore	Immediate	0-10+ years

production, as well as life stage specific survival, through in-subbasin habitat improvement and protection.	habitat quality.		
Water quality			
• Improve water quality and quantity	• C. Provide funding for on-the-ground actions to improve riparian conditions, improve stream flow and improve water quality.	Immediate	0-10+ years

B. Snake Hells Canyon Redband Trout (Oregon)

Section 4.7.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Snake Hells Canyon	Maintain population distribution and abundance		NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	Adequate

Section 4.7.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Same as Hells Canyon Snake summer steelhead	Same as Hells Canyon Snake summer steelhead	Same as Hells Canyon Snake summer steelhead

Section 4.7.4B.3 Strategies and Measures for Snake Hells Canyon Redband Trout (Oregon)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Same as Hells Canyon Snake summer steelhead	Same as Hells Canyon Snake summer steelhead	Immediate	1-5 years

C. Snake Hells Canyon Redband Trout (Idaho)

Section 4.7.4C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)			Number of local populations	Number of adults	Total number of adults
Snake Hells Canyon			NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	

Section 4.7.4C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.7.4C.3 Strategies and Measures for Snake Hells Canyon Redband Trout (Idaho)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity – hydrograph			
• Restore upstream and downstream connectivity.	• Provide funding for on-the-ground actions to restore habitat connectivity.	Immediate	0-10year

Physical habitat quality/quantity			
• Increase fish productivity and production, as well as life stage specific survival, through in-subbasin habitat improvement and protection.	• B. Provide for on-the-ground actions to restore habitat quality.	Immediate	0-10 years
Water quality			
• Improve water quality and quantity.	• C. Provide funding for on-the-ground actions to improve riparian conditions, improve stream flow and improve water quality.	Immediate	0-10 years

D. Snake Hells Canyon White Sturgeon

Section 4.7.4D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Snake Hells Canyon			NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	

Section 4.7.4D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Dams	Hydro-electric operations
Water quantity	Dams	Hydro-electric operations
Habitat quality/quantity	Dams	Hydro-electric operations
Population traits	Dams	Hydro-electric operations
Harvest	Sport fishing	Catch-and-release

Section 4.7.4D.3 Strategies and Measures for Snake Hells Canyon White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Improve flow regimes to provide adequate flows for spawning and proper conditions for eggs and juveniles, connectivity, and food base.	• A. Provide funding to restore habitat connectivity as well as to determine the feasibility of using nutrients to improve the food base.	Immediate	0-10 years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge.	• B. Provide funding to identify sources of sedimentation and actions to mitigate. Work with appropriate agencies and land owners to develop a strategy for reducing sedimentation.	Immediate	0-10 years
Habitat quality/quantity			
• Restore and manage demographic and genetic interchange among white sturgeon populations.	• C. Provide funding to determine the need to develop volitional passage facilities or the need for a periodic trap and transplant program to maintain population structure.	Immediate	0-10 years
Population traits			
• Increase abundance and size structure where necessary to maintain angling opportunity and promote natural spawning.	• D. Provide funding to determine the contribution of hatchery-reared fish and translocated wild fish to spawning populations. Maintain no-harvest angling regulations.	Immediate	0-10 years
Harvest			
• Quantify catch-and-release hooking mortality, illegal harvest, as well as direct tribal harvest levels.	E. Provide funding to determine the magnitude of loss associated with catch-and-release fishing. Provide funding to examine alternate sport gear types (hooks). Provide funding to collaborate with Washington and Oregon enforcement agencies and the Nez Perce Tribe to quantify levels of tribal harvest. Provide funding to determine the magnitude of loss associated with illegal sturgeon harvest.	Immediate	0-10 years

E. Snake Hells Canyon Smallmouth Bass

Section 4.7.4E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Snake Hells Canyon			NA	NA	NA

Status:

Population	Adult Abundance
Snake Hells Canyon	

Section 4.7.4E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats

Section 4.7.4E.3 Strategies and Measures for Snake Hells Smallmouth Bass

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity – hydrograph			
• Quantify smallmouth predation on rainbow trout.	• A. Provide funding to assess smallmouth bass population status and distribution as well as to determine the level of predation on rainbow trout.	Immediate	0-10+

Section 4.8 Mountain Snake Province

Section 4.8.1 Clearwater Subbasin (North Fork Clearwater River)

A. Clearwater Bull Trout

Section 4.8.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
North Fork Clearwater River	--			--	
	Number of Local Populations				
	11 (2 potential)		11 (2 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Total Number of Adults (redds) Fluivial fish (2007)
Lund Creek	--	--	30
Little Lost Creek	--	--	31
Lost Lake Creek	--	--	13
Lund Lake to Lost Lake Creek	--	--	21
Lost Lake Creek to Headwaters	--	--	8
Buck Creek	--	--	--
Canyon Creek	--	--	--

Population	Number of Adults	Number of Local Populations	Total Number of Adults (redds) Fluivial fish (2007)
Butte Creek	--	--	--
Rutledge Creek	--	--	--
Rocky Run Creek	--	--	6
1268 Bridge to Lund Creek	--	--	20
301 Bridge to 760 Bridge	--	--	--
Bostonia Creek	--	--	26
Boundary Creek	--	--	--
Goose Creek	--	--	1
Isabella Creek	--	--	1
Lake Creek	--	--	3
Long Creek	--	--	6
Moose Creek	--	--	0
Niagra Gulch	--	--	2
Placer Creek	--	--	2
Quartz Creek	--	--	0
Skull Creek	--	--	4
Swamp Creek	--	--	1
Vanderbilt Gulch	--	--	39
Orogrande Creek	--	--	--
Slate Creek	--	--	--
Floodwater Creek	--	--	--
Glover Creek	--	--	--
Stony Creek	--	--	--

B. Clearwater Westslope Cutthroat Trout

Section 4.8.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Clearwater			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
North Fork Clearwater	NA
Isabella Creek	0.83
Skull Creek	1.34

C. Clearwater Kokanee

Section 4.8.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Density		Number of local populations	Number of adults	Total number of adults
Dworshak Reservoir	30-50 fish/hectare		NA	NA	NA
	Catch Rate (10 inch minimum)				
	0.7 fish/hour		NA	NA	NA

Status:

Population	Adult Density (fish/ha)	Catch Rate
Dworshak Reservoir	21 (2005)	--

D. Clearwater Redband

Section 4.8.1D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
North Fork Clearwater			NA	NA	NA

Status:

Population	Adult Density Estimate (fish/100m^2)
North Fork Clearwater	NA
Isabella Creek	5.32
Skull Creek	0.80

E. Clearwater Mountain Whitefish

Section 4.8.1E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
North Fork Clearwater			NA	NA	NA

Status:

Population	Adult Density Estimate (fish/100m^2)
North Fork Clearwater	NA
Isabella Creek	0.83
Skull Creek	1.47

Section 4.8.1 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Agriculture and forestry practices destructed floodplain, riparian, and in-stream habitat, reduced recruitment of large woody debris, and led to excess sedimentation[1,2,4,5]
Habitat quality/quantity	Hydro-operations	During years of high discharge, entrainment losses thru Dworshak Dam reduce population[3]
Population traits	Introduced species	Hybridization with brook trout and hatchery rainbow trout[1,2,4]
Competition	Introduced species	Competition with brook trout and rainbow trout for available resources[1,2]
Water quality	Land use	High summer water temperatures due to agriculture and forestry practices[1,2,4,5]
Water quantity	Hydro-operations	Operation of Dworshak dam results in loss of connectivity[1,2,4,5]
Harvest	Illegal harvest	Illegal harvest[1]
Habitat access	Land use	Loss of habitat access (e.g., culverts)[1,2,4,5]
Nutrients	Hydro-operations	Lack of salmon carcasses. Low nutrients and nutrient imbalance limit the growth recruitment into the fishery[3]
Predation	Non-native species	Smallmouth bass[3]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Kokanee, [4] Redband trout, [5]Mountain whitefish

Section 4.8.1 Strategies and Measures for Clearwater Bull Trout, Westslope Cutthroat Trout, Kokanee, Redband Trout, and Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or	• A. Develop projects to address sedimentation issues, such as road obliteration/decommissioning, and historic mine cleanup[1,2,4,5] • B. Work with grazing unit permit holders and the	Immediate	0-10+ years

not functioning. Reduce sediment delivery to the stream network by reducing impacts of land practices along river and stream corridors[1]	USFS to retire grazing permits in key tributaries within the Middle Fork[1] • C. Work with the USFS, other state and federal agencies, private landowners, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat[1,2,4,5] • D. Incorporate evaluations of existing habitat in survey projects whenever possible[2,4,5]		
• Modify hydro-operations and facilities[3]	• E. Install strobe lights near the spillway and penstock intakes to Dworshak Dam to prevent kokanee entrainment[3] • F. Work shall be a cooperative effort between BPA, Idaho Fosh and Game, the Army Corps of Engineers, and the Nez Perce Tribe[3] • G. Selectively withdraw water from the reservoir at depths to avoid kokanee, while providing the appropriate temperature water for the river and hatchery downstream[3] • H. Identify the depth of kiokanee during the day and night, throughout the year, and determine a profile of water temperatures. The Corps of Engineers will then use this information to decide if water can be withdrawn at depths where kokanee entrainment would be minimized[3]		
Population traits			
• Reduce impacts from introduced species[1]	• I. Develop informational programs to educate anglers and the public to risks of introductions of exotic species[1] • J. Develop methods to remove exotic populations[1,2,4]	Immediate	0-10+ years

	• K. Determine levels of hybridization and distribution of exotic species[1,2,4] • L. Set liberal regulations on brook trout to reduce their numbers and limit their spread[1] • M. Emphasize use of westslope cutthroat trout for stocking mountain lakes in the Clearwater drainage[2]		
Competition			
• Reduce impacts of competition with invasive species[1]	• N. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species[1,2]	Immediate	0-10+ years
Water quality			
• Improve water quality[1]	• O. Improve riparian cover and land use practices to reduce water temperatures[1,2,4,5] • P. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources[1,2,4,5] • Q. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups[1,2,4,5]	Immediate	0-10+ years
Water quantity			
• Restore connectivity, food base, and nutrients to historic levels[1]	• R. Restore connectivity and develop fish passage[1,2,4,5] • S. Determine the feasibility of using nutrients to improve the food base[1,4]	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest[1]	• T. Install easy to read roadside signs that will inform anglers of the fishing regulations[1] • U. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem[1]	Immediate	0-10+ years

	• V. Simplify the fishing regulations[1]		
Habitat access			
• Improve habitat access[1]	• W. Remove or modify culverts which have been identified as fish barriers[1,2,4,5]	Immediate	0-10+ years
Nutrients			
• Improve water quality and increase zooplankton production[3]	• X. Enhance the nutrients in Dworshak reservoir. Supplement and balance annual levels of base nutrients (nitrogen and phosphorous)[3] • Y. Water quality will be monitored so that the proper balance of nutrients can be maintained[3] • Z. Examine kokanee abundance, growth, and survival rates in an effort to evaluate the nutrient enhancement program[3]	Immediate	0-10+ years
Predation			
• Assess potential impacts of smallmouth bass on kokanee and define the magnitude of the problem[3]	• AA. Document smallmouth bass food habits and a bioenergetic evaluation of the amount of gamefish that are eaten annually[3] • BB. Perform annual kokanee monitoring studies that determine the survival rate of kokanee to determine if it is below normal[3]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Kokanee, [4] Redband trout, [5]Mountain whitefish

Section 4.8.1 Clearwater Subbasin (Selway River)

F. Clearwater Bull Trout

Section 4.8.1F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Selway River	--			--	
	Number of Local				

	Populations				
	10 (4 potential)		10 (4 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Upper Selway River	--	--	0.10
White Cap Creek	--	--	0.00
Moose Creek Drainage	--	--	0.00
Little Clearwater	--	--	0.28

G. Clearwater Westslope Cutthroat Trout

Section 4.8.1G.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.33
White Cap Creek	0.46
Moose Creek Drainage	0.70
Little Clearwater	0.41

H. Clearwater Redband

Section 4.8.1H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	1.01
White Cap Creek	0.61
Moose Creek Drainage	1.58
Little Clearwater	1.40

I. Clearwater Mountain Whitefish

Section 4.8.1I.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.29
White Cap Creek	0.00
Moose Creek Drainage	0.00

Little Clearwater	0.84

J. Clearwater Westslope Cutthroat Trout

Section 4.8.1J.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.33
White Cap Creek	0.46
Moose Creek Drainage	0.70
Little Clearwater	0.41

K. Clearwater Redband

Section 4.8.1K.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	1.01
White Cap River	0.61

Moose Creek Drainage	1.58
Little Clearwater	1.40

L. Clearwater Mountain Whitefish

Section 4.8.1L.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Selway River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Upper Selway River	0.29
White Cap Creek	0.00
Moose Creek Drainage	0.00
Little Clearwater	0.84

Section 4.8.1 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Hybridization with brook trout and hatchery rainbow trout[1,2,3]
Competition	Introduced species	Competition with brook trout and rainbow trout for available resources,[1,2,3]
Harvest	Illegal harvest	Illegal harvest[1]
Habitat access	Land use	Loss of habitat access (e.g., culverts)[1,2,4]
Nutrients	Legacy effects	Loss of native forage due to decline of anadromous fish populations[1]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.1 Strategies and Measures for Clearwater (Selway)Bull trout, Westslope Cutthroat, Redband Trout, and Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Reduce impacts from introduced species[1,2,3]	• A. Develop informational programs to educate anglers and the public to risks of introductions of exotic species[1,2,3] • B. Develop methods to remove exotic populations[1,2,3] • C. Determine levels of hybridization and distribution of exotic species[1,2,3] • D. Set liberal regulations on brook trout to reduce their numbers and limit their spread[1,2] • E. Emphasize use of westslope cutthroat trout for stocking mountain lakes in the Clearwater drainage[2]	Immediate	0-10+ years
Competition			
• Reduce impacts of competition with invasive species[1,2]	• F. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species[1,2]	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest[1]	• G. Install easy to read roadside signs that will inform anglers of the fishing regulations[1] • H. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem[1] • I. Simplify the fishing regulations[1]		
Habitat access			
• Improve habitat access[1,2]	• J. Remove or modify culverts which have been identified as fish barriers[1,2,4]		
Nutrients			
• Increase abundance of native forage	• K. Determine the feasibility of using nutrients to improve food base[1]		

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.1 Clearwater Subbasin (Potlatch River)

M. Clearwater Redband

Section 4.8.1M.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Potlatch River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Potlatch Drainage	1.60

Section 4.8.1 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices
Water quality	Legacy effects	Increased water temperatures and altered hydrograph due to agriculture and forestry practices
Habitat access	Land use	Loss of habitat access (e.g., culverts)

Section 4.8.1 Strategies and Measures for Clearwater (Potlatch) Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Restore riparian habitat and function, and reduce sediment delivery to the stream network by reducing impacts of land use	• A. Develop projects to address sedimentation issues, such as road obliteration/decommissioning, and historic mine cleanup • B. Work with the USFS,	Immediate	0-10+ years

practices along the river and stream corridors	other state and federal agencies, private landowners, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat • C. Incorporate evaluations of existing habitat in survey projects whenever possible		
Water quality			
• Improve water quality and restore natural hydrograph	• D. Improve riparian cover and land use practices to reduce water temperatures • E. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources • F. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups	Immediate	0-10+ years
Habitat access			
• Improve habitat access	• G. Remove or modify culverts which have been identified as fish barriers		

Section 4.8.1 Clearwater Subbasin (South Fork Clearwater River)

N. Clearwater Bull Trout

Section 4.8.1N.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
South Fork Clearwater River	--			--	
	Number of Local Populations				

	5 (2 potential)		5 (2 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Density Estimate (fish/100m^2) 2007
American River	--	--	0.06
Crooked River	--	--	0.07
Red River	--	--	0.00
West Fork Crooked River	--	--	0.21

O. Clearwater Redband

Section 4.8.1O.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
South Fork Clearwater River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
American River	1.53
Crooked River	3.58
Red River	1.38
West Fork Crooked River	0.00

P. Clearwater Westslope Cutthroat Trout

Section 4.8.1P.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
South Fork Clearwater River	Restore critical habitat for fluvial component		NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
American River	0.06
Crooked River	0.47
Red River	0.11
West Fork Crooked River	0.04

Q. Clearwater Mountain Whitefish

Section 4.8.1Q.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
South Fork Clearwater River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
American River	0.96
Crooked River	0.72

Red River	0.76
West Fork Crooked River	0.00

Section 4.8.1 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices[1,2,3,4]
Population traits	Introduced species	Hybridization with brook trout and hatchery rainbow trout[1,2]
Competition	Introduced species	Competition with brook trout and rainbow trout for available resources[1,2]
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices[1,2,3,4]
Harvest	Illegal harvest	Illegal harvest
Habitat access	Land use	Loss of habitat access (e.g., culverts)[1,2,3,4]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.1 Strategies and Measures for Clearwater (South Fork) Bull Trout, Westslope Cutthroat Trout, Redband Trout, and Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land practices along river	• A. Develop projects to address sedimentation issues, such as road obliteration/decommissioning, and historic mine cleanup[1,2] • B. Work with the USFS, other state and federal agencies, private landowners, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decisions, and to	Immediate	0-10+ years

and stream corridors[1,2]	improve/restore riparian habitat[1,2]		
Population traits			
• Reduce impacts from introduced species[1,2,3,4]	• C. Develop informational programs to educate anglers and the public to risks of introductions of exotic species[1,2,3,4] • D. Develop methods to remove exotic populations[1,2,3,4] • E. Determine levels of hybridization and distribution of exotic species[1,2,3,4] • F. Set liberal regulations on brook trout to reduce their numbers and limit their spread[1,2,3,4] • G. Emphasize use of westslope cutthroat trout for stocking mountain lakes in the Clearwater drainage[2]	Immediate	0-10+ years
Competition			
• Reduce impacts of competition with invasive species[1,2]	• H. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species[1,2]	Immediate	0-10+ years
Water quality			
• Improve water quality[1,2,3,4]	• I. Improve riparian cover and land use practices to reduce water temperatures[1,2,3,4] • J. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources[1,2,3,4] • K. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups[1,2,3,4]	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest[1]	• L. Install easy to read roadside signs that will inform anglers of the fishing regulations[1] • M. Increase enforcement	Immediate	0-10+ years

	and education in areas where non-compliance with fishing regulations have been found to be a problem[1] • N. Simplify the fishing regulations[1]		
Habitat access			
• Improve habitat access[1,2,3,4]	• O. Remove or modify culverts which have been identified as fish barriers[1,2,3,4]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.1 Clearwater Subbasin (Lochsa River)

R. Clearwater Bull Trout

Section 4.8.1R.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/population	Total number of adults
Lochsa River	--			--	
	Number of Local Populations				
	16 (9 potential)		16 (9 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of Adults	Number of Local Populations	Density Estimate (fish/100m^2) 2007
White Sands Creek	--	--	0.00
Brushy Creek	--	--	0.20
Crooked Fork	--	--	0.02

S. Clearwater Redband

Section 4.8.1S.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Lochsa			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Mainstem Lochsa River	0.04
Brushy Creek	9.09
Crooked Fork	3.22

T. Clearwater Westslope Cutthroat Trout

Section 4.8.1T.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain populations at stable or increasing numbers		Number of local populations	Number of adults	Total number of adults
Lochsa	Restore critical habitat for fluvial component		NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Mainstem Lochsa River	0.16
Brushy Creek	1.09
Crooked Fork	1.37

U. Clearwater Mountain Whitefish

Section 4.8.1U.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase abundance		Number of local populations	Number of adults	Total number of adults
Lochsa			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)
Mainstem Lochsa River	0.75
Brushy Creek	0.99
Crooked Fork	0.34

Section 4.8.1 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Loss or destruction of floodplain, riparian and in-stream habitat, reduction in recruitment of large woody debris, and excess sedimentation due to agriculture and forestry practices[1,2,3,4]
Population traits	Introduced species	Hybridization with brook trout and hatchery rainbow trout[1,2]
Competition	Introduced species	Competition with brook trout and rainbow trout for available resources[1,2]
Water quality	Legacy effects	High summer water temperatures and low flows due to past agriculture and forestry practices[1,2,3,4]
Harvest	Illegal harvest	Illegal harvest
Habitat access	Land use	Loss of habitat access (e.g., culverts)[1,2,3,4]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.1 Strategies and Measures for Clearwater (Lochsa) Bull Trout, Westslope Trout, Redband trout, and Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land practices along river and stream corridors[1,2]	• A. Develop projects to address sedimentation issues, such as road obliteration/decommissioning, and historic mine cleanup[1,2] • B. Work with the USFS, other state and federal agencies, private landowners, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat[1,2] • Incorporate evaluations of existing habitat in survey projects whenever possible[1]	Immediate	0-10+ years
Population traits			
• Reduce impacts from introduced species[1,2,3,4]	• . Develop informational programs to educate anglers and the public to risks of introductions of exotic species[1,2,3,4] • E. Develop methods to remove exotic populations[1,2,3,4] • F. Determine levels of hybridization and distribution of exotic species[1,2,3,4] • G. Set liberal regulations on brook trout to reduce their numbers and limit their spread[1,2,3,4] • H. Emphasize use of westslope cutthroat trout for stocking mountain lakes in the Clearwater drainage[2]	Immediate	0-10+ years
Competition			
• Reduce impacts of competition with invasive species[1,2]	• I. Develop methods to remove exotic populations and to determine levels of hybridization and distribution of exotic species[1,2]	Immediate	0-10+ years
Water quality			

• Improve water quality[1,2,3,4]	• J. Improve riparian cover and land use practices to reduce water temperatures[1,2,3,4] • K. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources[1,2,3,4] • L. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups[1,2,3,4]	Immediate	0-10+ years
Harvest			
• Reduce illegal harvest[1]	• M. Install easy to read roadside signs that will inform anglers of the fishing regulations[1] • N. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem[1] • O. Simplify the fishing regulations[1]	Immediate	0-10+ years
Habitat access			
• Improve habitat access[1,2,3,4]	• P. Remove or modify culverts which have been identified as fish barriers[1,2,3,4]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Salmon Subbasin (Lower Salmon River, mouth to Little Salmon River

A. Salmon Bull Trout

Section 4.8.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults

Little-Lower Salmon River	--			--	
	Number of Local Populations				
	7 (3 potential)		7 (3 potential)		
	Total Number of Adults				
	2,000				2,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Slate Creek	--	--	0.26
John Day Creek	--	--	NA
Skookumchuck Creek	--	--	NA
Little Salmon	--	--	NA

B. Salmon Redband Trout

Section 4.8.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Lower Salmon River, mouth to Little Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2)

	(2007)
Slate Creek	5.01
John Day Creek	NA
Skookumchuck Creek	NA
Little Salmon	NA

C. Salmon Westslope Cutthroat Trout

Section 4.8.2C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Lower Salmon River, mouth to Little Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Slate Creek	0.00
John Day Creek	NA
Skookumchuck Creek	NA
Little Salmon	NA

D. Salmon White Sturgeon

Section 4.8.2D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	6,800 fish with a composition of 60% between 60 and 90cm total length, 30% between 92 and 183cm total length, and 10% greater than 183cm total length		Number of local populations	Number of adults/populations	Total number of adults
Hells Canyon			NA	NA	NA

Status:

Population	Abundance
Lower Snake River	Unknown

Section 4.8.1 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agriculture and forestry practices destroy floodplain and riparian habitat, reduce recruitment of large woody debris, and excess sedimentation [1,2,3]
Population traits	Hydro-operations	Hydro-operations limit recruitment[4]
Competition	Introduced species	Competition with brook trout and rainbow trout for available resources
Water quantity	Hydro-operations	Hydro-operations alter flow regimes[4]
Water quality	Legacy effects	Irrigation return flows, aquaculture operations, and municipal discharge[1,2,3,4]
Harvest	Fishing	Hooking mortality from sport fishery[4]
Habitat access	Land use	Loss of habitat access (e.g., culverts)[1,2,3]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]White sturgeon

Section 4.8.1 Strategies and Measures for Salmon (Lower Salmon River, mouth to Little Salmon River) Bull Trout, Westslope Cutthroat Trout, Redband trout, and White Sturgeon

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land practices along river and stream corridors[1,2]	• A. Develop projects to address sedimentation issues, such as road obliteration/decommissioning, and historic mine cleanup[1,2,3] • B. Work with the USFS, other state and federal agencies, private landowners, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat[1,2,3] • C. Incorporate evaluations of existing habitat in survey projects whenever possible[1,2,3]	Immediate	0-10+ years
Population traits			
• Increase abundance and size structure where necessary to maintain angling opportunity and promote natural spawning[4]	• D. Determine the contribution of hatchery-reared fish and translocated wild fish to spawning populations[4] • E. Maintain no-harvest angling regulations[4]	Immediate	0-10+ years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations and municipal discharge[1,2,4]	• F. Improve riparian cover and land use practices to reduce water temperatures[1,2,3,4] • G. Work with the USFS, other state and federal agencies, private landowners, county planners, conservation groups, and sportsman's groups[1,2,3,4] • H. Identify sources of sedimentation and actions to mitigate[1,2,3,4]	Immediate	0-10+ years
Water quantity			
• Improve flow regimes to provide adequate flows for spawning	• I. Identify on-the-ground actions that could be implemented to optimize	Immediate	0-10+ years

and proper conditions for eggs and juveniles, and to restore connectivity, food base, and nutrients to historic levels[4]	white sturgeon spawning success, incubation, and juvenile rearing conditions. This is especially critical in core conservation areas where populations are supported entirely by natural recruitment[4] • J. Continue to provide technical support and input to state and federal regulatory agencies regarding land management, water quality, hydropower operations, and flow management[4] • K. Restore connectivity and food base[4]		
Harvest			
• Quantify catch-an-release hooking mortality, illegal harvest, as well as direct tribal harvest levels[4]	• L. Determine the magnitude of loss associated with catch-and-release fishing[4] • M. Examine alternate sport gear types (hooks)[4] • N. Collaborate with Washington and Oregon enforcement agencies and the Nez Perce Tribe to quantify levels of tribal harvest[4] • O. Determine the magnitude of loss associated with illegal sturgeon harvest[4]	Immediate	0-10+ years
Habitat access			
• Improve habitat access[1,2,3]	• P. Remove or modify culverts which have been identified as fish barriers[1,2,3]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]White sturgeon

Section 4.8.2 Salmon Subbasin (Little Salmon River to Middle Fork Salmon River)

E. Salmon Redband Trout

Section 4.8.2E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Protect and conserve existing population		Number of local populations	Number of adults/populations	Total number of adults

Little Salmon River to Middle Fork Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Little Salmon River to Middle Fork Salmon River	Unknown

F. Salmon Bull Trout

Section 4.8.2F.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Salmon	--			--	
	Number of Local Populations				
	--		--		
	Total Number of Adults				
	--				--

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Little salmon River to Middle Fork Salmon River	Unknown	Unknown	Unknown

G. Salmon Westslope Cutthroat Trout

Section 4.8.2G.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Protect and conserve existing population		Number of local populations	Number of adults/populations	Total number of adults
Little Salmon River to Middle Fork Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Little Salmon River to Middle Fork Salmon River	Unknown

Section 4.8.2 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Competition	Introduced species	Competition with brook trout[1]
Water quality	Land use	Agriculture, forestry, and municipal development have led to sedimentation and high water temperatures[1,2]
Habitat access	Legacy effects	Past agriculture and forestry practices have blocked access to habitat[1,2,3]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout,

Section 4.8.2 Strategies and Measures for Salmon (Little Salmon to Middle Fork)Bull Trout, Westslope cutthroat Trout, and Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quality			
• Reduce impacts from development and	• A. Identify sources of sedimentation[1,2]	Immediate	0-10+ years

construction along stream corridors and reduce sedimentation[1,2]	• B. Work with jurisdictional agencies to identify priority needs[1,2] • C. Work with federal agencies, state agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern[1,2] • D. Promote the value and protection of functioning riparian zones and flood plains to reduce sedimentation, flood control, and solar heating[1,2]		
Competition			
• Reduce impacts from introduced species[1]	• E. Identify where introduced species pose risks to populations of native species[1] • F. Where feasible, remove introduced species[1] • G. Develop informational programs to educate anglers and the public to risks of random introductions of exotics[1] • H. Provide liberal regulations on brook trout[1] • I. Through planning, use enforcement efforts to curtail illegal introductions[1]	Immediate	0-10+ years
Habitat access			
• Ensure connectivity is maintained from mainstem to all tributaries[1,2,3]	• J. Identify manmade instream barriers that negatively impact stream connectivity[1,2,3] • K. Prioritize remedial actions[1,2,3] • L. Work with federal agencies, state agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern[1,2,3]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout,

Section 4.8.2 Salmon Subbasin (Upper and Lower Middle Fork Salmon River)

H. Salmon Bull Trout

Section 4.8.2H.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Middle Fork Salmon River	--			--	
	Number of Local Populations				
	28		28		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	--	--	0.25
Loon Creek	--	--	NA
Camas Creek	--	--	NA
Marsh Creek	--	--	NA

I. Salmon Redband Trout

Section 4.8.2I.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local	Number of adults/populations	Total number

			populations		of adults
Upper and Lower Middle Fork Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	0.36
Loon Creek	NA
Camas Creek	NA
Marsh Creek	NA

J. Salmon Westslope Cutthroat Trout

Section 4.8.2J.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Salmon			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	0.73
Loon Creek	NA
Camas Creek	NA
Marsh Creek	NA

K. Salmon Mountain Whitefish

Section 4.8.2K.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Upper and Lower Middle Fork Salmon River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Mainstem Middle Fork	0.70
Loon Creek	NA
Camas Creek	NA
Marsh Creek	NA

Section 4.8.2 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, mining activities, and agriculture[1,2,3,4]
Population traits	Introduced species	Hybridization and competition with brook trout[1]
Harvest	Current harvest practices	Sport fishing[1,2,3]
Habitat access	Land use	Diversions, hydro facilities, and culverts[1,2,3,4]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Strategies and Measures for Salmon (Little Salon to Middle Fork Salmon)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe

Habitat quality/quantity			
• Protect existing riparian habitat that is classified as properly functioning. Enhance and rehabilitate riparian habitat that is currently classified as functioning at risk or not functioning. Reduce sediment delivery to the stream network by reducing impacts of land practices along river and stream corridors[2,3,4]	• A. Develop projects to address sedimentation issues, such as road obliteration/decommissioning, and historic mine cleanup[2,3,4] • B. Work with grazing unit permit holders and the USFS to retire grazing permits in key tributaries within the Middle Fork[2,3,4] • C. Work with the USFS, other state and federal agencies, private landowners, and sportsman's groups to make protection of fisheries habitat a primary concern in land use decisions, and to improve/restore riparian habitat[2,3,4] • D. Incorporate evaluations of existing habitat in survey projects whenever possible[2,3,4]	Immediate	0-10+ years
• Reduce habitat fragmentation[1,2,3]	• E. Remove or modify culverts which have been identified as fish barriers[1,2,3] • F. Provide passage at irrigation and hydroelectric diversions on tributaries to the Middle Fork[1,2,3]		
Population traits			
• Reduce impacts from introduced species[1]	• G. Develop informational programs to educate anglers and the public to risks of introductions of exotic species[1] • H. Develop methods to remove exotic populations[1] • I. Determine levels of hybridization and distribution of exotic species[1] • J. Set liberal regulations on brook trout to reduce their numbers and limit their spread[1]	Immediate	0-10+ years
Harvest			
• Reduce illegal	• K. Install easy to read	Immediate	0-10+ years

harvest[1,2,3]	roadside signs that will inform anglers of the fishing regulations[1,2,3] • L. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem[1,2,3] • M. Simplify the fishing regulations[1,2,3] • N. Provide river floaters with educational material regarding fish conservation needs[1,2,3]		
Habitat access			
• Reduce and/or eliminate entrainment treats at key locations[1,2,3,4]	• O. Identify and screen high entrainment diversion locations in tributary areas[1,2,3,4] • P. Work with private landowners/irrigators[1,2,3,4]	Immediate	0-10+ years
• Improve habitat access	• Q. Remove or modify culverts which have been identified as fish barriers[4] • R. Improve fish passage at irrigation and hydroelectric diversions on tributaries to the Middle Fork[4]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Salmon Subbasin (Middle Salmon River, Middle Fork to Panther Creek)

L. Salmon Bull Trout

Section 4.8.2L.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon River-Panther	--			--	
	Number of Local Populations				

	20		20		
	Total Number of Adults				
	3,000				3,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2007)
Panther Creek	--	--	NA
Moyer Creek	--	--	NA
North Fork Salmon River	--	--	NA

M. Salmon Redband Trout

Section 4.8.2M.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increase the population and potentially use redband to recover steelhead		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon – Panther			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Panther Creek	0.62
Moyer Creek	1.76
North Fork Salmon River	0.76

N. Salmon Westslope Cutthroat Trout

Section 4.8.2N.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon – Panther			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Panther Creek	NA
Moyer Creek	NA
North Fork Salmon River	NA

O. Salmon Mountain Whitefish

Section 4.8.2O.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Middle Salmon – Panther			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2007)
Panther Creek	

Moyer Creek	
North Fork Salmon River	

Section 4.8.2 Primary Limiting Factors

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, mining activities, grazing, and irrigation[1,2,3,4]
Water quality	Land use	Irrigation[1,2,3,4]
Habitat access	Land use	Diversions, hydro facilities, and culverts[1,2,3,4]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Strategies and Measures for Salmon (Middle Fork Panther) Bull Trout, Westslope Cutthroat Trout, redband trout, and Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries[1,2,3,4]	• A. Reconnect strategic tributaries to the main-stem Salmon River[1,2,3,4] • B. Work with local landowners, irrigators, land management agencies, Lemhi County, and the highway administration to implement reconnects as manpower allows and as funding levels permit[1,2,3,4] • C. Improve water diversion and irrigation systems to conserve water for fish migration and passage[1,2,3,4] • D. Coordinate with land management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon tributary stream reconnect[1,2,3,4] • E. Develop water conservation agreements with irrigation districts to reduce levels of stream	Immediate	0-10+ years

	diversion[1,2,3,4]		
• Protect existing healthy, intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Restore proper floodplain function[1,2,3,4]	• F. Remove riprap, reopen isolated side channels and spring sources to provide flows to the historic floodplain[1,2,3,4] • G. Work with private landowners to protect and enhance riparian resources[1,2,3,4] • H. Improve grazing management, improve fencing, and purchase conservation easements[1,2,3,4] • I. Restore riparian vegetation via planting native vegetation in locations requiring shading, and bank stability[1,2,3,4]	Immediate	0-10+ years
Water quality			
• Improve water quality in the Panther Creek watershed[1,2,3,4]	• J. Improve water quality in the Panther Creek watershed by reducing mine effluents into the watershed[1,2,3,4] • K. Habitat improvement work to replace lost resources within the watershed[12,3,4]	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations[1,2,3,4]	• L. Identify and screen high entrainment diversion locations in tributary areas[1,2,3,4] • M. Work with private landowners / irrigators[1,2,3,4]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Salmon Subbasin (Lemhi River)

P. Salmon Bull Trout

Section 4.8.2P.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults

Lemhi River	--			--	
	Number of Local Populations				
	6 (3 potential)		6 (3 potential)		
	Total Number of Adults				
	2,000				2,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2006)
Lemhi River	--	--	0.13
Big Springs Creek	--	--	NA
Hayden Creek	--	--	0.23
Bear Valley Creek	--	--	0.13

Q. Salmon Redband Trout

Section 4.8.2Q.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase the population		Number of local populations	Number of adults/populations	Total number of adults
Lemhi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Lemhi River	0.34
Big Springs Creek	1.01
Hayden Creek	0.21

Bear Valley Creek	0.17

R. Salmon Westslope Cutthroat Trout

Section 4.8.2R.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increase populations in the mainstem Lemhi and mainstain stable populations in the tributaries		Number of local populations	Number of adults/populations	Total number of adults
Lemhi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Lemhi River	NA
Big Springs Creek	NA
Hayden Creek	0.09
Bear Valley Creek	0.10

S. Salmon Mountain Whitefish

Section 4.8.2S.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Lemhi River			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)

Lemhi River	1.22
Big Springs Creek	NA
Hayden Creek	0.12

Section 4.8.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Land use	Irrigation[1,2,3,4]
Habitat quality/quantity	Legacy effects	Roads, floodplain development, irrigation, and grazing[1,2,3,4]
Water quality	Land use	Irrigation, agriculture, and development[1,2,3,4]
Habitat access	Land use	Diversions[1,2,3,4]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Strategies and Measures for Salmon (Lemhi) Bull Trout, Westslope Cutthroat Trout, Redband Trout, and Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore natural hydrographs in key tributaries to ensure adequate base flows are available for fish migration at all life stages[1,2,3,4]	• A. Provide funding to reconnect strategic tributaries to the main-stem Lemhi River[1,2,3,4] • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit[1,2,3,4] • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage[1,2,3,4] • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed[1,2,3,4] • E. Coordinate with land	Immediate	0-10+ years

	management agencies, Lemhi County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect[1,2,3,4] • F. Develop water conservation agreements with water districts to reduce levels of stream diversion[1,2,3,4]		
Habitat quality/quantity			
• Protect existing healthy and intact riparian habitat and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors[1,2,3,4]	• G. Provide funding to complete improvements to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation)[1,2,3,4] • H. Work with private landowners to protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements[1,2,3,4] • I. Work with water users to mimic or restore natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats[1,2,3,4]	Immediate	0-10+ years
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of in river and stream reaches that support these life history stages[1,2,3,4]	• J. Provide funding to improve riparian cover and land use practices to improve flows and reduce water temperatures[1,2,3,4] • K. Fund improved water conveyance systems using pipelines and/or lined ditch systems[1,2,3,4] • L. Lease or acquire water rights to be dedicated in-stream[1,2,3,4] • M. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs[1,2,3,4] • N. Work with irrigation districts to ensure that diverted water is returned to	Immediate	0-10+ years

	the natural channel at the end of the irrigation season[1,2,3,4] • O. Work with private landowners/ irrigators[1,2,3,4]		
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations[1,2,3,4]	• P. Provide funding to identify and screen high entrainment diversion locations in tributary areas[1] • Q. Work with private landowners / irrigators[1,2,3,4]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Salmon Subbasin (Pahsimeroi River)

T. Salmon Bull Trout

Section 4.8.2T.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Pahsimeroi	--			--	
	Number of Local Populations				
	9		9		
	Total Number of Adults				
	3,000				3,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2006)
Pashimeroi River	--	--	NA

U. Salmon Redband Trout

Section 4.8.2U.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase the population		Number of local populations	Number of adults/populations	Total number of adults
Pahsimeroi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Pahsimeroi River	3.19

V. Salmon Westslope Cutthroat Trout

Section 4.8.2V.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increase populations		Number of local populations	Number of adults/populations	Total number of adults
Pahsimeroi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Pahsimeroi River	0.18

W. Salmon Mountain Whitefish

Section 4.8.2W.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults

Pahsimeroi			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
Pahsimeroi River	1.74

Section 4.8.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing[1,2,3,4]
Water quality	Land use	Agriculture and development[1,2,3,4]
Habitat access	Land use	Diversions[1,2,3,4]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Strategies and Measures for Salmon (Pahsimeroi) Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries[1,2,3,4]	• A. Improve water diversion and irrigation systems to conserve water for fish migration and passage[1,2,3,4] • B. Remove or modify culverts at road and highway crossings which may be fish barriers upon reconnect[1,2,3,4] • C. Develop water conservation agreements to reduce levels of stream diversion[1,2,3,4]	Immediate	0-10+ years
• Improve water diversion and irrigation systems to conserve water and facilitate the connection of isolated river reaches. Protect existing healthy riparian habitat	• D. Improve water diversion and irrigation systems to conserve water and connect isolated river reaches[1,2,3,4] • E. Strategies such as dry year lease options, conveyance improvements, change in application techniques, and water banking can be	Immediate	0-10+ years

and enhance and rehabilitate riparian habitats that are currently degraded. Reduce sediment delivery to the stream network by reducing impacts of land use practices along river and stream corridors[1,2,3,4]	employed[1,2,3,4] • F. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements[1,2,3,4] • G. Work with water users to mimic or rehabilitate natural hydrographs in the main-stem to transport and recruit gravels to spawning and rearing habitats[1,2,3,4] • H. Complete improvements to irrigation diversions to provide stable diversion points and reduce erosion (stream sedimentation) [1,2,3,4]		
Water quality			
• Improve water quality and quantity to provide adequate flows to support spawning and rearing life history stages of in river and stream reaches that support these life history stages[1,2,3,4]	• I. Improve riparian cover and land use practices to improve flows and reduce water temperatures[1,2,3,4] • J. Improve of water conveyance systems[1,2,3,4] • K. Lease or acquire water rights to be dedicated in-stream[1,2,3,4] • L. Work with irrigators to develop water management plans that create the most efficient program based on crop needs and soil types to preserve water for in-stream needs[1,2,3,4] • M. Work with irrigation districts to ensure that diverted water is returned to the natural channel at the end of the irrigation season[1,2,3,4]	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations	• N. Identify and screen high entrainment diversion locations in tributary areas[1,2,3,4] • O. Work with private landowners / irrigators[1,2,3,4]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Salmon Subbasin (Upper Salmon River)

X. Salmon Bull Trout

Section 4.8.2X.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon River	--			--	
	Number of Local Populations				
	18 (1 potential)		18 (1 potential)		
	Total Number of Adults				
	5,000				5,000

Status:

Population	Number of adults/populations	Number of Local Populations	Density Estimate (fish/100m^2) (2006)
East Fork	--	--	0.04
Mainstem	--	--	NA
Alturas Creek	--	--	NA
Redfish Creek	--	--	NA
Valley Creek	--	--	NA

Y. Salmon Redband Trout

Section 4.8.2Y.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan

Population	Maintain or increase the population		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
East Fork	0.52
Mainstem	0.49
Alturas Creek	0.09
Redfish Creek	0.21
Valley Creek	0.23

Z. Salmon Westslope Cutthroat Trout

Section 4.8.2Z.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Increase populations		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
East Fork	NA
Mainstem	0.02
Alturas Creek	NA
Redfish Creek	NA
Valley Creek	NA

AA. Salmon Mountain Whitefish

Section 4.8.2AA.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Maintain or increase population		Number of local populations	Number of adults/populations	Total number of adults
Upper Salmon			NA	NA	NA

Status:

Population	Density Estimate (fish/100m^2) (2006)
East Fork	1.06
Mainstem	2.36
Alturas Creek	2.04
Redfish Creek	0.09
Valley Creek	0.31

Section 4.8.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Legacy effects	Roads, irrigation, grazing[1,2,3,4]
Water quality	Land use	Irrigation[1,2,3,4]

Habitat access	Land use	Diversions[1,2,3,4]

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.8.2 Strategies and Measures for Salmon (Upper Salmon)Bull Trout, Westslope Cutthroat Trout, Westslope Cutthroat Trout, Redband Trout, and Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Improve habitat access by reconnecting strategic tributaries[1,2,3,4]	• A. Reconnect strategic tributaries to the main-stem upper Salmon River[1,2,3,4] • B. Work with local landowners, irrigators, land management agencies, and the highway administration to implement reconnects as manpower and funding levels permit[1,2,3,4] • C. Work with irrigators to improve water diversion and irrigation systems to conserve water for fish migration and passage[1,2,3,4] • D. Strategies such as dry year lease options, conveyance improvements, change in water application techniques, and water banking can be employed[1,2,3,4] • E. Coordinate with land management agencies, Custer County, and the highway administration to ensure fish passage at road and highway crossings which may be fish barriers upon reconnect[1,2,3,4] • F. Develop water conservation agreements with water districts to reduce levels of stream diversion[1,2,3,4]	Immediate	0-10+ years
• Protect existing healthy and intact riparian habitat, and enhance and rehabilitate riparian habitats that are currently	• G. Protect and enhance riparian resources with grazing management strategies, fencing and/or conservation easements[1,2,3,4] • H. Implement on-the-ground actions including: the	Immediate	0-10+ years

degraded. Restore proper floodplain function[1,2,3,4]	reopening of isolated side channels and spring sources to provide flows to the historic floodplain, planting native vegetation in locations requiring shading and bank stability, and determining the feasibility and cost effectiveness of reclaiming and restoring habitats damaged by historic mining activities[1,2,3,4]		
Water quality			
• Reduce summer water temperatures[1,2,3,4]	• J. Improve riparian cover and land use practices to reduce water temperatures[1,2,3,4] • K. Secure conservation easements in riparian and floodplain areas to protect vegetation and protect coldwater spring sources[1,2,3,4] • L. Reconnect of tributary habitat to provide cold water refugia to fishes in the main-stem Salmon River[1,2,3,4] • M. Work with private landowners/ irrigators[1,2,3,4]	Immediate	0-10+ years
Habitat access			
• Reduce and/or eliminate entrainment threats at key locations[1,2,3,4]	• N. Identify and screen high entrainment diversion locations in tributary areas[1,2,3,4] • O. Work with private landowners / irrigators[1,2,3,4]	Immediate	0-10+ years

[1]Bull trout, [2]Westslope cutthroat trout, [3]Redband trout, [4]Mountain whitefish

Section 4.9 Middle Snake Province

Section 4.9.1 Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Subbasin

A. Bruneau, Boise, Owyhee, Payette,Snaje Upper Middle, Weiser Bull Trout

Section 4.9.1A.1 Biological Objectives and Status

	Subbasin/Management		Draft Recovery Plan

	Plans				
Population (core)	Number of adults/populations		Number of local populations	Number of adults/populations	Total number of adults
Boise, Payette, Weiser					
	Number of Local Populations				
	Total Number of Adults				

Status:

Population	Estimated Abundance	Number of Local Populations
Anderson Ranch	10,412	15
Arrowrock	53,028	15
Lucky Peak	1,532	1
Deadwood River	4,007	5
Squaw Creek	17,251	2
Upper South Fork Payette River	21,303	9
Middle Fork Payette River	NA	1
North Fork Payette River	467	1
Weiser River	NA	5

Section 4.9.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quality	Legacy issues	
Habitat quality/quantity	Land use	
Habitat access	Legacy issues	

Competition	Introduced species	Brook trout
Nutrients	Hydro-operations	Reduced stream productivity due to hydrosystem development and the resultant loss of anadromous fish nutrient inputs

Section 4.9.1A.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle Weiser Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			

B. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Redband Trout

Section 4.9.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Enhance persistence and resilience of existing populations and expand the range and productivity of native redband trout		Number of local populations	Number of adults	Total number of adults
Snake River and Tributaries			NA	NA	NA

Status:

Population	Mean density estimate (fish/m^2)
Snake River and tributaries	0.095

Section 4.9.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Hydro-operations	Reduced stream flows and altered hydrographs due to reservoir development, water storage, and irrigation withdrawals

Water quality	Legacy issues	Sedimentation and high water temperatures due to road development
Habitat quality/quantity	Land use	Loss of instream and riparian habitat due to development
Habitat access	Legacy issues	Instream barriers
Nutrients	Legacy issues	Reduced stream productivity due to hydrosystem development and the resultant loss of anadromous fish nutrient inputs

Section 4.9.1B.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Reduce or eliminate impacts associated with surface water storage, diversion and adjacent land use along stream corridors	• A. Assess entrainment losses at diversions and to describe population impacts • B. Prioritize and implement measures to reduce/eliminate entrainment loss • C. Work with Federal agencies, State agencies, irrigation districts and landowners to improve flow regimes where native redband trout occur • D. Promote efficient water use	Immediate	0-10+ years
Water quality			
• Reduce sedimentation impacts from road development and maintenance and construction along stream corridors	• E. Identify sedimentation sources and work with jurisdictional agencies to mitigate • F. Restore riparian areas to control erosion and reduce solar heating • G. Implement TMDLs where appropriate • H. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary	Immediate	0-10+ years

	concern		
Habitat quality/quantity			
• Avoid or mitigate habitat impacts from development and land use along stream corridors	• I. Conduct standard population and habitat surveys • J. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern • K. Incorporate habitat assessment into standard population surveys	Immediate	0-10+ years
Habitat access			
• Maintain or restore population connectivity throughout mainstem reaches, between mainstem rivers and tributaries, and within tributaries	• L. Identify and prioritize the removal of in stream barriers	Immediate	0-10+ years
Nutrients			
• Restore ecosystem productivity and redband trout abundance and resiliency by nutrient supplementation in key habitats	• M. Refine methods and describe ecological benefits of nutrient supplementation to redband trout as well as other resident fish, aquatic, and terrestrial species • N. Develop and fund a marine nutrient mitigation program to benefit redband trout and other resident fish, riparian, and upland species	Immediate	0-10+ years

C. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Mountain Whitefish

Section 4.9.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Protect and conserve existing populations		Number of local populations	Number of adults	Total number

					of adults
Boise, Payette, Weiser			NA	NA	NA

Status:

Population	Abundance (estimate)
Weiser River	992
Payette River	1,499,216
Boise River	322,691
Owyhee River	0
Bruneau River	8,664
Big Wood River	2,876
Salmon Falls Creek	0
Rock Creek	0

Section 4.9.1C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Residential development and construction
Water quality	Land use	Residential development
Water quantity	Land use	Water diversions and irrigation

Section 4.9.1C.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Mountain Whitefish

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Reduce impacts from development and construction along stream corridors and reduce sedimentation	• A. Conduct standard population and habitat surveys • B. Work with Federal agencies, State agencies, local city planners, developers, and landowners to implement protection and conservation of wetland, riparian, and instream	Immediate	0-10+ years

	habitats • C. Prevent the removal of woody debris critical to the development and maintenance of winter habitat (i.e pools) • D. Preserve and restore side channel habitat. Incorporate habitat assessment into standard population surveys		
Water quality			
• Reduce impacts from development and construction along stream corridors and reduce sedimentation	• E. Identify sedimentation sources and work with jurisdictional agencies to mitigate • F. Work with Federal agencies, State agencies, local city planners, developers, and landowners to implement protection and conservation of wetland, riparian, and instream habitats • G. Promote the value, restoration and protection of functioning riparian zones, wetlands, and flood plains to reduce sedimentation, solar heating and increase flood control	Immediate	0-10+ years

Water quantity			
• Reduce impacts from development and surface water diversion along stream corridors	• H. Determine the extent of entrainment loss at major diversions and identify the level of population loss that is occurring • I. Work with Federal agencies, State agencies, local city planners, developers, irrigation districts and landowners to make the protection of fisheries habitat a primary concern • J. Promote efficient water use	Immediate	0-10+ years

D. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser White Sturgeon (Shoshone Falls to Hells Canyon Dam)

Section 4.9.1D.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Conserve, restore, and enhance viable white sturgeon populations capable of providing sport-fishing opportunity		Number of local populations	Number of adults	Total number of adults
Snake River			NA	NA	NA

Status:

Population	Population Estimate
C.J. Strike	566 (2007)

Section 4.9.1D.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Hydro-operations	Altered hydrograph and reduced total Snake River discharge due to hydro-operations
Water quality	Legacy issues	Sediment and high organic loads due to irrigation return flows, aquaculture operations, and municipal discharge
Habitat quality/quantity	Hydro-operations	Hydroelectric facilities have

		created slackwater reservoirs that are seasonally unusable
Population traits	Hydro-operations	Lack of recruitment

Section 4.9.1D.3 Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser White Sturgeon (Shoshone Falls to Hells Canyon Dam)

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Improve flow regimes to provide adequate flows for spawning and proper conditions for eggs and juveniles, connectivity, and food base	• A. Implement management actions that optimize white sturgeon spawning success, incubation, and juvenile rearing conditions, with emphasis on core conservation populations supported entirely by natural recruitment.	Immediate	0-10+ years
Water quality			
• Reduce sediment and nutrient delivery from irrigation return flows, aquaculture operations, and municipal discharge	• B. Identify sources of sedimentation and actions to mitigate • C. Work with appropriate agencies and land owners to develop a strategy for reducing sedimentation • D. Implement TMDL	Immediate	0-10+ years
Habitat quality/quantity			
• Restore and manage demographic and genetic interchange among white sturgeon populations	• E. Determine the need to develop volitional passage facilities or the need for a periodic trap and transplant program to maintain population structure	Immediate	0-10+ years

Population traits			
• Increase abundance and size structure where necessary to maintain angling opportunity and promote natural spawning	• F. Determine the contribution of hatchery-reared fish and translocated wild fish to spawning populations • G. Maintain no-harvest angling regulations	Immediate	0-10+ years

E. Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Wood River Sculpin

Section 4.9.1E.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Big Wood River, Little Wood River, and Camas Creek	Maintain and restore populations of WRS in suitable waters and historic habitat to ensure a high probability of long-term persistence in appropriate numbers to perform ecological functions.		NA	NA	NA

Status:

Population	Estimated Abundance
Wood River Basin	1,356,600 (2003)

Section 4.9.1E.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Predation	Introduced species	Brown trout
Water quantity	Land use	Surface water diversion
Water quality	Legacy issues	Sedimentation and high water temperatures due to development
Habitat quality/quantity	Land use	Loss or destruction of instream and riparian habitat due to development

Section 4.9.1E.3 Strategies and Measures for Bruneau, Boise, Owyhee, Payette, Snake Upper Middle, Weiser Wood River Sculpin

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Predation			
• Prevent/reduce upstream expansion of brown trout	• A. Determine the distribution and abundance of brown trout	Immediate	0-10+ years
Water quantity			
• Reduce or eliminate impacts associated with surface water diversion and adjacent land use along stream corridors	• B. Evaluate entrainment loss at major diversions • C. Describe the magnitude of the problem and prioritize actions to correct • D. Work with jurisdictional agencies to mitigate • E. Work with Federal agencies, State agencies, irrigation districts and landowners to make the protection of fisheries habitat a primary concern • F. Promote efficient water use	Immediate	0-10+ years
Water quality			
• Reduce impacts from development and construction along stream corridors and reduce sedimentation	• G. Identify sources of sedimentation and work with jurisdictional agencies to mitigate • H. Work with Federal agencies, State agencies,	Immediate	0-10+ years

	local city planners, developers, irrigation districts and landowners to make the protection of fisheries habitat a primary concern • I. Promote the value and protection of functioning riparian zones and flood plains to reduce sedimentation, flood control, and solar heating		
Habitat quality/quantity			
• Reduce impacts from development and land use along stream corridors and reduce sedimentation (i.e. embeddedness)	• J. Conduct standard population and habitat surveys • K. Work with Federal agencies, State agencies, local city planners, developers, and landowners to make the protection of fisheries habitat a primary concern. • L. Incorporate habitat assessment into standard population surveys • M. Preserve existing side channel habitat.	Immediate	0-10+ years

Section 4.9.2 Malheur Subbasin

A. Malheur Bull Trout

Section 4.9.2A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Malheur	--			--	
	Number of Local Populations				
	2 or more		2 or more		
	Total Number of Adults				
	2,000 – 3,000				2,000-3,000

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Upper Malheur	--	1	194 (for both populations)
North Fork Malheur	--	1	

Section 4.9.2A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Livestock grazing, timber harvest, road building, dispersed recreation, and agriculture practices
Habitat access	Current land use	Culverts, irrigation dams, and diversion dams
Water quality	Current land use	Livestock grazing, timber harvest, road building, dispersed recreation, and agriculture practices.
Water quantity	Current land use	Irrigation withdrawals
Contaminants	Current land use	Livestock grazing, timber harvest, road building, dispersed recreation, and agriculture practices.
Competition	Non-native fish	Hybridization, introgression and competition with brook trout
Nutrients	Current land use; dams	Construction and operation of hydropower and irrigation dams

Section 4.9.2A.3 Strategies and Measures for Malheur Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore and protect riparian habitats	• A. Improve instream habitat, incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans	Immediate	10+ years

	• B. Identify site-specific threats that may be limiting bull trout in watersheds with historical bull trout habitat • C. Identify and pursue opportunities to implement recovery strategies • D. Restore shade and canopy, riparian cover, and native vegetation in all bull trout spawning areas • E. Reduce grazing impacts in all bull trout spawning areas • F. Identify and prioritize opportunities for channel restoration in Lake Creek • G. Determine life history requirements of resident and migratory bull trout local population in the Malheur Core Area • H. Provide long-term habitat protection through land purchase or easements • I. Develop educational materials on bull trout and their habitat needs to provide to landowners and interested public parties • J. Integrate watershed analyses and assessments and restoration activities on public and private lands • K. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout • L. Improve and implement fisheries management guidelines and policies designed to protect native species • M. Evaluate effectiveness of different habitat restoration techniques in restoring channel functions and local bull trout populations in the Malheur Core Area		

	• N. Determine the movement and seasonality of use of different habitat types by adult and sub-adult migratory bull trout in multiple streams, with emphasis on reservoirs and mainstem rivers • O. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, periodically review progress towards recovery goals and assess recovery tasks • P. Conduct regular surveys in potential habitat in the Malheur Core Area where bull trout status is unknown or re-colonization is anticipated		
Habitat Access			
• Re-establish historical connectivity and migratory corridors for all native fish species	• Q. Identify and implement opportunities for two-way passage at major dams • R. Install appropriate fish screen and passage structures around diversions and/or remove related migration barriers • S. Provide passage at transportation/road-related barriers • T. Incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans • U. Review reservoir operational concerns and provide operating recommendation through Federal consultation or other means • V. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout, work cooperatively with the Burns-Paiute tribal government to implement recovery actions,	Immediate	5-10 years

	and periodically review progress towards recovery goals and assess recovery tasks		
Population Traits			
• Genetic identification of populations	• W. Develop genetic management plan for bull trout population isolated by human made barriers • X. Determine consequences of genetic fragmentation/isolation due to human-made barriers, identify and pursue opportunities to implement recovery strategies	Immediate	0-5 years
Water Quality			
• Meet water quality standards set by the Malheur River DEQ TMDL's	• Y. Assess sediment sources in Malheur Subbasin • Z. Stabilize roads, crossings, and other sources of sediment delivery • AA. Incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans • BB. Identify and pursue opportunities to implement recovery strategies, increase monitoring of sediment inputs on the Malheur National Forest • CC. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout, improve and implement fisheries management guidelines and policies designed to protect native species, work cooperatively with the Burns-Paiute tribal government to implement recovery actions, and periodically review progress towards recovery goals and assess recovery	Immediate	10+ years

	tasks		
Water Quantity			
• Restore historical stream discharge hydrograph to mainstem and tributary habitats	• DD. Assess current and historical effects of upland management on changes to the hydrograph in all spawning tributaries • EE. Incorporate bull trout recovery actions into The Oregon Plan for Salmon and Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans • FF. Identify and pursue opportunities to implement recovery strategies, establish/provide instream flows downstream from reservoirs and stabilize flow regimes • GG. Restore connectivity and opportunities for migration by improving instream flows and/or water rights, • HH. Coordinate bull trout recovery with recovery efforts, management plans, etc. of other species such as redband trout, improve and implement fisheries management guidelines and policies designed to protect native species • II. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, and periodically review progress towards recovery goals and assess recovery tasks	Immediate	10+ years
Contaminants			
• Identify non-point sources	• JJ. Assess and mitigate effects on bull trout from non-point source pollution	Immediate	5-10 years
Competition			
• Remove or control non-native fish populations that impact native fish populations	• KK. Implement brook trout removal efforts • LL. Incorporate bull trout recovery actions into The Oregon Plan for Salmon and	Immediate	10+ years

	Watersheds and the Northwest Power and Conservation Council Subbasin/Management Plans • MM. Determine site-specific levels of competition and hybridization with introduced sport fish and assess impacts of those interactions • NN. Identify and pursue opportunities to implement recovery strategies • OO. Develop and implant an educational effort to address problems and consequences of unauthorized fish introductions • PP. Increase information outreach to anglers • QQ. Improve and implement fisheries management guidelines and policies designed to protect native species • RR. Determine the movement and seasonality of use of different habitat types by adult and sub-adult migratory bull trout in multiple streams, with emphasis on reservoirs and mainstem rivers • SS. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, periodically review progress towards recovery goals and assess recovery tasks		
Nutrients			
• Restore nutrient cycle and prey base interactions	• TT. Investigate potential for restoring historic prey base by reintroducing anadromous species • UU. Identify and pursue opportunities to implement recovery strategies • VV. Develop an annual work plan to support implementation in the Malheur Recovery Unit • WW. Review reservoir	Immediate	0-5 years

	operational concerns and provide operating recommendation through Federal consultation or other means • XX. Improve and implement fisheries management guidelines and policies designed to protect native species • YY. Evaluate food web interactions in drainages most affected by introduced fishes, reservoir operations, loss of anadromous species (prey base/nutrients), etc, • ZZ. Work cooperatively with the Burns-Paiute tribal government to implement recovery actions, and periodically review progress towards recovery goals and assess recovery tasks		

B. Malheur Redband Trout

Section 4.9.2B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Malheur	Insufficient evaluation and monitoring data to determine estimate		NA	NA	NA

Status:

Population	Adult Abundance
Malheur	156,200

Section 4.9.2B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Livestock grazing, timber harvest, road building, dispersed

		recreation, urban development and agriculture practices
Habitat access	Current land use	Irrigation diversions, irrigation dams, and road crossings
Water quality	Current land use	Livestock grazing, timber harvest, road building and agriculture practices.
Water quantity	Current land use	Irrigation practices
Competition	Non-native species	Hybridization, introgression and competition with rainbow trout
Nutrients	Current land use; dams	Loss of marine derived nutrients

Section 4.9.2B.3 Strategies and Measures for Malheur Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Restore and protect instream habitat and stream channel processes	• A. Allow stream flow processes to maintain channels through restoration of natural flow regimes and floodplain connection • B. Improve instream channel habitat through placement of large woody debris and boulders, bank stabilization efforts and flow augmentation/improvements • C. Develop off-channel habitat • D. Remove or modify levies, berms, roads or dikes where appropriate • E. Re-configure modified channels through active restoration • F. Restore shade and canopy, riparian cover, and native vegetation in all redband trout spawning areas • G. Reduce grazing impacts in all redband trout spawning areas • H. Provide long-term habitat	Immediate	10+ years

	protection through land purchase or easements, • I. Evaluate effectiveness of different habitat restoration techniques • J. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
Habitat Access			
• Improve habitat connectivity and fish passage	• K. Create fish passage at dams and irrigation water diversion structures • L. Remove unnecessary dams and diversion structures, remove barriers at roads • M. Repair/improve culverts to allow fish passage, eliminate barriers created by dewatered reaches and poor water quality • N. Install approved fish screens at irrigation diversions • O. Identify and implement opportunities for two-way passage at major dams, • P. Determine consequences of genetic fragmentation/isolation due to human-made barriers • Q. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	0-5 years
Water Quality			
• Improve riparian, floodplain and wetland habitats	• R. Maintain/protect existing riparian, floodplain and wetland habitats • S. Restore and maintain connection of stream channels to their floodplains and restore floodplain function	Immediate	10+ years

	• T. Plant native vegetation, reestablish wetlands through easements, restoration and enhancement • U. Establish buffers to improve riparian areas through conservation easements, riparian fencing and implementation of setbacks, and implement proper grazing management • V. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
• Improve water quality	• W. Maintain or create adequate vegetation in buffers to intercept overland and subsurface sources of pollution • X. Appropriate application of herbicides and insecticides to protect water quality and aquatic resources • Y. Implement nutrient management • Z. Implement sewage and stormwater management • AA. Increase monitoring of sediment inputs • BB. Assess and mitigate effects on redband trout from non-point source pollution • CC. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	10+ years
• Reduce upland erosion and sedimentation	• DD. Assess sediment sources in Malheur Subbasin • EE. Stabilize roads, crossings, and other sources of sediment delivery • FF. Encourage improvements in grazing management	Immediate	5-10 years

	• GG. Encourage improvements in timber management • HH. Encourage improvements in agricultural practices including methods such as no till farming or cover crops • II. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
Water Quantity			
• Reduce out-of-stream water use through efficiency, conservation, lease or purchase	• JJ. Assess current and historical effects of upland management on changes to the hydrograph in all spawning tributaries • KK. Establish/provide instream flows downstream from reservoirs and stabilize flow regimes • LL. Improve irrigation efficiency and water management to increase instream flows (may include lease and purchase of water where necessary and available) • MM. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	10+ years
Competition			
• Remove or control non-native fish populations that impact native fish populations	• NN. Determine site-specific levels of competition and hybridization with introduced sport fish and assess impacts of those interactions • OO. Develop and implant an educational effort to address problems and consequences of unauthorized fish introductions • PP. Monitor habitat and water quality improvements	Immediate	10+ years

	by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan		
Nutrients			
• Restore nutrient cycle and prey base interactions	• QQ. Investigate potential for restoring historic prey base by reintroducing anadromous species • RR. Evaluate food web interactions in drainages most affected by introduced fishes, reservoir operations, loss of anadromous species (prey base/nutrients), etc • SS. Utilize anadromous fish carcass planting methodologies to restore lost marine derived nutrients and monitor effectiveness of these actions • TT. Monitor habitat and water quality improvements by utilizing methodologies identified in the Malheur River Subbasin Native Salmonid Monitoring Plan	Immediate	0-5 years

Section 4.9.3 Owyhee Subbasin

A. Owyhee Redband Trout

Section 4.9.3A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Maintain a healthy fishery		Number of local populations	Number of adults/population	Total number of adults
Owyhee			NA	NA	NA

Status:

Population	Number of adults/population	Number of Local Populations	Total Number of Adults
Owyhee			Unknown

Section 4.9.3A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Livestock grazing and ATV use
Water quality	Current land use	Livestock grazing
Population traits	Hatchery fish	Introgression with hatchery rainbow trout
Habitat access	Current land use	Road crossings

Section 4.9.3A.3 Strategies and Measures for Powder Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Identify all potential redband trout habitat	• A. Survey all streams that allow for permanent residence, spawning, and rearing of young • B. Classify streams by proper functioning condition	Immediate	1-5 years
• Protect existing properly functioning streams.	• C. Exclude livestock from critical areas using fences, stock troughs, and strategically placed salt licks • D. Reduce sedimentation from roads by improving road crossings, maintaining culverts, and restricting access during wet portions of the year		
• Improve streams with inadequate proper functioning condition	• E. Exclude livestock from critical areas using fences, troughs, and strategically placed salt licks • F. Reduce sedimentation from roads by improving road crossings, maintaining culverts, and restricting access during wet seasons of the year • G. Improve bank stabilization by reestablishing native vegetation such as willows and other hydrophilic plants		
Water Quality			
• Bank stabilization, road maintenance, and	• H. Revegetating shore and banks by active planting	Immediate	1-5 years

livestock exclusion from critical areas	• I. Requesting road maintenance as needed • J. Constructing livestock fences, water troughs, and strategically placing salt licks to reduce impacts from livestock		
Population traits			
• Change stocking practices to include only triploid rainbow trout	• K. Purchasing of only triploid rainbow trout to minimize interbreeding of redband strains and other strains	Immediate	1-5 years
Habitat Access			
• Ensuring that sufficient flows are maintained in road crossings to allow migration upstream and downstream	• L. Installation of culverts, rock crossings, and other types of stream crossings at each location roads intersect streams and designed to maintain adequate flows through each structure to allow fish passage	Immediate	1-5 years

Section 4.9.4 Powder Subbasin

A. Powder Bull Trout

Section 4.9.4A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Number of adults/population		Number of local populations	Number of adults/population	Total number of adults
Powder	NA			NA	
	Number of Local Populations				
	NA		NA		
	Total Number of Adults				
	NA			NA	

Status:

Population	Number of adults/population	Number of Local	Total Number of Adults

		Populations	
Powder			Unknown

Section 4.9.4A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Current land use	Agricultural and urban development
Water quality	Current land use	Livestock grazing and agriculture
Water quantity	Current land use	Irrigation
Habitat access	Current land use	Irrigation diversions and road crossings

Section 4.9.4A.3 Strategies and Measures for Powder Bull Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Quality/Quantity			
• Improve stream channel processes	• A. Allow stream flow processes to maintain channels through restoration of natural flow regimes and floodplain connection • B. Improve instream channel habitat through placement of large woody debris and boulders, bank stabilization efforts and flow augmentation/improvement • C. Develop off-channel habitat, remove or modify levies, berms, roads or dikes where appropriate • D. Re-configure modified channels through active restoration	Immediate	1-5 years
Water Quality			
• Improve riparian, floodplain and wetland habitats	• E. Maintain/protect existing riparian, floodplain and wetland habitats • F. Implement proper grazing management • G. Establish buffers to improve riparian areas	Immediate	1-5 years

	through conservation easements, riparian fencing and implementation of setbacks • H. Reestablish wetlands through easements, restoration and enhancement • I. Plant native vegetation • J. Restore and maintain connection of stream channels to their floodplains and restore floodplain function		
• Improve water quality	• K. Maintain or create adequate vegetation in buffers to intercept overland and subsurface sources of pollution • L. Appropriate application of herbicides and insecticides to protect water quality and aquatic resources • M. Implement nutrient management, and implement sewage and stormwater management	Immediate	1-5 years
• Reduce upland erosion and sedimentation	• N. Encourage improvements in road management to reduce erosion • O. Encourage improvements in grazing management • P. Encourage improvements in timber management • Q. Encourage improvements in agricultural practices including methods such as not till farming or cover crops	Immediate	1-5 years
Water Quantity			
• Reduce out-of-stream water use through efficiency, conservation, lease or purchase	• R. Improve irrigation and water management to increase flow (may include lease and purchase of water where necessary and available)	Immediate	1-5 years
Habitat Access			
• Improve habitat connectivity and fish passage	• S. Create fish passage at dams and irrigation water	Immediate	1-5 years

	diversion structures • T. Remove unnecessary dams and diversion structures • U. Remove barriers at roads; repair/improve culverts to allow fish passage, eliminate barriers created by dewatered reaches and poor water quality • V. Install approved fish screens at irrigation diversions		

B. Powder Redband Trout

Section 4.9.4B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Abundance		Number of local populations	Number of adults	Total number of adults
Powder	None		NA	NA	NA

Status:

Population	Abundance
Powder	Unknown

Section 4.9.4B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat access	Current land use	Agricultural and urban development
Water quality	Current land use	Livestock grazing and agriculture
Water quantity	Current land use	Irrigation
Habitat access	Current land use	Irrigation diversions and road crossings

Section 4.9.4B.3 Strategies and Measures for Powder Redband Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat Access			

• Improve stream channel processes	• A. Allow stream flow processes to maintain channels through restoration of natural flow regimes and floodplain connection, and improve instream channel habitat through placement of large woody debris and boulders, bank stabilization efforts and flow augmentation/improvement • B. Develop off-channel habitat, remove or modify levies, berms, roads or dikes where appropriate, and re-configure modified channels through active restoration	Immediate	
Water Quality			
• Improve riparian, floodplain and wetland habitats	• C. Maintain/protect existing riparian, floodplain and wetland habitats • D. Implement proper grazing management • E. Establish buffers to improve riparian areas through conservation easements, riparian fencing and implementation of setbacks, • F. Reestablish wetlands through easements, restoration and enhancement • G. Plant native vegetation • H. Restore and maintain connection of stream channels to their floodplains and restore floodplain function	Immediate	
• Improve water quality	• I. Maintain or create adequate vegetation in buffers to intercept overland and subsurface sources of pollution • J. Appropriate application of herbicides and insecticides to protect water quality and aquatic resources • K. Implement nutrient management • L. Implement sewage and stormwater management	Immediate	
• Reduce upland erosion and sedimentation	• M. Encourage improvements in road management to reduce erosion • N. Encourage improvements in grazing management	Immediate	

	• O. Encourage improvements in timber management, • P. Encourage improvements in agricultural practices including methods such as not till farming or cover crops		
Water Quantity			
• Reduce out-of-stream water use through efficiency, conservation, lease or purchase	• Q. Improve irrigation and water management to increase flow (may include lease and purchase of water where necessary and available)	Immediate	
Habitat Access			
• Improve habitat connectivity and fish passage	• R. Create fish passage at dams and irrigation water diversion structures • S. Remove unnecessary dams and diversion structures • T. Remove barriers at roads; repair/improve culverts to allow fish passage, eliminate barriers created by dewatered reaches and poor water quality • U. Install approved fish screens at irrigation diversions	Immediate	

Section 4.10 Upper Snake Province

Section 4.10.1 Upper, Headwaters, Closed Subbasins

A. Upper, Headwaters, Closed Yellowstone Cutthroat Trout

Section 4.10.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Decrease rainbow or hybrid trout abundance and maintain at no more than 10% of species composition in the South Fork of the Snake River, as indexed by the Conant electrofishing reach		Number of local populations	Number of adults/population	Total number of adults
	Identify and reduce artificially blocked streams or unscreened diversions		NA	NA	NA
	Protect and enhance existing CORE (<1% hybridized) populations and associated habitat emphasizing connectivity and expanded distribution where feasible				
South Fork of the Snake River					
Teton River					
Blackfoot River					
Portneuf River					

	Subbasin/Management Plans		Draft Recovery Plan		
Raft River					
Goose Creek					
Big Cottonwood Creek					
Dry Creek					

Status:

Population	Rainbow/hybrid abundance	Yellowstone Cutthroat trout Abundance
South Fork of the Snake River	1,328 age-1+ fish/mile (2007) Contant Reach	2,244 age-1+ fish/mile (2007) Contant Reach
Teton River	422 age-1+ fish/mile (2007) Teton Valley 50 age-1+ fish/mile(2007) Lower Teton (South Fork)	48 age-1+ fish/mile (2007) Teton Valley 149 age-1+ fish/mile(2007) Lower Teton (South Fork)
Blackfoot River	NA	19 adults collected at migration trap
Portneuf River	Unknown	Unknown
Raft River	Unknown	Unknown
Goose Creek	Unknown	Unknown
Big Cottonwood Creek	Unknown	Unknown
Dry Creek	Unknown	Unknown

Section 4.10.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water quantity	Hydro-operations and land-use	Loss of peak flows due to hydro-operations and loss of mid- and late-summer flows in small streams due to withdrawals for irrigation
Habitat quality/quantity	Legacy issues	Loss or destruction of important floodplain/riparian habitat and excess sediment delivery
Population traits	Introduced species	Hybridization with rainbow trout
Predation/competition	Birds and introduced fish species	Competition with brook trout and American white pelican predation on spawning Yellowstone cutthroat trout
Harvest	Illegal harvest	Illegal harvest of Yellowstone cutthroat trout
Habitat access	Land-use	Roads, residential development, railroads, dikes, irrigation diversions
Water quality	Legacy issues	Forest and agriculture management practices

Section 4.10.1A.3 Strategies and Measures for Upper, Headwaters, Closed Yellowstone Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quantity			
• Restore peak springtime flows in the South Fork of the Snake River	• A. Monitor fish populations to evaluate effectiveness of managed flow regimes • B. Obtain sufficient normative river flows and river processes to minimize survival bottlenecks of Yellowstone cutthroat trout, and to hinder successful reproduction of rainbow trout • C. Provide a maximum springtime: minimum winter flow ratio of at least 15:1 in at least two of every three years	Immediate	0-10+ years
• Increase stream flows during	• D. Identify opportunities to increase stream flows and	Immediate	0-10+ years

critical periods for migration or mid-late summer rearing	provide funding (e.g., water purchase programs, donated water rights, more efficient irrigation practices, and possibly conversion to groundwater use) • E. Provide access to thermal refugia by restoring connectivity in key systems		
Habitat quality/quantity			
• Reduce impacts from development along river and stream corridors and reduce sediment delivery to the stream network	• F. Identify on-the-ground habitat projects to protect key riparian habitats and stream corridors (e.g., through conservation easements, acquisitions, and technical guidance to prospective developers		0-10+ years
Population traits			
• Reduce impacts from introduced species	• G. Conserve the genetic integrity of the YCT population through development and operation of fish trapping facilities on the four main cutthroat trout spawning tributaries to the South Fork of the Snake River • H. Continue efforts to encourage harvest of rainbow and hybrid trout in the South Fork of the Snake River and in other areas where they pose direct threat to the genetic integrity of Yellowstone cutthroat trout • I. Where rainbow or hybrid trout are stocked in waters supporting native Yellowstone cutthroat trout populations, only triploid (sterile) fish will be used • J. Develop informational programs to educate anglers and the public to risks of random introductions of exotic species • K. Through planning, use enforcement efforts to curtail illegal introductions • L. Consider drainage	Immediate	0-10+ years

	restoration projects that result in the removal of hybridized rainbow trout X Yellowstone cutthroat trout population and the subsequent transplant of genetically pure YCY in naturally or artificially isolated populations		
Predation/competition			
• Reduce impacts from introduced species	• M. Control impacts of introduced fish species • N. Where brook trout are stocked in waters supporting native Yellowstone cutthroat trout populations, only triploid (sterile) fish will be used • O. Develop informational programs to educate anglers and the public to risks of random introductions of exotic species • P. Through planning, use enforcement efforts to curtail illegal introductions • Q. Provide liberal regulations on brook trout	Immediate	0-10+ years
• Reduce pelican predation on spawning YCT	• R. Develop management strategies that will balance conservation and recreation interests for both fish and pelican populations in Idaho.	Immediate to mid-term	0-10+ years
Harvest			
• Reduce impacts associated with the illegal harvest of cutthroat trout	• S. Produce and install easy to read road side signs that inform anglers of what the fishing regulations are when traveling the major roads within the Upper Snake subbasin • T. Increase enforcement and education in areas where non-compliance with fishing regulations have been found to be a problem	Immediate	0-10+ years

Habitat access			
• Restore connectivity to important spawning, rearing and refugia habitat	• U. Identify and inventory, impassible roads crossings, subdivisions, railroads, dikes and other man-caused developments that potentially jeopardize fish populations • V. Develop a data base to demonstrate the magnitude of habitat loss and more effectively influence land use decisions • W. Work with the Forest Service, Idaho Department of Lands, other agencies, water users, non-governmental organizations, private developers, landowners, county planners and interested angling groups to make protection of fisheries habitat a primary concern in land use decisions. Work with the above entities to insure mitigation of habitat loss or to restore access whenever possible.	Immediate	0-10+ years
• Unscreened irrigation diversions that entrain fish	• X. Reduce entrainment to irrigation diversions in systems where native fish populations are adversely impacted	Immediate	0-10+ years
Water quality			
• Improve water quality	• Y. Determine levels of in stream contaminants • Z. Work with Department of Environmental Quality, Environmental Protection Agency, U.S. Fish and Wildlife Service, Bureau of Land Management, U.S. Forest Service, private developers, landowners, and other agencies to improve riparian habitat conditions	Immediate	0-10+ years

B. Upper, Headwaters, Closed Northern leatherside chub

Section 4.10.1B.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Maintain and restore populations of Northern leatherside chubin suitable waters and historic habitat to ensure a high probability of long-term persistence in appropriate numbers to perform ecological functions		Number of local populations	Number of adults	Total number of adults
Raft River			NA	NA	NA
Goose Creek					

Status:

Population	Adult Abundance
Raft River	Unknown
Goose Creek	Unknown

Section 4.10.1B.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Water Quality	Land-use	Increased water temperatures, sedimentation, and riparian degradation due to livestock grazing
Population traits	Distribution and genetic composition	Distribution and genetic composition unknown

Section 4.10.1B.3 Strategies and Measures for Upper, Headwaters, Closed Northern leatherside chub

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Water quality			
• Enhance and preserve riparian habitat	• A. Assess population status and linkages to potentially critical habitat • B. Provide information to land management agencies and public on identification, population status and distribution of leatherside chub in the drainages. • C. Work with local regulatory agencies and landowners to minimize impacts of livestock grazing on riparian areas	Immediate	0-10+ years
Population traits			
• Identify current distribution and evaluate genetic composition	• D. Develop baseline population structure information • E. Work with local regulatory agencies and collection permit applicants to document the presence of Northern leatherside chub in the Raft and Goose creek drainages and to secure tissue samples for genetic evaluation	Immediate	0-10+ years

C. Upper, Headwaters, Closed Mountain Yellowstone Cutthroat Trout

Section 4.10.1C.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population (core)	Adult Abundance		Number of local populations	Number of adults	Total number of adults
Fort Hall Reservation	15 yct per 100m		NA	NA	NA

Status:

Population	Adult Abundance
Ross Fork (mountain streams)	25/100m
Mill Creek (mountain creek)	12/100m
West Fork Bannock Creek	3/100m
Fort Hall Bottoms (spring creeks)	14/200m

Section 4.10.1C.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Population traits	Introduced species	Hybridization with rainbow trout
Water quality	Land use	Overgrazing of riparian areas contribute to high water temperature and increase sedimentation
Habitat quality/quantity	Land use	Agriculture
Contaminants	Land use	Mining and industry produce selenium and industry bi-products
Water quantity	Land use	Irrigation

Section 4.10.1C.3 Strategies and Measures for Upper, Headwaters, Closed Yellowstone Cutthroat Trout

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Population traits			
• Increase species composition to greater than 90% pure Yellowstone cutthroat all sample sites (mountain streams	• A. Evaluate the role of hatcheries for YCT restoration and enhancement in streams once populated by pure YCT • B. Remove all non-native salmonids through harvest,	Immediate	1-5 years

and Bottoms)	and weirs • C. Continue stocking native cutthroat only • D. Continue with on-going restoration projects • E. Inform public of YCT conservation importance • F. Develop and implement Fort Hall fish management plan • G. Protect and enhance YCT core populations (0% hybridized) in the Ross Fork Creek watershed • H. Restore creeks in the Bannock Creek watershed from 25% to greater than 90% YCT and increase trout densities at all sites: West Fork .01m^2 to 1.0m^2 for trout >300mm; restore 0 back to .40m^2 at site on Moonshine cr.; restore back to 1.0m^2 from .27m^2 at Rattlesnake Creek • I. Utilize hatchery facility to assist enhancement of core and conservation populations of YCT on the Reservation, and restoring I/E streams in closed systems • J. Protect all spawning sites • K. Identify and evaluate limiting factors of adult trout on the Fort Hall Bottoms		
• Increase catch per hour from .10 to 2.5 for the Bottoms streams.	• L. Supplement fishery through stocking of native cutthroat trout • M. Utilize hatchery facility to assist enhancement of core and conservation populations of YCT on the Reservation, and restoring I/E streams in closed systems		
Water Quality			

• Protect and enhance fish and wildlife habitat.	• N. Meet TMDLs.	Immediate	1-5 years
Contaminants			
• Reduce contamination	• O. Identify areas of contamination and determine any contamination to aquatic and terrestrial spp. and ecosystems. • P. Enforce existing laws. • Q. Inform public and tribal membership	Immediate	1-5 years
Habitat quality/quantity			
• Improve riparian habitat	• R. Land acquisitions, conservation easements, transfers and exchanges • S. Regional planning, interagencies and private landowners • T. Protect and enhance fish and wildlife habitat through altered grazing practices		
Water Quantity			
• Increase flows	• U. Establish criteria for instream flows • V. Improve irrigation management (water delivery) • W. Screen diversions • X. Develop and implement Fort Hall Fish Management Plan	Immediate	1-5 years

Section 4.11 Systemwide

Section 4.11.1 Systemwide (all applicable subbasins)

A. Freshwater Mussels (western pearlshell, western ridged mussel and the genus Anodonta spp.)

Section 4.11.1A.1 Biological Objectives and Status

	Subbasin/Management Plans		Draft Recovery Plan		
Population	Re-establish self-sustaining populations of all three genera in at least 50% of historical habitat		Number of local populations	Number of adults	Total number of adults
Systemwide	Achieve reproduction and recruitment in all three genera		NA	NA	NA
	Increased understanding of factors that led to extirpation of shellfish from drainages within the Columbia River Basin				
	Monitor mussel populations for unique learning opportunities and possible applications elsewhere				

Status:

Population	Distribution	Reproduction and recruitment	Abundance
Systemwide	Unknown	Unknown	Unknown

Section 4.11.1A.2 Primary Limiting Factors and Threats

Limiting Factor	General Threat	Specific Threats
Habitat quality/quantity	Land use	Agriculture, forestry, and residential practices
Population traits	Population structure unknown	Population structure unknown
Water quality	Land use	Agriculture, forestry, and residential practices

Section 4.11.1A.3 Strategies and Measures

Strategy	Measure	Implementation Timeframe	Expected Response Timeframe
Habitat quality/quantity			
• Determine and restore preferred habitat	• A. Conduct field studies and re-location efforts to identify preferred physical habitat of all three genera • B. Determine optimal stream flows, especially in reaches dewatered for irrigation or impacted by dams • C. Determine habitat preferences through re-location experiments; increase habitat diversity	Immediate	1 – 5 years
• Design and implement a basic monitoring program to determine trends in river mussel populations throughout the Columbia River drainage. Determine what factors may positively and negatively influence recruitment	• D. Determine if recruitment is occurring, through cohort studies, in selected mussel populations throughout the basin for all three genera of river mussels • E. Determine age structure of selected populations. Investigate which factors positively (e.g., abundance of host fish) or negatively (water quality thresholds) impact recruitment into existing mussel beds	Immediate	1 – 5 years
• Determine which genera and species occur in the Columbia River Basin, and which stocks of mussels in the basin, based partly on genotypic	• F. Determine genetically which genera of *Anodonta* occur in the Columbia River Basin (a recent new genus has been discovered) • G. Conduct systematic genetic surveys of mussels in the basin to match existing genetic makeup of populations with extant	Immediate	1 – 5 years

diversity, may be best suited for targeted reintroduction efforts	populations in nearby drainages to find most suitable candidates for re-introduction efforts		
• Determine host fish and minimum host fish population levels needed to maintain self-sustaining mussel populations	• H. Determine host fish through laboratory experiments, culture juvenile mussels in hatchery setting for possible re-introduction trials, determine optimal habitats for both fish hosts and mussel species	Immediate	1 – 5 years
Population traits			
• Determine host fish and minimum host fish population levels needed to maintain self-sustaining mussel populations	• I. Determine host fish through laboratory experiments, culture juvenile mussels in hatchery setting for possible re-introduction trials • J. Determine optimal habitats for both fish hosts and mussel species	Immediate	1 – 5 years
Water quality			
• Determine if existing water quality in selected reaches of the Columbia River Basin will maintain viable and self-sustaining mussel populations	• K. Conduct physiological and condition experiments to determine lethal limits for mussels in regards to summer temperatures, dislodging flows, food availability and composition, and overall water quality requirements	Immediate	1 – 5 years