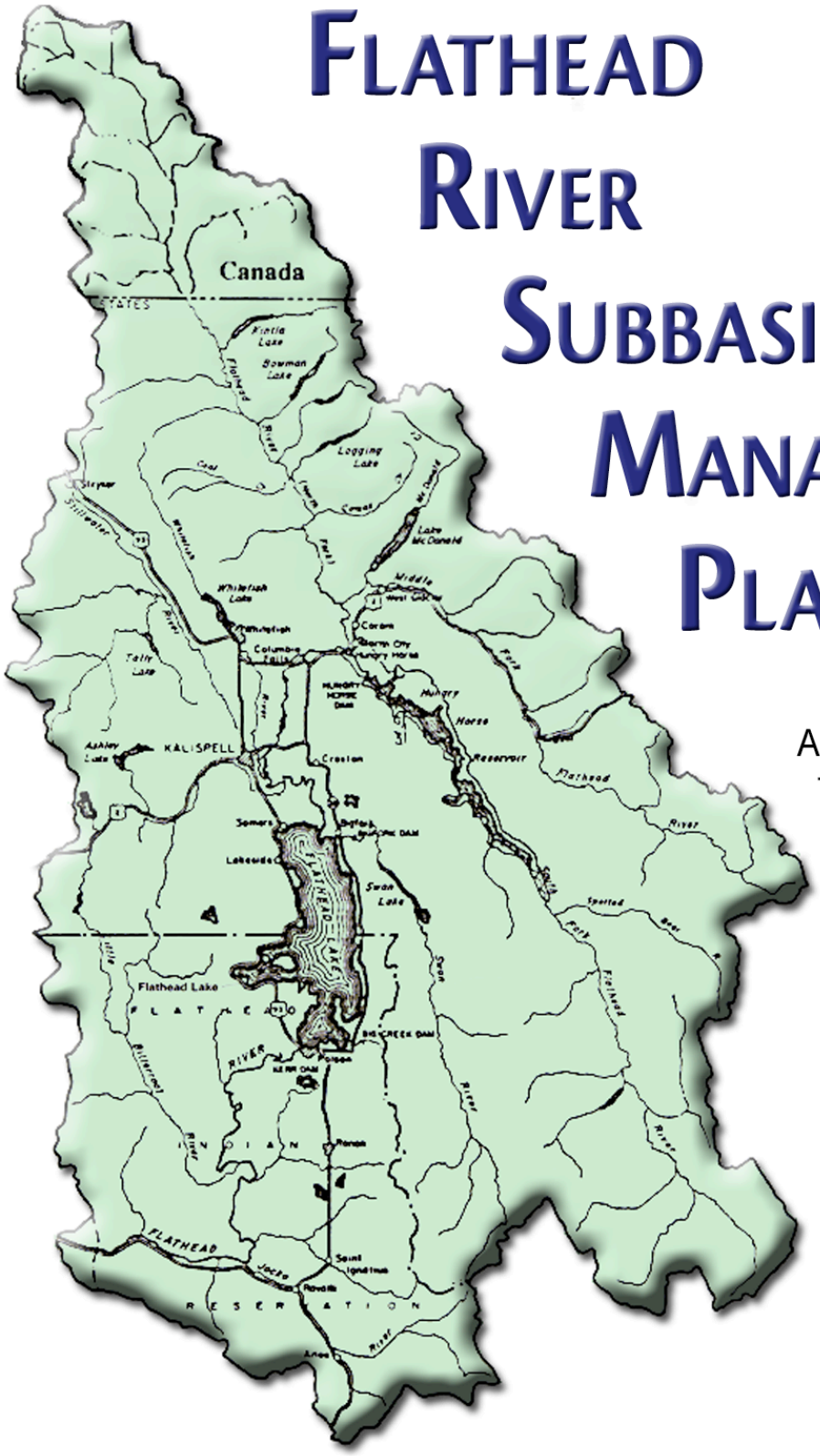
October 11, 2004

Flathead River Subbasin Management Plan



A Report prepared for the Northwest Power and Conservation Council

A vision, guiding principles, management objectives and strategies, and a research, monitoring, and evaluation program to protect, mitigate, and enahnce fish and wildlife resources of the Flathead River Subbasin

Reservation of Rights

A number of governments and agencies participated in the development of this Flathead Subbasin Plan, Part I (Assessment Volume), Part II (Inventory Volume), and Part III (Management Plan Volume), its appendices, and electronically linked references and information (hereafter Plan). The primary purpose of the Plan is to help direct Northwest Power and Conservation Council funding of projects that respond to impacts from the development and operation of the Columbia River hydropower system.

Nothing in this Plan, or the participation in its development, is intended to, and shall not be interpreted to, compromise, influence, or preclude any government or agency from carrying out any past, present, or future duty or responsibility which it bears or may bear under any authority.

Nothing in this Plan or the participation in its development constitutes a waiver or release of any rights, including the right to election of other remedies, or is intended to compromise, influence, or preclude any government or agency from developing and prosecuting any damage claim for those natural resource impacts identified in the Plan which are not directly and exclusively resulting from, or related to, the development and operation of the Columbia River hydropower system.

Nothing in this Plan or the participation in its development is intended to, and shall not be interpreted to, waive any rights of enforcement of regulatory, adjudicatory, or police powers against potentially responsible parties for compliance with applicable laws and regulations pertaining to natural resource damages throughout the Flathead Subbasin whether or not specifically identified in this Plan.

This Plan is the result of a group effort. Nothing in it or the participation in its development should be interpreted as constituting unqualified acceptance or endorsement of the Plan, its appendices, or any electronically linked reference or information by any party.

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Introduction

This management plan is Part III of the Flathead River Subbasin Plan. Part I, the Assessment, forms the scientific and technical foundation of the Subbasin Plan and identifies the limiting factors impeding the biological performance of fish and wildlife populations. Part II, the Inventory, summarizes fish and wildlife protection and restoration activities that have occurred within the subbasin over the last five years. The Inventory also evaluates how well past and current projects have addressed the limiting factors identified in the Assessment. This Management Plan, considered the heart of the Subbasin Plan, describes a vision for the subbasin and lists a series of objectives and strategies designed to address the limiting factors identified in the Assessment. It also includes a research, monitoring, and evaluation program. The overall goal of Management Plan is to protect, mitigate, and enhance aquatic and terrestrial habitats, species assemblages, and ecological functions in the Flathead Subbasin over the next 10 to 15 years.

We have organized aquatic objectives and strategies by habitat type (mainstem, tributaries, and reservoirs) and by focal fish species (bull trout and westslope cutthroat trout). We have organized terrestrial objectives and strategies by biome (wetland/riparian, grassland, xeric forest, and mesic forest). The plan also includes administrative or programmatic objectives. A series of strategies follow each objective.

One of the underlying premises of the Subbasin Plan is that ecosystem components rarely function independently. Hence, most of the objectives and strategies that we have developed are interrelated, and the successful implementation of one will help to ensure the success of others, furthering our overall goal of protecting and enhancing species, populations, habitats, and ecological functions.

While the objectives and strategies have a biological focus, they also have important social, political, and economic implications. Indeed, those social factors are important determinants of future management plan success. For example, the accomplishment of some of the objectives and strategies will require the cooperation of private landowners and local communities. Years of professional and public stakeholder group communication in the Flathead Subbasin have helped to shape this management plan, and our ongoing efforts in this area will continue to help resolve challenges that arise during the implementation phase of the plan.

An additional significant component of the management plan is the consideration of the cultural priorities of the Flathead Tribe. Projects with objectives and strategies consistent with and supportive of tribal culture will be considered as an important overlay to the subbasin vision, and the biologically driven working hypotheses, objectives, and strategies.

Coordination with Canada

The B.C. Ministry of Water, Land, and Air Protection, as well as the B.C. Ministry of Sustainable Resource Management fully participated in and were committed to the development of the assessment for the Canadian portion of the Flathead Subbasin Plan. Because no policy-level process had been established to provide for transboundary management plan development prior to the initiation of subbasin planning, the Subbasin coordinators in Montana felt it inappropriate for the U.S. planning process to encompass Canadian portions of the subbasin. Instead, members of the Planning Team from the U.S. developed the management plan for the U.S. portion of the subbasin. As the management agencies in Canada complete their planning processes (with appropriate Canadian First Nations and stakeholder input), Flathead Subbasin planners and managers in the U.S. can coordinate and mesh the U.S. and Canadian plans. Until then, Canadian management agencies will have the assessment available to them for their planning processes. Fish and wildlife managers and planners in the U.S. and their counterparts in Canada believe it is critically important to work on transboundary issues in future planning processes.

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10.1 Vision and Scientific and Guiding Principles

The development of the Flathead Subbasin vision, objectives, and strategies has been guided by the vision, scientific principles, and basin-level fish and wildlife objectives found in Northwest Power and Conservation Council 2000 Fish and Wildlife Program (Program). As such, they are consistent with the Program, key sections of which follow.

10.1.1 Overall Vision for the NWPCC Fish and Wildlife Program

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To access the full NWPCC Fish and Wildlife Program, go to: http://www.nwcouncil.org/fw/program/Default.htm

Click Here

The vision for the Northwest Power and Conservation Council's Fish and Wildlife Program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the region. This ecosystem provides abundant opportunities for tribal trust and treaty right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act.

Wherever feasible, this program will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. In those places where this is not feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used. Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem.

10.1.2 Vision for the Flathead River Subbasin

The vision for the Flathead River Subbasin is a healthy ecosystem supporting normative and/or natural physical and biological conditions and a sustainable human community. Achievement of this vision is supported and guided by the following scientific principles of the Fish and Wildlife Program and the guiding principles for the subbasin (which follow the Program's principles).

10.1.2. Scientific Principles of the NWPCC Fish and Wildlife Program

As part of its scientific foundation, the Program recognizes eight principles of general application. It is intended that all actions taken to implement this program be consistent with these principles.

Principle 1. The abundance, productivity and diversity of organisms are integrally linked to the characteristics of their ecosystems.
The physical and biological components of ecosystems together produce the diversity, abundance and productivity of plant and animal species, including humans. The combination of suitable habitats and necessary ecological functions forms the ecosystem structure and conditions needed to provide the desired abundance and productivity of specific species.

Principle 2. Ecosystems are dynamic, resilient and develop over time.
Although ecosystems have definable structures and characteristics, their behavior is highly dynamic, changing in response to internal and external factors. The system we see today is the product of its biological, human and geological legacy. Natural disturbance and change are normal ecological processes and are essential to the structure and maintenance of habitats.

Principle 3. Biological systems operate on various spatial and time scales that can be organized hierarchically.
Ecosystems, landscapes, communities and populations are usefully described as hierarchies of nested components distinguished by their appropriate spatial and time scales. Higher-level ecological patterns and processes constrain, and in turn reflect, localized patterns and processes. There is no single, intrinsically correct description of an ecosystem, only one that is useful to management or scientific research. The hierarchy should clarify the higher-level constraints as well as the localized mechanisms behind the problem.

Principle 4. Habitats develop, and are maintained, by physical and biological processes.
Habitats are created, altered and maintained by processes that operate over a range of scales. Locally observed conditions often reflect more expansive or non-local processes and influences, including human actions. The presence of essential habitat features created by these processes determines the abundance, productivity and diversity of species and communities. Habitat restoration actions are most effective when undertaken with an understanding and appreciation of the underlying habitat-forming processes.

Principle 5. Species play key roles in developing and maintaining ecological conditions.
Each species has one or more ecological functions that may be key to the development and maintenance of ecological conditions. Species, in effect, have a distinct job or occupation that is essential to the structure, sustainability and productivity of the ecosystem over time. The existence, productivity and abundance of specific species depend on these functions. In turn, loss of species and their functions lessens the ability of the ecosystem to withstand disturbance and change.

Principle 6. Biological diversity allows ecosystems to persist in the face of environmental variation.
The diversity of species, traits and life histories within biological communities contributes to ecological stability in the face of disturbance and environmental change. Loss of species and their ecological functions can decrease ecological stability and resilience. It is not simply that more diversity is always good; introduction of non-native species, for example, can increase diversity but disrupt ecological structure. Diversity within a species presents a greater range of possible solutions to environmental variation and change. Maintaining the ability of the ecosystem to express its own species composition and diversity allows the system to remain productive in the face of environmental variation.

Principle 7. Ecological management is adaptive and experimental.
The dynamic nature, diversity, and complexity of ecological systems routinely disable attempts to command and control the environment. Adaptive management — the use of management experiments to investigate biological problems and to test the efficacy of management programs — provides a model for experimental management of ecosystems. Experimental management does not mean passive "learning by doing," but rather a directed program aimed at understanding key ecosystem dynamics and the impacts of human actions using scientific experimentation and inquiry.

Principle 8. Ecosystem function, habitat structure and biological performance are affected by human actions.
As humans, we often view ourselves as separate and distinct from the natural world. However, we are integral parts of ecosystems. Our actions have a pervasive impact on the structure and function of ecosystems, while at the same time, our health and well being are tied to these conditions. These actions must be managed in ways that protect and restore ecosystem structures and conditions necessary for the survival and recovery of fish and wildlife in the basin. Success depends on the extent to which we choose to control our impacts so as to balance the various services potentially provided by the Columbia River Basin.

10.1.3. Guiding Principles for the Flathead River Subbasin

The following principles will help guide implementation of all subbasin objectives, strategies and action:

1. Respect, recognize, and honor the legal authority, jurisdiction, treaty-reserved rights, and all legal rights of all parties.

2. Protect, enhance, and restore habitats in a way that will sustain and recover native aquatic and terrestrial species with emphasis on the recovery of Endangered Species Act listed and native species. Provide adequate protections for unique habitats that may not be abundant but that play an important ecological role.

3. Improve water quality throughout the subbasin.

4. Protect open space.

5. Foster ecosystem protection, enhancement, and restoration that result in ridgetop-to-ridgetop stewardship of natural resources, recognizing all components of the ecosystem, including the human component.

6. Provide information to residents of the Flathead subbasin to promote understanding and appreciation of the need to protect, enhance, and restore a healthy and properly functioning native ecosystem. Utilize incentive-based and educational approaches to promote ecologically sound use of natural resources.

7. Sustain natural resource-based economies in concert with native aquatic and terrestrial species and encourage new industries that contribute to clean air and clean water.

8. Promote and enhance local participation in, and contribution to, natural resource problem solving and subbasin-wide conservation efforts.

9. Coordinate efforts to implement the Pacific Northwest Electric Power Planning and Conservation Act, the Endangered Species Act, the Clean Water Act, tribal treaties, and other local, state, federal, and tribal programs, obligations, and authorities.

10. Utilize a scientific foundation, for diagnosing biological problems, for designing and prioritizing projects, and for monitoring and evaluation to guide improving management to better achieve objectives.

11. Enhance native species populations to a level of healthy and harvestable abundance to support tribal treaty and public harvest goals.

10.1.4. Scientific Framework for the Flathead River Subbasin

Flathead River Subbasin Planners developed a hierarchical, multi-scale scientific framework to address primary and secondary limiting factors through a series of objectives and strategies. The approach addresses issues at several levels, from broad, basin-wide mitigation requirements to site-specific actions. Priority is assigned to the groups of activities identified in Figures 10.1 through 10.3. The Research, Monitoring, and Evaluation Program (Section 10.3) includes a more specific prioritization criteria that will operate at the project level.

Preventing the types of impacts that reduce the overall health of the subbasin is a major priority (Figure 10.1). Modifications to dam operation are a basin-wide mitigation requirement because of the far-reaching influence that dam operations have on the environmental conditions of reservoirs and rivers throughout the Columbia River basin. Hungry Horse Dam, completed in 1952, created the 23,813-acre, 35-mile-long Hungry Horse reservoir and disconnected the South Fork Flathead River from the rest of the Flathead System. When Hungry Horse Reservoir filled, 77 miles of high quality stream habitat was lost, resulting in an estimated minimum annual loss of 65,000 westslope cutthroat trout and 250,000 bull trout (MFWP and CSKT 1991). (The Hungry Horse loss statement (MFWP and CSKT 1991) also identified lost annual production of 100,000 kokanee adults in Flathead Lake to partially replace lost forage for lake trout in Flathead Lake.) Excessive Hungry Horse Reservoir drawdowns now expose vast expanses of reservoir bottom to drying, thus killing aquatic insects, which are the primary spring food supply. Reduced reservoir pool volume impacts all aquatic trophic levels due to the diminished size of the aquatic environment. During summer, reservoir drawdown reduces the availability of terrestrial insects for fish prey because fewer insects are trapped on the diminished surface area. Impoundment by Hungry Horse Dam and the removal of riparian vegetation altered the annual temperature cycle in the river. These changes have affected the food base for the many wildlife species that feed on aquatic organisms (CSKT 2001).

Power production and flood control operations of Hungry Horse Dam have essentially reversed the annual hydrograph, resulting in storing water derived from spring runoff and releasing it during the fall and winter months when flows

were historically low. In addition to creating an exposed unproductive varial zone, short-term sporadic releases in the tailwater have resulted in higher substrate embeddedness, and a less diverse and productive aquatic invertebrate community (Hauer et al. 1994). Reduction in natural spring freshets due to flood control has reduced the hydraulic energy needed to maintain the river channel and periodically resort river gravels. Collapsing river banks caused by intermittent flow fluctuation and lack of flushing flows have resulted in sediment buildup in the river cobbles, which is detrimental to insect production, fish food availability, and security cover (Brian Marotz, Montana Fish, Wildlife & Parks, 2003, pers. comm.). Impoundment has also greatly benefited the native northern pikeminnow and peamouth chub to the extent that these species now compete with or prey upon aquatic species of special concern for both food and space (CSKT 2001).

Preventing the introduction and spread of non-native species is another priority. Prevention and immediate detection of non-native species (including non-native plants, invertebrates, fish and other animals) is critical if managers are to avoid major disruptions to the ecological community structure and balance. Surveys have already identified sources of genetic introgression between native westslope cutthroat and non-native rainbow trout. Bull trout hybridize with non-native brook trout where they coexist and the progeny are largely sterile. If no action is taken, genetic introgression will continue to erode the remaining stocks of native trout.

Onsite mitigation addresses fish and wildlife habitat degradation; fish passage and wildlife-migration barriers; genetic introgression in pure, native fish stocks; and negative interactions between native and non-native fish and wildlife species (figure 10.2). Much of the altered habitat can be addressed using techniques that do not require changes in reservoir or river management. Objectives and strategies also address riparian and floodplain habitat degradation, major sediment and nutrient sources, channel and bank instability, and impacts caused by non-native fish introductions.

Offsite mitigation presents opportunities to create genetic reserves to conserve native species and to increase hunting and fishing opportunities (Figure 10.3). Complete mitigation of the documented fish and wildlife losses is not currently possible on-site given the state of the science and the degraded state of many of the habitats in the Subbasin. Therefore, off-site mitigation is necessary to achieve acceptable levels of restoration.

Planning and Technical Team members have developed objectives and identified near-term opportunities for watershed restoration and protection based on habitat quality (assessed using QHA for fish and TBA for wildlife), community composition, native species abundance, and Endangered Species Act requirements. Our near-term opportunities for restoration are those that are (1) necessary for

LINKS

For information about QHA and LQHA (Qualitative Habitat Assessment and Lacustrine Qualitative Habitat Assessment), go to Section 5.1.1 of the Assessment.

Click Here

For information about TBA (Terrestrial Biome Assessment), go to Section 5.2.1 of the Assessment.

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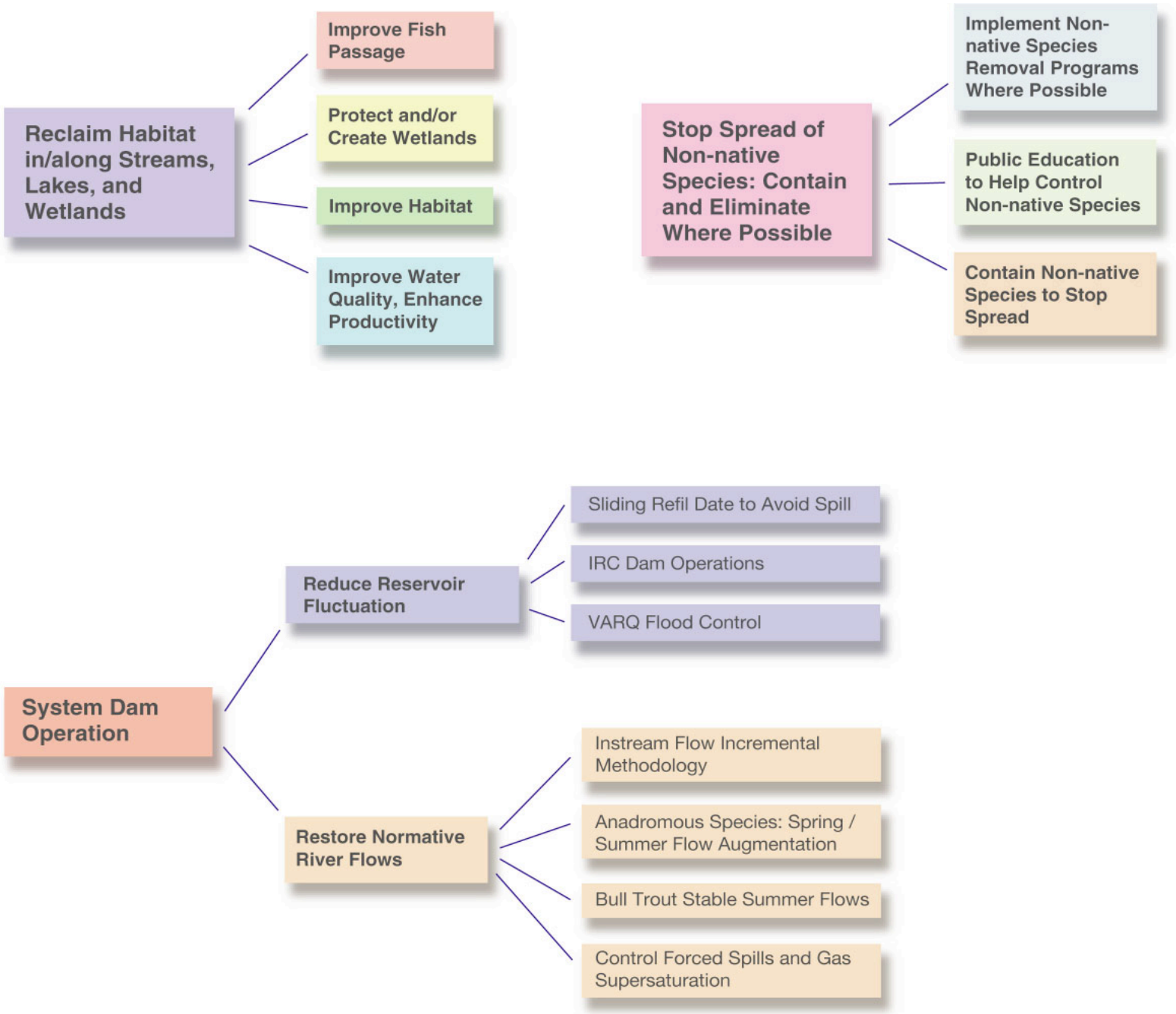

Figure 10.1. Basin-wide Mitigation

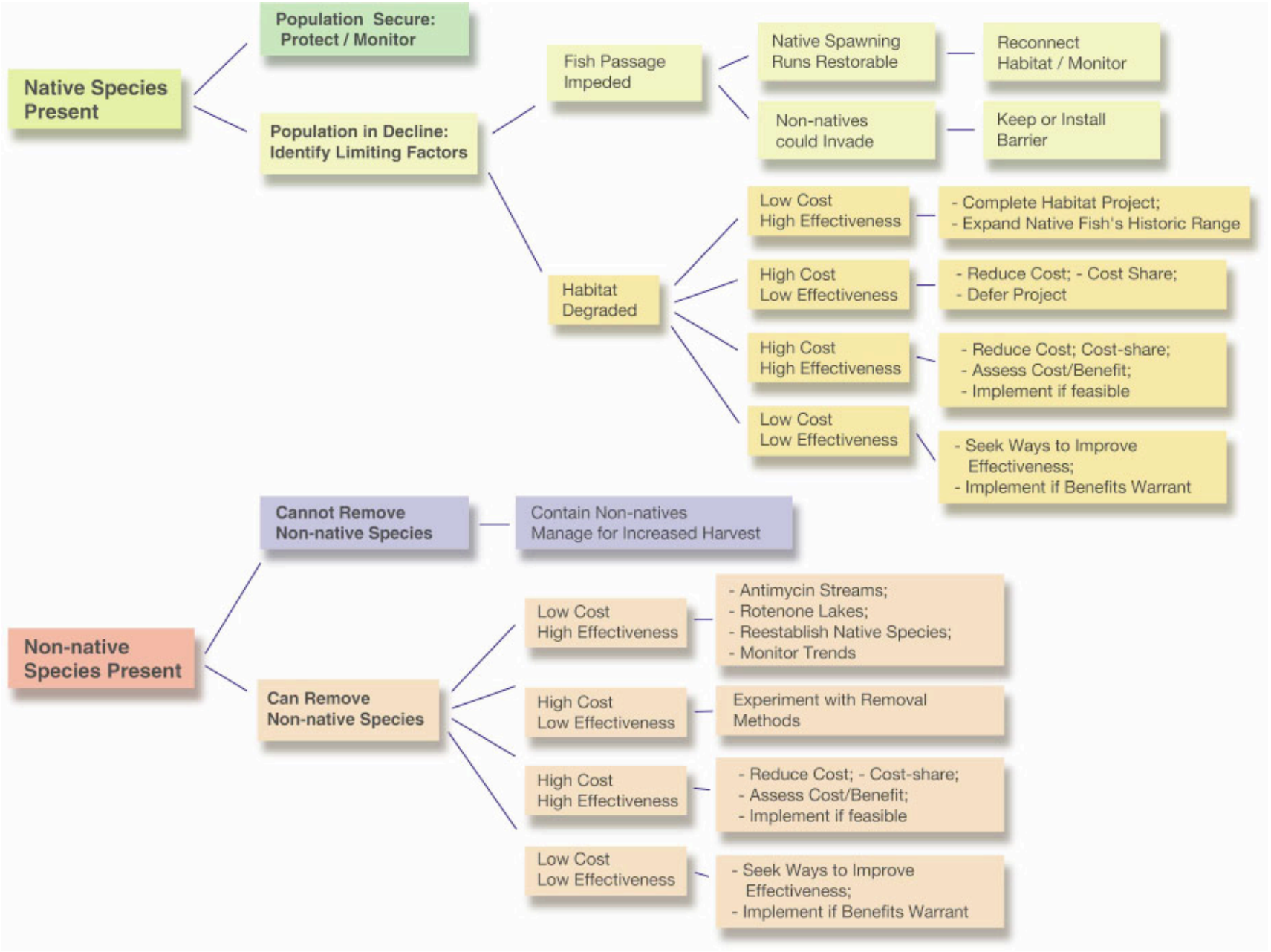

Figure 10.2. Decision pathways: Onsite Mitigation

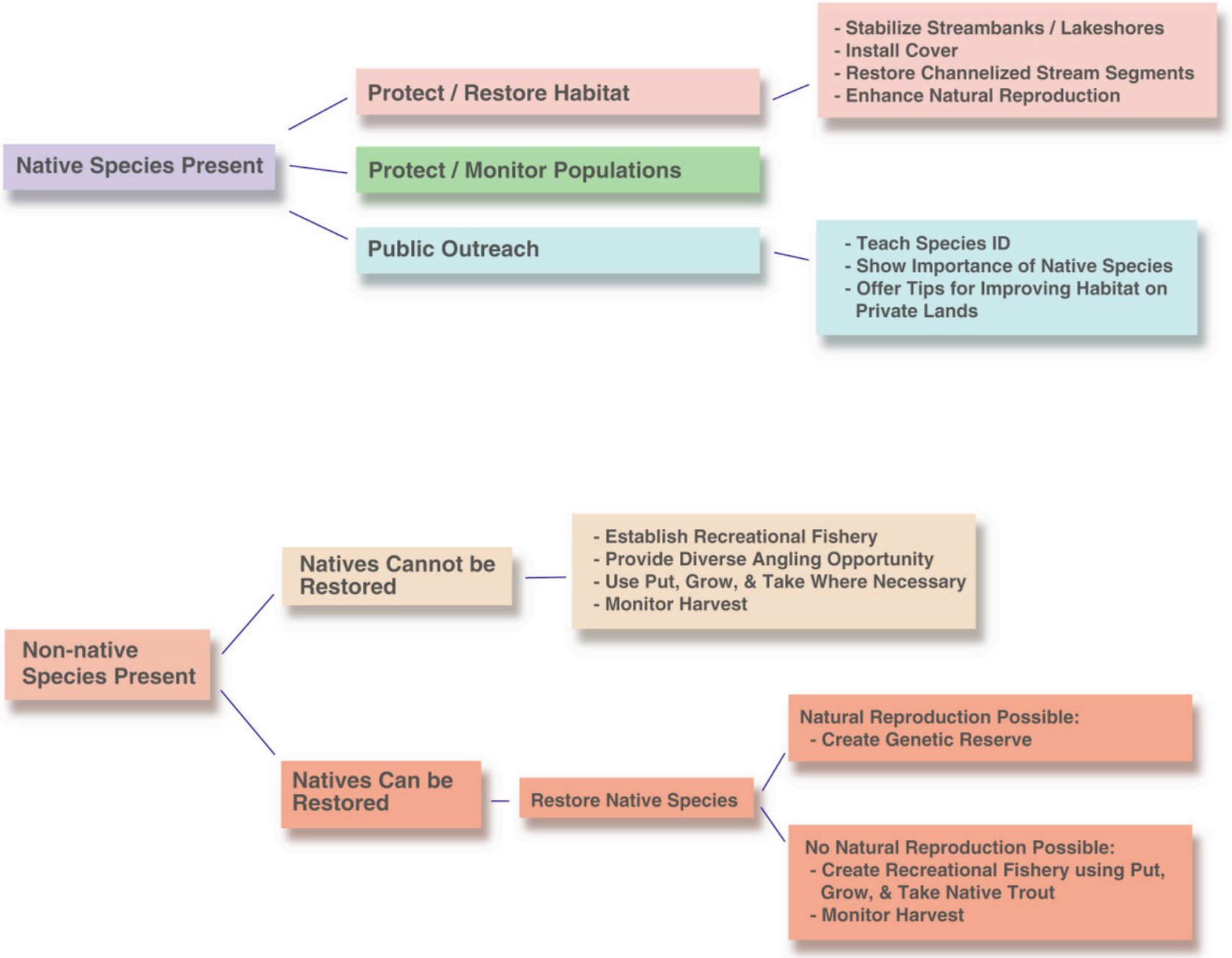

Figure 10.3. Decision Pathway: Offsite Mitigation.

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For a list of focal and target species, see Section 1.3.3 of the Assessment.

Click Here

the recovery of listed species and (2) slightly to moderately degraded habitats important to focal and target species (for a list of focal and target species, see Section 1.3.3 of the Assessment). More severely degraded watersheds with introduced species and limited or nonexistent native fish populations will be addressed over a longer period of time. Our near-term opportunities for protection are those relatively undisturbed habitats that contain strong populations of native species. To support these objectives, this plan proposes a mix of strategies designed to cost effectively produce the greatest benefits to fish and wildlife. Monitoring will be necessary to assess the efficacy of objectives and strategies and improve the program over time.

10.2 Objectives and Strategies

10.2.1 Fish and Wildlife Program Basin-level Fish Objectives

The Council's basin-level objectives to mitigate for resident fish losses are based on the premise that the development and operation of the hydrosystem has resulted in losses of numbers and diversity of native resident fish, such as bull trout, cutthroat trout, kokanee, white sturgeon and other species. The following objectives address resident fish losses:

Basin-Level Resident Fish Objective 1

Complete assessments of resident fish losses throughout the basin resulting from the hydrosystem, expressed in terms of the various critical population characteristics of key resident fish species.

Basin-Level Resident Fish Objective 2

Maintain and restore healthy ecosystems and watersheds, which preserve functional links among ecosystem elements to ensure the continued persistence, health and diversity of all species including game fish species, nongame fish species, and other organisms.

Basin-Level Resident Fish Objective 3

Protect and expand habitat and ecosystem functions as the means to significantly increase the abundance, productivity, and life history diversity of resident fish at least to the extent that they have been affected by the development and operation of the hydrosystem.

Basin-Level Resident Fish Objective 4

Achieve population characteristics of these species (bull trout, cutthroat trout, kokanee, white sturgeon and other species) within 100 years that, while fluctuating due to natural variability, represent on average full mitigation for losses of resident fish.

10.2.2 Fish and Wildlife Program Basin-level WildlifeObjectives

The Council's basin-level objectives to mitigate wildlife losses are based on the premise that development and operation of the hydrosystem resulted in wildlife losses through construction and inundation losses, direct operational losses or through secondary losses. The program has included measures and implemented projects to obtain and protect habitat units in mitigation for these calculated construction/ inundation losses. Operational and secondary losses have not been estimated or addressed. The program includes a commitment to mitigate for these losses. More specific wildlife objectives are:

Basin-Level Wildlife Objective 1

Quantify wildlife losses caused by the construction, inundation, and operation of the hydropower projects.

Basin-Level Wildlife Objective 2

Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses.

Basin-Level Wildlife Objective 3

Coordinate mitigation activities throughout the basin and with fish mitigation and restoration efforts, specifically by coordinating habitat restoration and acquisition with aquatic habitats to promote connectivity of terrestrial and aquatic areas.

Basin-Level Wildlife Objective 4

Maintain existing and created habitat values.

Basin-Level Wildlife Objective 5

Monitor and evaluate habitat and species responses to mitigation actions.

10.2.3 Subbasin-level Objectives and Strategies

Background

In this document, we define primary limiting factors as the root causes of the problems in the subbasin, while secondary limiting factors are the specific issues caused by those over-arching problems (figure 10.4). Because it is difficult to develop a single objective for a primary limiting factor (for example, impoundment and hydro operations), our approach has been to develop a coordinated and integrated set of objectives for secondary limiting factors, thereby addressing more comprehensively the various facets of each of the primary limiting factors.

Ecological degradation has occurred in the Flathead River Subbasin for over 100 years. Cascading trophic and biological effects resulting from these changes have occurred on the same time scale. It is therefore likely that successful restoration cannot be completed in a fraction of the time it took the system to be degraded. Time is also required to address, negotiate, and resolve societal issues associated with large-scale habitat and ecological change.

Linkage of Aquatic Objectives and Strategies with Limiting Factors

Primary limiting factors are severe, usually large-scale ecological alterations that result in multiple secondary ecological impacts. Primary and secondary limiting factors negatively affect ecological function and fish and wildlife populations in an additive fashion. Primary limiting factors are casual factors of ecological and demographic decay. Secondary limiting factors are the subset of problems resulting from the primary limiting factors. Because limiting factors are interrelated and often occur at several levels, attempting to mitigate a single cause of mortality for a single focal fish species or life stage cannot resolve the multivariate problem of ecological limitation in the subbasin. Therefore objectives and strategies must be developed and implemented in a coordinated fashion so that they address each of the primary limiting factors in a comprehensive way.

We identified three primary aquatic limiting factors in the Flathead River Subbasin: (1) impoundment and hydro operations, (2) physical habitat alteration (in addition to impoundments and hydro operations), and (3) the introduction of non-native species (Figure 10.4). These three primary limiting factors resulted in at least 18 important secondary limiting factors that negatively affect habitat, fish, and wildlife. Our objectives and strategies address each of these limiting factors. Tables 10.1 and 10.2 show the linkage between secondary limiting factors and objectives.

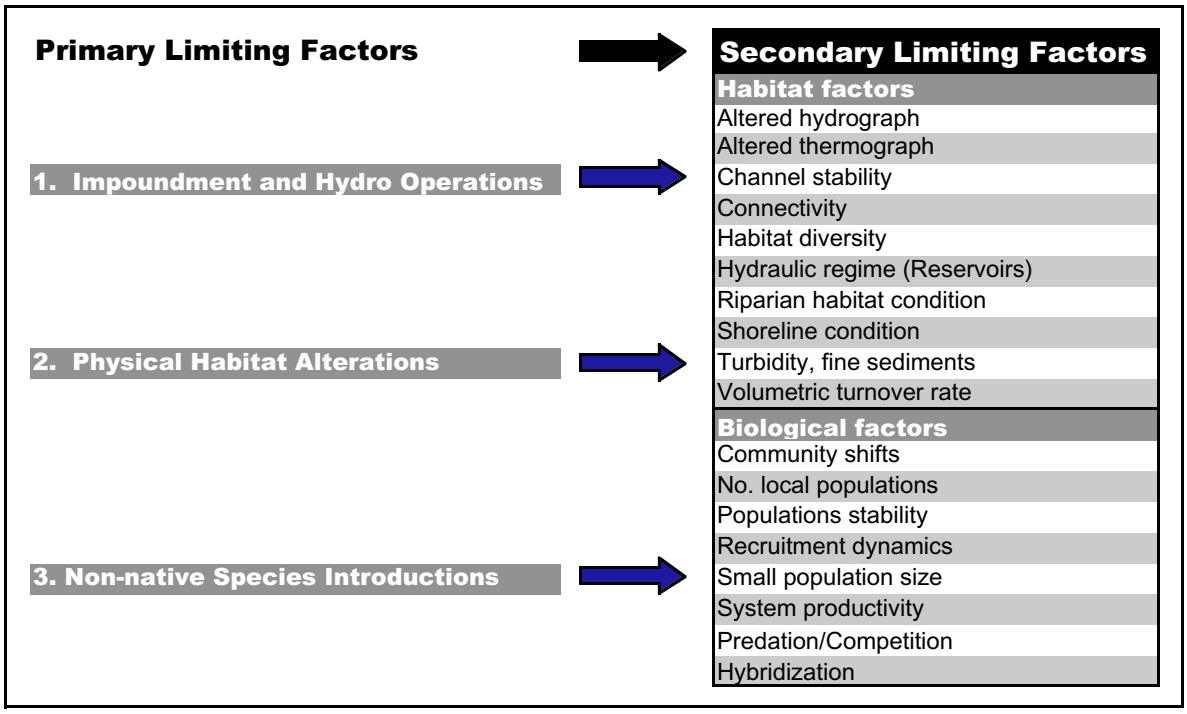

Figure 10.4. Primary and secondary aquatic limiting factor linkage in the Flathead River Subbasin.

Table 10.1. Linkage of secondary aquatic limiting factors and remedial management objectives by habitat type and focal species in the Flathead River Subbasin. Each objective is supported by multiple management strategies that are described in the series of tables immediately following this section.

Secondary	Habitat Types				Focal Species	
Limiting Factors	Mainstem	Tributaries	Reservoirs	Lakes	Bull Trout	WCT
Habitat Factors						
Altered hydrograph	M3				M3	M3
Channel stability		T2			T2	T2
Connectivity		T5			T5	T5
Habitat diversity	M2	T3	R3		M2, T3, R3	M2, T3, R3
Hydraulic regime			R2		R2	R2
Class 1 habitat protection		T6			T6	T6
Shoreline condition			R1	L1	R1, L1	R1, L1
Riparian condition	M1	T1			M1, T1	M1, T1
Fine sediments	M4	T4			M4, T4	M4, T4
Volumetric turnover rate			R4		R4	R4
Pollutants				L2	L2	L2
Biological Factors						
No. local populations	BT1, WCT1	BT1, WCT1	BT1, WCT1	BT1, WCT1	**BT1**	WCT1
Non-native species	**BT4, WCT3**	**BT4, WCT3**	**BT4, WCT3**	**BT4, WCT3**	BT4	**WCT3**
Populations stability	BT3	BT3	BT3	BT3		
Recruitment failure						
Small population size	BT2, WCT2	BT2, WCT2	BT2, WCT2	BT2, WCT2, WCT4	**BT2**	WCT2, WCT4

Table 10.2. Linkage of terrestrial limiting factors and remedial management objectives, by biome. Each objective is supported by multiple management strategies.

Limiting Factor	Biome				
	Regulated Mainstem	Riparian/ Wetland	Grassland/ Shrub	Xeric Forest	Mesic Forest
Altered Hydrograph	RW1	RW4			
Land Conversion		RW2	GS2		
Forest Management		RW3			
Human/Wildlife Conflicts		RW5		XF4	MF2
Non-native Species		RW6	GS3		MF4
Forest Encroachment			GS1	XF2	
Overgrazing			GS4		
Fire Exclusion				XF1	MF1
Forest Fragmentation				XF3	
Roads					MF3

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The term HUC, which stands for Hydrologic Unit Codes (for example, 4th code HUC), is used throughout these objectives. For a definition of HUCs, go to: http://water.usgs.gov/GIS/huc.html

Click Here

For the list of near-term restoration and protection priorities (Class 1, 2, and 2.5) streams and lakes and subunits, go to Section 6.4.

Click Here

Aquatic Objecitves

The tables that follow present Flathead Subbasin aquatic management objectives and strategies designed to mitigate primary and secondary aquatic limiting factors in the Flathead Subbasin. Objectives and strategies addressing the mainstem, tributaries, reservoirs, and lakes are followed by objectives and strategies for focal fish species (bull trout and westslope cutthroat trout).

Regulated Mainstem

Limiting factors:

Riparian Condition (M1)
Habitat Diversity (M2)
Altered Hydrograph (M3)
Fine Sediment (M4)

Regulated Mainstem Objective M1	
Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Regulated Mainstem Flathead River
Limiting Factor	Riparian Condition
Timeframe	By 2020
Objective (Measurable Action)	Improve riparian condition of the mainstem to a level that supports sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use.
Primary Limiting Factor(s) Addressed	Impoundment and Hydro Operations, Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Habitat diversity, fine sediments, channel stability, connectivity, altered hydrograph, altered thermograph, community shifts, population stability
NWPCC Programmatic H's Addressed	Habitat
Where	All regulated mainstem reaches of the Flathead River.
Other/Notes	
Strategies	- Coordinate subbasin activities with appropriate agencies and organizations. - Develop a consolidated riparian and wetland habitat map for the regulated mainstem of the Flathead River. - Investigate and analyze historic losses of riparian and wetland habitats in the regulated mainstem of the Flathead River. - Identify associated losses in biological functions and performance (i.e., riparian dependent birds, etc.). - Coordinate projects through the Focus Watershed Program to assist with identifying site-specific riparian restoration projects and to coordinate with landowners, agencies, and other funding sources. - Assess operational losses of riparian habitat attributable to the operation of Hungry Horse Dam and the method used to derive loss statement. - Coordinate efforts with all natural resource managers to develop comprehensive riparian and wetland habitat protection, rehabilitation, and enhancement plan for the Flathead River regulated mainstem. - Cooperate and coordinate efforts to restore natural disturbance regimes (i.e., natural vegetation, etc.).

Regulated Mainstem Objective M1	

	- Identify and address human impacts along the regulated mainstem of the Flathead River utilizing adaptive management techniques.
	  - Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions.
	  - Conduct watershed problem assessments. Identify site-specific threats (problem assessment) that may be limiting focal species.
	  - Revegetate denuded riparian areas. Revegetate to restore shade and canopy, riparian cover, and native vegetation in streams where investigation indicates such actions are likely to benefit native fish.
	  - Improve grazing practices. Reduce negative effects of grazing with improved grazing management or riparian fencing where investigation indicates such actions are likely to benefit native fish.
	  - Protect riparian habitats. When possible (i.e. with willing landowners) provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means.
	- Cooperate and coordinate efforts with all stakeholders to protect, enhance and rehabilitate riparian and wetland habitats in the Flathead River mainstem.
	- Initiate and develop noxious weed management strategies.
	- Coordinate efforts with all natural resource managers to develop comprehensive noxious weed management plan.

Regulated Mainstem Objective M2	
Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Regulated Mainstem Flathead River
Limiting Factor	Habitat Diversity
Timeframe	By 2020
Objective (Measurable Action)	Restore the habitat diversity of the mainstem to a level that supports sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Channel stability, connectivity, altered thermograph, number of local populations, population stability, system productivity, predation/competition, community shift
NWPCC Programmatic H's Addressed	Habitat

Regulated Mainstem Objective M2	
Where	All regulated mainstem reaches of the Flathead River
Other/Notes	
Strategies	- Increase or improve instream habitat by restoring recruitment of large woody debris, pool development, or other appropriate components in streams where investigation indicates such actions are likely to benefit native fish. - Place large rocks and woody debris in streams to restore the appropriate channel morphometry using natural channel-rehabilitation techniques. - Coordinate projects through the Focus Watershed Program to work collaboratively with landowners, agencies, and other funding sources.

Regulated Mainstem Objective M3	
Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Regulated Mainstem Flathead River
Limiting Factor	Altered hydrograph
Timeframe	2005 to 2020+
Objective (Measurable Action)	Working with Action Agencies, bring Hungry Horse Dam operations 50% closer to normative conditions during summer and spring while providing flood control.
Primary Limiting Factor(s) Addressed	Impoundment and Hydro Operations
Additional Secondary Limiting Factor(s) Addressed	Channel stability, habitat diversity, fine sediments, riparian habitat condition, connectivity, altered thermograph, recruitment failure, population stability, system productivity, predation/competition, community shift
NWPCC Programmatic H's Addressed	Hydro and Habitat
Where	Downstream from Hungry Horse Dam to Flathead Lake
Other/Notes	Collaborations with Action agencies required.
Strategies	- Continue to vigorously seek opportunities to restore normative river functions to the Flathead River, including hydrograph cycles (flow, timing, duration), periodic flood flows, habitat diversity, and floodplain connectivity to mimic natural functions and processes. - Operate dams to minimize negative effects on focal species. *(Applicable Objectives: All Regulated Mainstem Objectives; and All Reservoir Objectives).* - Reduce reservoir operational impacts. Review Flathead Lake and Hungry Horse Reservoir operational concerns (*e.g.*, water level manipulation) and support operating recommendations that provide enforceable drawdown limits and refill guidelines through Federal Energy Regulatory Commission license (Kerr) and/or Federal consultation (Hungry Horse Reservoir; USFWS Biological Opinion). The Variable Flow Flood Control model should be

Regulated Mainstem Objective M3	
	implemented by water managers to provide comprehensive, long-term, balanced, and predictable allocation of water resources from Hungry Horse Reservoir that will limit the duration and frequency of deep reservoir drawdowns, improve reservoir refill probability, and produce a more naturally shaped dam discharge pattern downstream (USFWS 2000). Once implemented, evaluate strategies to determine the effects on bull trout recovery. - Provide instream flow downstream of dams. Maintain or exceed recommended instream flow levels in the lower South Fork Flathead River (USFWS 2000), using results of current research, and minimize peaking flows in the mainstem Flathead River downstream of Hungry Horse Dam. Consider bull trout and westslope cutthroat trout concerns when developing flood control release patterns. - Evaluate selective withdrawal at Hungry Horse Dam. Evaluate the adequacy of the selective withdrawal system in partially restoring the normal summer thermal regime in the Flathead River downstream of Hungry Horse Dam and assess whether it meets the needs of migratory bull trout. Refine operations if necessary. - Avoid gas supersaturation from Hungry Horse Dam. Avoid conditions for potential gas entrainment to cause nitrogen supersaturation below Hungry Horse Dam that is detrimental to focal species. - Evaluate impact of dam operations on focal species predators. Continue research on response of introduced predators (*i.e.*, lake trout and northern pike) to Flathead Lake and Flathead River water level and temperature manipulations and provide recommendations for operation of Hungry Horse and Kerr Dams to favor native species.

Regulated Mainstem Objective M4	
Species/Lifestage	All Focal Species, Spawning/Incubation
4th-Code HUC	Regulated Mainstem Flathead River
Limiting Factor	Fine Sediment
Timeframe	2005 to 2020
Objective (Measurable Action)	Reduce the delivery of fine sediments in the mainstem to a level that supports sustainable population levels of focal species that function naturally and may be capable of supporting appropriate forms of human use.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Recruitment failure, population stability, population size, system productivity, community shift
NWPCC Programmatic H's Addressed	Habitat

Regulated Mainstem Objective M4	
Where	All regulated mainstem reaches of the Flathead River.
Other/Notes	
Strategies	- Maintain and protect habitat by achieving compliance with existing habitat protection laws, policies, and guidelines. - Reduce general sediment sources on tributaries by stabilizing roads, crossings, and other sources of sediment delivery. Work with the U.S. Forest Service to lower forest road densities. Pave, upgrade, or relocate portions of major access roads to reduce impacts from sediment and remedy extensive floodplain encroachment and channel alterations. - Implement stream bank stabilization measures where necessary. - Implement riparian revegetation/rehabilitation projects. - Agitate embedded gravels to remove silts and fine sands where appropriate. - Install artificial spawning structures where necessary. - Coordinate projects through the Focus Watershed Program to identify sediment reduction projects and to coordinate with landowners, agencies, and other funding sources. - Participate with the Montana Department of Environmental Quality in the Total Maximum Daily Load planning, implementation, and monitoring process. Achieve compliance with water quality standards. - Support habitat protection and monitoring in British Columbia. Work collaboratively with British Columbia Ministry of Water, Land, and Air Protection and other Canadian governmental and nongovernmental entities to ensure focal species habitat is protected and enhanced in the North Fork of the Flathead upstream of the International border. Continue habitat and fishery monitoring efforts. - Eliminate/reduce sediment sources. When possible (i.e. with willing landowners) provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means.

Tributaries

Limiting factors:

Riparian Condition (T1)
Channel Stability (T2)
Habitat Diversity (T3)
Fine Sediment (T4)
Connectivity (T5)
Protection of Class 1 waters (T6)

Tributary Objective T1	
Species/Lifestage	All Focal Species, Rearing and Spawning/Incubation
4th-Code HUC	Tributaries (All 4th-Code HUCs)
Limiting Factor	Riparian Condition
Timeframe	2005 to 2020+
Objective (Measurable Action)	Restore riparian habitats to a level equivalent to the riparian condition habitat restoration score of reference streams.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Altered hydrograph, altered thermograph, channel stability, habitat diversity, fine sediment, connectivity, community shifts, population stability
NWPCC Programmatic H's Addressed	Habitat
Where	In Class 2 and 2.5 streams.
Other/Notes	
Strategies	- Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions. - Conduct watershed problem assessments. Identify site-specific threats (problem assessment) that may be limiting focal species in watersheds not already evaluated. - Revegetate denuded riparian areas. Revegetate to restore shade and canopy, riparian cover, and native vegetation in streams where investigation indicates such actions are likely to benefit native fish, locally or downstream. Work with landowners to ensure that riparian areas are not further denuded or degraded. - Improve grazing practices. Reduce negative effects of grazing with improved grazing management or riparian fencing where investigation indicates such actions are likely to benefit native fish, locally or downstream. - Protect riparian habitats. When possible (i.e. with willing landowners) provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means. - Maintain flows that sustain and promote ecological processes through the purchasing and leasing of water rights and water conservation agreements.

Tributary Objective T1	
	- Remove roads and recontour road prisms wherever possible to reduce road densities - Coordinate projects through the Focus Watershed Program to identify site-specific riparian restoration projects and to coordinate with landowners, agencies, and other funding sources. - Coordinate riparian activities with appropriate agencies and organizations such as soil and water conservation districts, United States Department of Agriculture, and Canadian agencies. Use partnerships and collaborative processes whenever possible. - Support watershed group restoration efforts and encourage establishment of new watershed groups to implement restoration objectives. Support collaborative efforts by local watershed groups already established to accomplish site-specific protection and restoration activities. - Initiate and develop cooperative adaptive management strategies with International entities (i.e., British Columbia Ministry of the Environment, environmental organizations, etc.).

Tributary Objective T2	
Species/Lifestage	All Focal Species, Spawning/Incubation and Rearing
4th-Code HUC	Tributaries (All 4th-Code HUCs)
Limiting Factor	Channel Stability
Timeframe	2005 to 2020+
Objective (Measurable Action)	Improve channel stability to a level equivalent to the channel stability habitat restoration score of reference streams.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Fine sediment, riparian, community shifts, population stability, system productivity
NWPCC Programmatic H's Addressed	Habitat
Where	In Class 2 and 2.5 streams.
Other/Notes	
- Strategies	- Upgrade problem roads. Pave, upgrade, or relocate portions of major access roads to reduce impacts from sediment and remedy extensive floodplain encroachment and channel alterations. Remove roads and recontour road prisms wherever possible to minimize road densities. - Restore stream channels. Conduct stream channel restoration activities where investigation indicates such actions are likely to benefit native fish. Restore proper pattern, profile, and form and incorporate natural channel rehabilitation techniques into stream stabilization designs. - Improve instream habitat. Increase or improve instream habitat by restoring recruitment of large woody debris, pool development, or other appropriate

Tributary Objective T2	
	components in streams where investigation indicates such actions are likely to benefit native fish. - Minimize potential stream channel degradation. Ensure that negative effects to focal species of ongoing flood control activities are minimized or eliminated. - Coordinate projects through the Focus Watershed Program to assist with identifying projects and to coordinate with landowners, agencies, and other funding sources. - Enhance channel stability. Provide long-term channel stability through purchase, conservation easements, landowner incentives, management plans, and other means.

Tributary Objective T3	
Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Tributaries (All 4th-Code HUCs)
Limiting Factor	Habitat Diversity
Timeframe	2005 to 2020+
Objective (Measurable Action)	Improve habitat diversity to a level equivalent to the habitat diversity habitat restoration score of reference streams.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Channel stability, connectivity, altered thermograph, number of local populations, population stability, system productivity, predation/competition, community shift
NWPCC Programmatic H's Addressed	Habitat
Where	In Class 2 and 2.5 streams.
Other/Notes	
Strategies	- Increase or improve instream habitat by restoring recruitment of large woody debris, pool development, or other appropriate components in streams where investigation indicates such actions are likely to benefit native fish. - Place large rocks and woody debris in streams to restore the appropriate channel morphometry using natural channel rehabilitation techniques. - Restore channel length, sinuosity, remove berms, controls, etc. - Coordinate projects through the Focus Watershed Program to assist with landowners, agencies, and other funding sources. - Enhance/protect habitat diversity. Provide long-term channel stability through purchase, conservation easements, landowner incentives, management plans, and other means.

Tributary Objective T4	
Species/Lifestage	All Focal Species, Spawning/Incubation and Rearing
4th-Code HUC	Tributaries (All 4th-Code HUCs)
Limiting Factor	Fine Sediment
Timeframe	2005 to 2020
Objective (Measurable Action)	Reduce the delivery of fine sediments to a level equivalent to the fine sediment habitat restoration score of reference streams.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Habitat diversity, recruitment dynamics, population size, system productivity, population stability, community shift
NWPCC Programmatic H's Addressed	Habitat
Where	In Class 2 and 2.5 streams.
Other/Notes	

Strategies	- Maintain and protect habitat by achieving compliance with existing habitat protection laws, policies, and guidelines.
	- Achieve compliance with water quality standards and develop TMDLs for water quality impaired streams (streams listed on the DEQ 303(d) impaired water bodies list).
	- Reduce general sediment sources by stabilizing or removing roads, removing or upgrading crossings, and other sources of sediment delivery.
	  - Address forest road maintenance and problem areas. Increase maintenance of extensive secondary road systems on U.S. Forest Service, Plum Creek Timber Company, Tribal, and State lands by increased application of best management practices, with emphasis on remediating sediment-producing hotspots and maintaining bridges, culverts, and crossings in drainages that support focal species spawning and rearing. Decommission surplus forest roads, especially those that are chronic sources of sediment and those that are located in areas of highly erodible geological formations. Remove culverts and bridges on closed roads that are no longer maintained.
	  - Improve maintenance along transportation corridors. Improve maintenance of all major roads and railroads along riparian corridors to reduce impacts of sediment and floodplain encroachment. When reconstruction occurs, advocate moving major problem reaches out of riparian corridors. Improve capability for quick response for dealing with potential hazardous material spills.
	  - Modify problem reaches of trail system. Improve or relocate portions of the U.S. Forest Service and Glacier National Park trail system to eliminate stream crossings in known bull trout spawning reaches.
	  - Monitor existing and future coal mine and coalbed methane development in British Columbia. Monitor and assess existing and potential sediment and acid mining runoff related to existing and proposed coal mining activities in the British Columbia portion of the North Fork Flathead River. Assess potential impacts on water quality and quantity, water temperature,

Tributary Objective T4	
	and sediment input from coalbed methane development and associated road construction and other developments. - Minimize recreational development in focal species spawning and rearing habitat. Minimize impacts from expansion or development of new golf courses, ski areas, campgrounds, fishing access sites, and second home or other recreational developments in the corridors of focal species spawning and rearing streams. - Implement stream bank stabilization measures where necessary using natural channel design and revegetation techniques. - Implement riparian revegetation/rehabilitation projects. - Install artificial spawning habitat where necessary. - Coordinate projects with the Focus Watershed Program to identify site-specific sediment reduction projects and to coordinate with landowners, agencies, and other funding sources. - Participate with the and Montana Department of Environmental Quality in the Total Maximum Daily Load planning, implementation, and monitoring process. Achieve compliance with water quality standards. - Support habitat protection and monitoring in British Columbia. Work collaboratively with British Columbia Ministry of Water, Land, and Air Protection and other Canadian governmental and nongovernmental entities to ensure focal species habitat is protected and enhanced in the North Fork of the Flathead. - Reduce sediment sources. Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means. - Continue habitat and fishery monitoring efforts.

Tributary Objective T5	
Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Tributaries (All 4th-Code HUCs)
Limiting Factor	Connectivity
Timeframe	2005 to 2020+
Objective (Measurable Action)	Restore passage to migratory fish by removing potential man-caused barriers, i.e. impassable culverts, hydraulic headcuts, water diversion blockages, landslides, and impassable deltas
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Population stability, number of local populations, habitat diversity, system productivity, hybridization
NWPCC Programmatic H's Addressed	Habitat
Where	In Class 2 and 2.5 streams.
Other/Notes	
Strategies	- Identify, monitor, and maintain existing barriers necessary to prevent Invasion by introduced species; install new barriers where necessary to prevent invasion of introduced species. - Identify barriers or sites of entrainment for focal species, and implement tasks to provide passage and eliminate entrainment. - Eliminate entrainment in diversions. Identify potential loss of fish in diversions and screen water diversions and irrigation ditches identified as high priority by watershed groups. - Provide fish passage around diversions. Install appropriate fish passage structures around diversions and/or remove related migration barriers. - Eliminate culvert barriers. Monitor road crossings for blockages to upstream passage and replace existing culverts that impede passage. - Work with the Focus Watershed Coordination project to assist with identifying barriers and coordinate with landowners, agencies, and other funding sources. Improve instream flows. Restore connectivity and opportunities for migration by securing or improving instream flows and acquiring water rights from willing sellers, - Restore connectivity. Provide long-term habitat availability through purchase, conservation easements, landowner incentives, management plans, and other means.

Tributary Objective T6	
Species/Life stage	All species, All life stages
4th-Code HUC	Tributaries (All 4th-Code HUCs)
Limiting Factor	Protection of Class 1 waters
Timeframe	2005 to 2020+
Objective (Measurable Actions)	Protect and maintain prime, functioning tributary habitat (identified as Class 1 in QHA analysis)
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Habitat diversity, connectivity, turbidity and fine sediments, physical habitat, population stability
NWPCC Programmatic H's Addressed	Habitat
Where	Class 1 streams in the US portion of the Flathead Subbasin
Other/Notes	
Strategies	- In conjunction with appropriate management and regulatory agencies, create new or use existing mechanisms to protect and maintain Class 1 streams or reaches (including but not limited to title acquisition, conservation easements, and long term leases). - Periodically evaluate and update habitat condition. Implement actions necessary to maintain Class 1 status. - Work with the Focus Watershed Coordination project to assist with coordinating with landowners, agencies, and other funding sources to facilitate habitat protection. - Protect habitat. Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means.

Reservoirs

Limiting factors:

Shoreline Condition (R1)
Hydraulic Regime (R2)
Habitat Diversity (R3)
Volumetric Turnover Rates (R4)

Reservoir Objective R1	
Species/Lifestage	All Focal species and All Live Stages
4th-Code HUC	South Fork Flathead
Limiting Factor	Shoreline condition
Timeframe	2005 - 2020
Objective (Measurable Action)	R1a. Revegetate the top ten feet (as measured from full pool) of varial zone substrate using techniques developed by BOR R1b. Improve the shoreline condition of Flathead Lake to a level equivalent to the shoreline condition habitat restoration score in LQHA for reference lakes.
Primary Limiting Factor(s) Addressed	Impoundment and Hydro Operations
Additional Secondary Limiting Factor(s) Addressed	Riparian Habitat Condition, fine sediments, habitat diversity, community shifts, system productivity
NWPCC Programmatic H's Addressed	Habitat and Hydro
Where	Hungry Horse Reservoir varial zone and Flathead Lake
Other/Notes	Initial conclusive results expected from Hungry Horse reservoir by 2008.
Strategies	- Plan and coordinate cost-effective means of revegetating the reservoir varial zone of Hungry Horse with appropriate agencies and organizations by implementing the most effective techniques developed by BOR. - Implement fully the Kerr Project Fish and Wildlife Implementation Strategy - Initiate and develop noxious weed management strategies with International entities (i.e., British Columbia Ministry of the Environment, environmental organizations, etc.).

Reservoir Objective R2	
Species/Lifestage	All Focal species
4th-Code HUC	South Fork Flathead, Flathead Lake
Limiting Factor	Hydraulic regime
Timeframe	2005-2020+
Objective (Measurable Action)	R2a. Reduce reservoir drawdown and reduce the frequency of Hungry Horse Reservoir refill failure to within five feet of full pool as compared to historic operation. R2b. Fully implement Article 63(1) of the Kerr Project License, which calls for the Confederated Salish and Kootenai Tribes to develop and implement a monitoring program to assess Kerr Project compliance with required project operations.
Primary Limiting Factor(s) Addressed	Impoundment and Hydro Operations
Additional Secondary Limiting Factor(s) Addressed	Altered hydrograph, altered thermograph, system productivity, connectivity, volumetric turnover rates, community shifts, population stability
NWPCC Programmatic H's Addressed	Habitat and Hydro
Where	Hungry Horse Reservoir and Flathead Lake
Other/Notes	Future water regulatory rulings will be incorporated into these operations

Strategies	- Operate dams to minimize negative effects on focal species.
	  - Reduce reservoir operational impacts. Review Flathead Lake and Hungry Horse Reservoir operational concerns (*e.g.*, water level manipulation) and support operating recommendations that provide enforceable drawdown limits and refill guidelines through Federal Energy Regulatory Commission license (Kerr) and/or Federal consultation (Hungry Horse Reservoir; USFWS Biological Opinion). The Variable Flow Flood Control model should be implemented by water managers to provide comprehensive, long-term, balanced, and predictable allocation of water resources from Hungry Horse Reservoir that will limit the duration and frequency of deep reservoir drawdowns, improve reservoir refill probability, and produce a more naturally shaped dam discharge pattern downstream (USFWS 2000). Once implemented, evaluate strategies to determine the effects on bull trout recovery.
	  - Provide instream flow downstream of dams. Maintain or exceed recommended instream flow levels in the lower South Fork Flathead River (USFWS 2000), using results of current research, and minimize peaking flows in the mainstem Flathead River downstream of Hungry Horse Dam. Consider bull trout and westslope cutthroat trout concerns when developing flood control release patterns.
	  - Evaluate selective withdrawal at Hungry Horse Dam. Evaluate the adequacy of the selective withdrawal system in partially restoring the normal summer thermal regime in the Flathead River downstream of Hungry Horse Dam and assess whether it meets the needs of migratory bull trout. Refine operations if necessary.

Reservoir Objective R2	
	- Avoid gas supersaturation from Hungry Horse Dam. Avoid conditions for potential gas entrainment to cause nitrogen supersaturation below Hungry Horse Dam that is detrimental to focal species. - Evaluate impact of dam operations on focal species predators. Continue research on response of introduced predators (*i.e.*, lake trout and northern pike) to Flathead Lake and Flathead River water level and temperature manipulations and provide recommendations for operation of Hungry Horse and Kerr Dams to favor native species.

Reservoir Objective R3	
Species/Lifestage	All Focal species
4th-Code HUC	South Fork Flathead, Flathead Lake
Limiting Factor	Habitat Diversity
Timeframe	2005-2020+
Objective (Measurable Action)	Improve the habitat diversity of Hungry Horse and Flathead Lake to a level equivalent to the habitat diversity habitat restoration score in LQHA for reference lakes.
Primary Limiting Factor(s) Addressed	Impoundment and Hydro Operations, Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Community shifts, population stability, system productivity, predation/competition
NWPCC Programmatic H's Addressed	Habitat and Hydro
Where	Hungry Horse Reservoir and Flathead Lake
Other/Notes	Future water regulatory rulings will be incorporated into these operations
Strategies	- Increase or improve in-lake habitat by restoring appropriate components and by placing artifical and natural habitat structures where investigation indicates such actions are likely to benefit native fish.

Reservoir Objective R4	
Species/Lifestage	All Focal Species and All Live Stages
4th-Code HUC	South Fork Flathead
Limiting Factor	Volumetric turnover rates
Timeframe	2005 to 2020+
Objective (Measurable Action)	Increase seasonal or in-seasonal reservoir retention time by five days relative to past operations during similar water years.
Primary Limiting Factor(s) Addressed	Impoundment and Hydro Operations
Additional Secondary Limiting Factor(s) Addressed	Altered hydrograph, altered thermograph, population stability, community shifts, recruitment dynamics, system productivity
NWPCC Programmatic H's Addressed	Habitat and Hydro
Where	Hungry Horse Reservoir
Other/Notes	
Strategies	- Work with action agencies to increase seasonal or in-seasonal reservoir retention time by five days relative to past operations during similar water years.

Lakes

Limiting factors:

Shoreline Condition (L1)
Pollutants (L2)

Lakes Objective L1	
Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Lakes in all 4th-Code HUCs
Limiting Factor	Shoreline Condition
Timeframe	2005 to 2020
Objective (Measurable Action)	Restore lake shoreline conditions to a level equivalent to the shoreline condition habitat restoration score of reference lakes.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Habitat diversity, riparian habitat condition, community shifts, fine sediment, and system productivity
NWPCC Programmatic H's Addressed	Habitat
Where	In Class 2 and 2.5 lakes
Other/Notes	
Strategies	- Maintain and protect lake habitats important to native species from degradation by achieving compliance with existing habitat protection laws, policies, and guidelines. - Protect critical lake wetland and riparian habitats through acquisition or conservation easements. Identify and rank all high priority areas and establish purchase/protection mechanisms. - Work with the Focus Watershed Coordination project to identify site-specific lake wetland/riparian restoration projects and to coordinate with landowners, agencies, and other funding sources. - Implement wildlife enhancement and protection projects for lake wetland and riparian areas in cooperation with all interested parties in the subbasin as opportunities arise. - Protect/restore lakeshore habitats. Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means. - Implement shoreline restoration techniques to stabilize shorelines that are destabilized by fluctuating lake levels.

Lakes Objective L2	
Species/Lifestage	All Focal Species, All Life Stages
4th-Code HUC	Lakes in all 4th-Code HUCs)
Limiting Factor	Pollutants
Timeframe	2005 to 2020
Objective (Measurable Action)	Reduce pollution to a level equivalent to the pollution habitat restoration score of reference lakes.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	System productivity, community shifts, number of local populations
NWPCC Programmatic H's Addressed	Habitat
Where	In Class 2 and 2.5 lakes.
Other/Notes	
Strategies	- Achieve compliance with water quality standards and develop TMDLs for water quality impaired lakes (lakes listed on the DEQ 303(d) impaired water bodies list). - Assess nutrient input and increase water quality monitoring and remediation. Assess and continue to address effects of nutrient enrichment from municipal sewage plants, agriculture, forestry, and development of lakeshores. Increase water quality monitoring in major lake basins (*e.g.*, Flathead, Swan, Whitefish, McDonald). Focus water quality remediation efforts on rapidly developing and implementing total maximum daily load programs for impaired water bodies (section 303[d] list). - Implement water quality regulations. Evaluate enforcement of water quality standards and implement total maximum daily load program. - Eliminate/reduce pollutant sources. Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means. - Coordinate projects with the Focus Watershed Program to identify site-specific pollutant reduction projects and to coordinate with landowners, agencies, and other funding sources.

Bull Trout

Limiting factors:

Number of local populations (BT1)
Population size (BT2)
Population stability (BT3)
Non-native species (BT4)

Bull Trout Objective BT1	
Species/Life stage	Bull Trout, All Life Stages
4th-Code HUC	All 4th-Code HUCs
Limiting Factor	Number of Local Populations
Timeframe	2005 to 2020+
Objective (Measurable Action)	Maintain or increase the total number of identified local populations, and maintain the broad distribution of local populations in all existing core areas.
Additional Secondary Limiting Factor(s) Addressed	Population stability, connectivity, small population size
NWPCC Programmatic H's Addressed	Habitat, Harvest
Where	Bull Trout Core Areas
Other/Notes	This objective is from the Draft Bull Trout Recovery Plan, which has not yet been adopted.
Strategies	- Minimize unintentional bull trout mortality. Evaluate and prevent over-harvest and incidental angling mortality of bull trout. Ensure that sport angling regulations and fisheries management plans, guidelines, and policies minimize unintentional mortality of bull trout in Hungry Horse Reservoir, Flathead Lake, and tributaries other bull trout waters. - Evaluate potential effects of introduced fishes on bull trout recovery and westslope cutthroat trout conservation and implement tasks to minimize negative effects. - Evaluate effects of existing and proposed sport fishing regulations on bull trout. - Evaluate opportunities for regulated bull trout fisheries. Evaluate carefully regulated harvest of bull trout (in Hungry Horse Reservoir) where monitoring of the population status provides a clear record that a harvestable surplus can be maintained and that such harvest will benefit, or at least not be detrimental to, recovery goals. Limited harvest regulations may increase public support for recovery goals, as well as aid for implementing other recovery tasks. - Characterize, conserve, and monitor genetic diversity and gene flow among local populations. - Incorporate conservation of genetic and behavioral attributes of bull trout into recovery and management plans. - Conduct genetic inventory to understand the genetic baseline and to monitor genetic changes throughout the range of bull trout. Continue coordinated genetic inventory throughout recovery unit. - Experiment with micro-elemental signatures in fish scales and otoliths to determine the natal stream of origin.

Bull Trout Objective BT1	
	- Maintain long-term viability. Manage local populations (numbers and life forms) to maintain long-term viability. - Maintain or increase opportunities for gene flow among bull trout populations. Restore fish passage on a case-by-case basis where connectivity has been artificially severed. - Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation. [The bull trout Scientific Group developed a protocol entitled "The Role of Stocking in Bull Trout Recovery".

Bull Trout Objective BT2	
Species/Life stage	Bull Trout, All Life Stages
4th-Code HUC	All 4th-Code HUCs
Limiting Factor	Population Size
Timeframe	2005 to 2020+
Objective BT2 (Measurable Actions)	BT2a. Achieve at least 5 local populations with more than 100 adult bull trout in all primary core areas. Achieve at least 10 local populations with more than 100 adult bull trout in the Flathead Lake core area. In each of the primary core areas, the total adult bull trout abundance, distributed among local populations, must exceed 1,000 fish, and adult bull trout abundance must exceed 2,500 adult bull trout in Flathead Lake and Swan Lake. BT2b. Achieve at least one local population containing more than 100 adult bull trout in secondary core areas with the habitat capacity to do so, and ensure that the total adult abundance exceeds 2,400 fish in the secondary core areas collectively.
Additional Secondary Limiting Factor(s) Addressed	Number of local populations, population stability, recruitment failure
NWPCC Programmatic H's Addressed	Habitat, Harvest
Where	Objective BT2a: Bull Trout Primary Core Areas Objective BT2b: Bull Trout Secondary Core Areas
Other/Notes	This objective is from the Draft Bull Trout Recovery Plan, which has not yet been adopted.
Strategies	- Minimize unintentional bull trout mortality. Evaluate and prevent over-harvest and incidental angling mortality of bull trout. Ensure that sport angling regulations and fisheries management plans, guidelines, and policies minimize unintentional mortality of bull trout in Hungry Horse Reservoir, the Flathead River, tributaries, and other bull trout waters. - Evaluate potential effects of introduced fish species on bull trout recovery and westslope cutthroat trout conservation, and implement tasks to minimize negative effects. - Evaluate regulated harvest of bull trout (in Hungry Horse Reservoir) where monitoring of the population status provides a clear record that a harvestable

Bull Trout Objective BT2	
	surplus can be maintained and that such harvest will benefit, or at least not be detrimental to, recovery goals. Where limited harvest regulations can be implemented, additional sport-fishing support can be solicited for recovery goals, as well as aid for implementing other recovery tasks. - Characterize, conserve, and monitor genetic diversity and gene flow among local populations. - Incorporate conservation of genetic and behavioral attributes of bull trout into recovery and management plans. - Conduct genetic inventory to understand the genetic baseline and to monitor genetic changes throughout the range of bull trout, continue coordinated genetic inventory throughout recovery unit. - Experiment with micro-elemental signatures in fish scales and otoliths to determine the natal stream of origin - Manage local populations (numbers and life forms) to maintain long-term viability. - Maintain or increase opportunities for gene flow among bull trout populations. Restore fish passage on a case-by-case basis where connectivity has been artificially severed. - Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation. [[The bull trout Scientific Group developed a protocol entitled "The Role of Stocking in Bull Trout Recovery".]

Bull Trout Objective BT3	
Species/Life stage	Bull Trout, All Life Stages
4th-Code HUC	All 4th-Code HUCs (Biological)
Limiting Factor	Population stability
Timeframe	2005 to 2020+
Objective BT3 (Measurable Action)	Achieve an overall bull trout population trend that is accepted, under contemporary standards of the time, as stable or increasing, based on at least 10 years of monitoring data.
Additional Secondary Limiting Factor(s) Addressed	Number of local populations, recruitment failure, population size
NWPCC Programmatic H's Addressed	Harvest
Where	Bull Trout Primary and Secondary Core Areas
Other/Notes	This objective is from the Draft Bull Trout Recovery Plan, which has not yet been adopted.
Strategies	- Minimize unintentional bull trout mortality. Evaluate and prevent over-harvest and incidental angling mortality of bull trout. Ensure that sport angling regulations and fisheries management plans, guidelines, and policies minimize unintentional mortality of bull trout in Hungry Horse Reservoir, the Flathead River, tributaries, and other bull trout waters.

Bull Trout Objective BT3	
	- Evaluate potential effects of introduced fishes on bull trout recovery and westslope cutthroat trout conservation and implement tasks to minimize negative effects. - Evaluate effects of existing and proposed sport fishing regulations on bull trout. - Evaluate opportunities for regulated bull trout fisheries. Evaluate management proposals to allow carefully regulated harvest of bull trout (in Hungry Horse Reservoir) where monitoring of the population status provides a clear record that a harvestable surplus can be maintained and that such harvest will benefit, or at least not be detrimental to, recovery goals. If allowable harvest levels can be implemented, additional sport-fishing support can be solicited for recovery goals, as well as aid for implementing other recovery tasks. - Characterize, conserve, and monitor genetic diversity and gene flow among local populations. - Incorporate conservation of genetic and phenotypic attributes of bull trout into recovery and management plans. - Conduct genetic inventory to contribute to establishing a program to understand the genetic baseline and to monitor genetic changes throughout the range of bull trout and continue coordinated genetic inventory throughout recovery unit. - Maintain long-term viability. Manage local populations (numbers and life forms) to maintain long-term viability. - Maintain or increase opportunities for gene flow among bull trout populations. Restore fish passage on a case-by-case basis where connectivity has been artificially severed. - Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation.

Bull Trout Objective BT4	
Species/Lifestage	Bull Trout, All Life Stages
4th-Code HUC	Tributaries and Lakes (All 4th-Code HUCs) (Biological)
Limiting Factor	Non-native Species
Timeframe	2005 to 2020+
Objective (Measurable Action)	Prevent further expansion, suppress, and where possible, eradicate non-native species in the regulated mainstem, reservoirs, and all streams and lakes ranked as high and/or moderate risk in the QHA spreadsheet model.
Primary Limiting Factor(s) Addressed	Non-native species introductions
Additional Secondary Limiting Factor(s) Addressed	Community shifts, number of local populations, population stability, predation/competition, hybridization, recruitment failure
NWPCC Programmatic H's Addressed	None
Where	In the regulated mainstem, reservoirs, and Class 2 and 2.5 streams, ranked as high risk for non-native species interactions in the QHA spreadsheet model.

Bull Trout Objective BT4	
Other/Notes	
Strategies	- Develop, implement, and enforce public and private fish stocking policies to reduce stocking of non-native fishes. - Develop and implement an outreach program to reduce the introduction of non-native invertebrate and plant species. - Prevent introductions of non-native fishes from private fish ponds. Reduce threat of inadvertent introduction from private fish ponds by closely regulating existing permits and by screening future applications. - Upgrade fish hatchery practices. Evaluate all fish stocking programs and private and public hatchery practices to minimize the risk of further inadvertent introduction of non-native species to the subbasin. - Evaluate and upgrade policies for preventing illegal transport and introduction of non-native fishes. - Provide information to the public about ecosystem concerns of illegal introductions of non-native fishes and discourage unauthorized fish introductions. Implement an educational effort about the problems and consequences of unauthorized fish introductions. Continue assessment of predator and prey interactions with emphasis on preventing illegal introductions of lake trout, walleye, brown trout, or other competing piscivores from nearby waters. - Develop tasks to reduce negative effects of non-native taxa on focal species. - Implement control of non-native fishes where found to be feasible and appropriate. - Experimentally remove established brook trout populations. Evaluate opportunities for removing brook trout from selected streams and lakes - Rehabilitate habitat to favor native species assemblages.

Westslope Cutthroat Trout

Limiting factors:

Number of local populations (WCT1)
Small population size (WCT2)
Non-native species (WCT3)

Westslope Cutthroat Trout Objective WCT1	
Species/Life stage	Westslope Cutthroat Trout, All Life Stages
4th-Code HUC	All 4th-Code HUCs (Biological)
Limiting Factor	Number of Local Populations
Timeframe	2005 to 2020+
Objective (Measurable Action)	Maintain or increase the total number of genetically pure local populations, and maintain the broad distribution of local populations in existing metapopulations.
Primary Limiting Factor(s) Addressed	Non-native Species Introductions and Physical Habitat Alteration
Additional Secondary Limiting Factor(s) Addressed	Population stability, connectivity, community shifts, predation/competition, hybridization
NWPCC Programmatic H's Addressed	Harvest, Hatchery
Where	All westslope cutthroat trout waters
Other/Notes	This objective is from the Memorandum of Understanding and Conservation Agreement for westslope cutthroat trout (*Oncorhynchus clarki lewisi*) and status of westslope cutthroat trout in the United States.
Strategies	- Minimize unintentional westslope cutthroat trout mortality. Evaluate and prevent over-harvest and incidental angling mortality of westslope cutthroat trout. Ensure that sport angling regulations and fisheries management plans, guidelines, and policies minimize unintentional mortality of westslope cutthroat trout. - Evaluate potential effects of introduced fishes on westslope cutthroat trout conservation and implement tasks to minimize negative effects. - Evaluate effects of existing and proposed sport harvest regulations on westslope cutthroat trout. - Characterize, conserve, and monitor genetic diversity and gene flow among local populations. - Incorporate conservation of genetic and behavioral attributes of westslope cutthroat trout into recovery and management plans. - Conduct genetic inventory to complete the genetic baseline (untested areas) and to monitor genetic changes throughout the range of westslope cutthroat trout. - Experiment with micro-elemental signatures in fish scales and otoliths to determine the natal stream of origin. - Maintain long-term viability of conservation populations (numbers and lifecycle strategies) and establish wild populations where native stocks have been extirpated.

Westslope Cutthroat Trout Objective WCT1	
	- Maintain existing opportunities for gene flow among westslope cutthroat trout populations. - Develop genetic management plans and guidelines for appropriate use of transplantation and artificial propagation. All donor populations will be 100% genetically pure and free of all reportable fish pathogens. The degree of relatedness among populations, expressed in genetic dendrograms, will form the basis for selecting nearest neighbor stocks where evidence exists for the population targeted for restoration. Donor fish will be collected over several years to maximize heterogeneity and held in isolation until their status can be determined. - Complete renovation of the Sekokini Springs Natural Rearing Facility to facilitate experimental culture of up to four genetic strains of westslope cutthroat. Rear juveniles to maturity under nearly natural conditions to conserve wild behavioral traits and produce F1 progeny to restore wild spawning runs in restored or reconnected habitat.

Westslope Cutthroat Trout Objective WCT2	
Species/Life stage	Westslope Cutthroat Trout, All Life Stages
4th-Code HUC	All 4th-Code HUCs (Biological)
Limiting Factor	Small Population Size
Timeframe	2005 to 2020+
Objective (Measurable Action)	Achieve at least 20 genetically pure conservation populations with a minimum of 50 adults in each of the subpopulations, with each of these conservation populations containing at least 500 adult westslope cutthroat trout.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration, Non-native Species Introductions
Additional Secondary Limiting Factor(s) Addressed	Number of local populations, population stability, recruitment failure
NWPCC Programmatic H's Addressed	Harvest, Habitat
Where	Westslope Cutthroat Trout conservation waters
Other/Notes	Most of the strategies under this objective were adapted from the WCT MOU and status report.
Strategies	- Minimize unintentional westslope cutthroat trout mortality. Evaluate and prevent over-harvest and incidental angling mortality of westslope cutthroat trout. Ensure that sport angling regulations and fisheries management plans, guidelines, and policies minimize unintentional mortality of westslope cutthroat trout. - Evaluate potential effects of introduced fish species on westslope cutthroat trout restoration and implement tasks to minimize negative effects. - Evaluate effects of existing and proposed sport harvest regulations on westslope cutthroat trout populations. - Maintain long-term viability of conservation populations (numbers and life cycle

Westslope Cutthroat Trout Objective WCT2	
	strategies). Where necessary, isolate pure populations to prevent invasion of nonnative species or genetically introgressed populations. - Complete renovation of the Sekokini Springs Natural Rearing Facility to facilitate experimental culture of up to four genetic strains of westslope cutthroat. Rear juveniles to maturity under nearly natural conditions to conserve wild behavioral traits and produce F1 progeny to restore wild spawning runs in restored or reconnected habitat.

Westslope Cutthroat Trout Objective WCT3	
Species/Lifestage	Westslope Cutthroat Trout, All Life Stages
4th-Code HUC	Tributaries and Lakes (All 4th-Code HUCs)
Limiting Factor	Non-native Species
Timeframe	2005 to 2020+
Objective (Measurable Action)	Prevent further expansion, suppress, and where possible, eradicate species that hybridize, prey upon or compete with native species.
Primary Limiting Factor(s) Addressed	Physical Habitat Alteration, Non-native Species Introductions
Additional Secondary Limiting Factor(s) Addressed	Number of local populations, population stability, recruitment failure
NWPCC Programmatic H's Addressed	Harvest, Habitat
Where	In the regulated mainstem, reservoirs, and Class 2 and 2.5 streams and lakes ranked as high risk for non-native species interactions in QHA.
Other/Notes	
Strategies	- Isolate pure westslope cutthroat trout populations from introduced species that compete with, hybridize with, or prey on genetically pure westslope cutthroat trout (after completion of an environmental assessment). - Where logistically and technically feasible and socially acceptable, suppress or eradicate introduced species that compete with, hybridize with, or prey on genetically pure westslope cutthroat trout - Develop, implement, and enforce public and private fish stocking policies to reduce stocking of non-native fishes. - Develop and implement an outreach program to reduce the introduction of non-native invertebrate and plant species - Prevent introductions of non-native fishes from private fish ponds. Reduce threat of inadvertent introduction from private fish ponds by closely regulating existing permits and by screening future applications. - Upgrade fish hatchery practices. Evaluate all fish stocking programs and private and public hatchery practices to minimize the risk of further inadvertent introduction of non-native species to the subbasin.

Westslope Cutthroat Trout Objective WCT3	
	- Evaluate and upgrade policies for preventing illegal transport and introduction of non-native fishes. - Provide information to the public about ecosystem concerns of illegal introductions of non-native fishes and discourage unauthorized fish introductions. Implement an educational effort about the problems and consequences of unauthorized fish introductions. Continue assessment of predator and prey interactions with emphasis on preventing illegal introductions of lake trout, walleye, brown trout, or other competing piscivores from nearby waters. - Develop tasks to reduce negative effects of non-native taxa on focal species - Implement control of non-native fishes where found to be feasible and appropriate. - Rehabilitate habitat to favor native species assemblages. - Use RSI's to increase native species densities in areas where natural colonization is not possible.

Westslope Cutthroat Trout Objective WCT4	
Species/Lifestage	Westslope Cutthroat Trout, All Life Stages
4th-Code HUC	Lakes (South Fork of the Flathead)
Limiting Factor	Small population size
Timeframe	2005 to 2020+
Objective (Measurable Action)	Remove non-native species or introgressed populations from at least 2 mountain lakes per year in the South Fork of the Flathead River watershed and repopulate those lakes with compatible, genetically pure westslope cutthroat trout.
Primary Limiting Factor(s) Addressed	Non-native Species Introductions
Additional Secondary Limiting Factor(s) Addressed	Number of local populations
NWPCC Programmatic H's Addressed	Habitat, Hatchery
Where	In South Fork of the Flathead lakes ranked as high risk for non-native species interactions
Other/Notes	
Strategies	- Utilize rotenone to remove non-native species or introgressed populations - Utilize anthomycin remove non-native species or introgressed populations - Detoxify icthiotoxins upstream of all sources of bull trout populations and genetically pure westslope cutthroat trout populations. - Request a change in harvest regulations to allow unlimited recreational harvest of fish 1 to 2 years prior to treatment. - Transport and apply icthiotoxins using appropriate means.

Harvest

Tribal Subsistence and Angler Harvest Objective

Tribal Subsistence and Angler Harvest (HAR1)

Tribal Subsistence and Angler Harvest Objective HAR1	
Species/Life stage	Juvenile and Adult Sportfish
4th-Code HUC	All 4th-Code HUCs
Limiting Factor	Population Size
Timeframe	2005 to 2020+
Objective (Measurable Action)	Maintain or increase harvestable sportfish while protecting the long-term persistence of native species populations. Sportfish are defined as fish caught for personal use, fun, and challenge.
Primary Limiting Factor(s) Addressed	None
Additional Secondary Limiting Factor(s) Addressed	Number of local populations, population stability
NPCC Programmatic H's Addressed	None
Where	Hungry Horse Reservoir, Flathead River (MT/Canada), Flathead Lake and lakes within the Flathead Watershed.
Other/Notes	
Strategies	- Maintain long-term viability of conservation populations (numbers and lifecycle strategies) and establish wild populations where native stocks have been extirpated. - Minimize unintentional mortality of native species through restrictive harvest regulations, fisheries management plans, guidelines, and policies. - Promote angler compliance to fishing regulations through law enforcement and education. - Initiate natural reproduction of fish species where suitable habitat can be restored or reconnected to reduce reliance on artificial propagation. - Create alternative harvest opportunities in offsite lakes through hatchery production of native fish to maintain angler interest in species conservation. Where native species cannot be restored, maximize harvest by introducing fish species that will not threaten the recovery of bull trout and westslope cutthroat trout. - Evaluate potential effects of introduced fish species on westslope cutthroat trout restoration and bull trout recovery, conservation and implement tasks to minimize negative effects. - Evaluate effectiveness of stocking size and season on survival, growth and angler harvest using periodic population estimation and angler creel census. - Cooperatively regulate fish harvests with British Columbia. Emphasize the importance of cooperative management transboundary fish populations. - Develop fisheries management plans and guidelines for appropriate use of transplantation and artificial propagation.

Terrestrial Objectives

The tables that follow present Flathead Subbasin terrestrial management objectives and strategies designed to mitigate terrestrial limiting factors in the Flathead Subbasin. Objectives and strategies are grouped by biome.

Wetland/Riparian Biome

Regulated Mainstem Wetland/Riparian Limiting Factors:

Altered Hydrograph (RW1)

Other Wetland /Riparian Limiting Factors:

Land Conversion (RW2)
Forest Management (RW3)
Altered Hydrograph (RW4)
Human/Wildlife Conflicts (RW5)
Non-native Species (RW6)

Regulated Mainstem Wetland/Riparian Objective RW1	
Species	All Wetland Target Species
Units	Regulated Mainstem – Flathead River
Limiting Factor	Altered Hydrograph
Timeframe	2005 to 2020+
Objective (Measurable Action)	Working with Action Agencies, bring Hungry Horse Dam operations 50% closer to normative conditions during summer and spring while providing flood control.[1]
Strategies	- Continue to vigorously seek opportunities to restore normative river functions to the Flathead River, including hydrograph cycles (flow, timing, duration), periodic flood flows, habitat diversity, and floodplain connectivity to mimic natural functions and processes. - Operate dams to minimize negative effects on focal species. *(Applicable Objectives: All Regulated Mainstem Objectives; and All Reservoir Objectives).* - Reduce reservoir operational impacts. Review Flathead Lake and Hungry Horse Reservoir operational concerns (*e.g.*, water level manipulation) and support operating recommendations that provide enforceable drawdown limits and refill guidelines through Federal Energy Regulatory Commission license (Kerr) and/or Federal consultation (Hungry Horse Reservoir; USFWS Biological Opinion). The Variable Flow Flood Control model should be implemented by water managers to provide comprehensive, long-

[1] *"Normative " is defined as the condition where natural flood plain functions and channel maintenance can occur. This includes a reduction in the width of the varial zone (that becomes biologically unproductive), removing unseasonable flow fluctuations (natural day to day fluctuations vary by 5% during basal conditions and 10% during spring runoff), restoring a natural spring freshet (runoff occurs in late May or early June, followed by a stable, low basal flow period), periodic channel maintenance flows (a bankfull flow for at least 48 hours on a periodicity of 2.5 years, or every second or third year, or 3 out of 10), stable summertime flows that are constant or gradually reducing after spring runoff (this can include a sliding scale to respond to varying water availability). The condition allows the river to flush fine sediments into the channel margins during runoff (cleaning fines from interstitial spaces in river cobbles creating insect habitat). As flows decline from the spring peak, terrestrial vegetation can invade the margins and as flows stabilize (riparian can establish including willows, cottonwood, grasses and sedges), roots prevent fines from being swept back into the channel (preventing embeddedness and siltation). Rivers that maintain normative functions have stabile banks, slow channel migrations, maintain low width/depth ratios, and high pool/length ratios.*

Regulated Mainstem Wetland/Riparian Objective RW1	
	term, balanced, and predictable allocation of water resources from Hungry Horse Reservoir that will limit the duration and frequency of deep reservoir drawdowns, improve reservoir refill probability, and produce a more naturally shaped dam discharge pattern downstream (USFWS 2000). Once implemented, evaluate strategies to determine the effects on bull trout recovery. - Provide instream flow downstream of dams. Maintain or exceed recommended instream flow levels in the lower South Fork Flathead River (USFWS 2000), using results of current research, and minimize peaking flows in the mainstem Flathead River downstream of Hungry Horse Dam. Consider bull trout and westslope cutthroat trout concerns when developing flood control release patterns.

Riparian/Wetland Objective RW2	
Species	All Riparian and Wetland Target Species
Units	All Units
Limiting Factor	Land Conversion
Timeframe	2005 to 2020+
Objective (Measurable Action)	Using acquisitions, conservation easements and management agreements, conserve and restore 10% over the next 10-15 years in those subunits for which the floodplain vegetation Index in the TBA spreadsheet tool are 8 or lower, consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to conduct watershed problem assessments. Identify site-specific threats (problem assessment) that may be limiting focal and target species in watersheds that have not already been evaluated and identify and prioritize areas in identified subunits that are in need of protection and restoration. - Work with the Focus Watershed Coordination project to identify site-specific projects and to coordinate with landowners, agencies, and other funding sources. - Assess protection and restoration options for prioritized areas through the environmental analysis (NEPA) and management planning processes. - Revegetate denuded riparian areas. Revegetate past riparian harvest zones to restore shade and canopy, riparian cover, and native vegetation. Work with landowners to ensure that riparian areas are not further degraded or denuded. - Improve grazing practices. Reduce negative effects of grazing by fencing riparian areas or improving management practices. - Restore stream channels. Conduct stream channel restoration activities where evaluation indicates that such activities are necessary to restore proper stream function and only where similar results cannot be achieved by other, less costly and less intrusive means. - Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means and implement restoration options.

Riparian/Wetland Objective RW3	
Species	All Riparian and Wetland Target Species
Units	All Units other than the mainstem
Limiting Factor	Altered Hydrograph
Timeframe	2005 to 2020+
Objective (Measurable Action)	Restore the hydrography within a natural range of variability on 10% of riparian/wetland acres over the next 10-15 years in those subunits for which the freshette impact index/water level difference Index in the TBA spreadsheet tool ranges from 4 through 8 (riparian) below 8 (wetlands), consistent with management and mitigation plans.
Strategies	- Conduct watershed problem assessments. Identify site-specific flow threats (problem assessment) that may be limiting focal and target species in watersheds that have not already been evaluated. - Reduce reservoir operational impacts. Review Flathead Lake and Hungry Horse Reservoir operational concerns (*e.g.*, water level manipulation) and support operating recommendations that provide enforceable drawdown limits and refill guidelines through Federal Energy Regulatory Commission license (Kerr) and/or Federal consultation (Hungry Horse Reservoir; USFWS Biological Opinion). The Variable Flow Flood Control model should be implemented by water managers to provide comprehensive, long-term, balanced, and predictable allocation of water resources from Hungry Horse Reservoir that will limit the duration and frequency of deep reservoir drawdowns, improve reservoir refill probability, and produce a more naturally shaped dam discharge pattern downstream (USFWS 2000). Once implemented, evaluate strategies to determine the effects on bull trout recovery. - Provide instream flow downstream of dams. Maintain or exceed recommended instream flow levels in the lower South Fork Flathead River (USFWS 2000), using results of current research, and minimize peaking flows in the mainstem Flathead River downstream of Hungry Horse Dam. Consider wetland and riparian concerns when developing flood control release patterns. - Improve instream flows. Restore connectivity of riparian and wetlands by securing or improving instream flows and acquiring or leasing water rights from willing sellers. - Identify impaired stream channel and riparian areas and implement tasks to restore their appropriate functions. - Work with the Focus Watershed Coordination project to identify site-specific projects and to coordinate with landowners, agencies, and other funding sources. - Provide long-term instream flows and connectivity through purchase, conservation easements, landowner incentives, management plans, and other means and implement restoration options.

Riparian/Wetland Objective RW4	
Species	All Riparian and Wetland Target Species
Units	All Units
Limiting Factor	Forest Management
Timeframe	2005 to 2020+
Objective (Measurable Action)	Restore forest communities on 10% of riparian/wetland watershed acres over the next 10-15 years in those subunits for which the floodplain vegetation index/vegetation disturbance Index in the TBA spreadsheet tool ranges from 4 through 8, consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to identify and prioritize areas in identified subunits that are in need of restoration. - Assess restoration options (silvicultural treatments, road closures and removal, revegetation, etc.) for prioritized areas through the environmental analysis (NEPA) and management planning processes. - Work with the Focus Watershed Coordination project to coordinate with landowners, agencies, and other funding sources. - Schedule and implement treatments on identified priorities. - Encourage full implementation of BMPs on all forest lands in the subbasin. - Assure adequate attention is given to how forest management practices affect wildlife and to mitigating unavoidable impacts during the revision of the Flathead National Forest Plan.

Riparian/Wetland Objective RW5	
Species	All Riparian and Wetland Target Species
Units	All Units
Limiting Factor	Human-Wildlife Conflicts
Timeframe	2005 to 2020+
Objective (Measurable Action)	Reduce human/wildlife conflicts in wetland/riparian areas by 10% over the next 10-15 years as measured by the number of conflicts reported to fish and wildlife management authorities.
Strategies	- Decommission unnecessary roads to reduce harassment of wildlife and encourage more uniform use of available wildlife habitat. - Continue to develop and implement strategies to educate private landowners on how to coexist with wildlife and preserve or enhance habitat. - Educate the public about native wildlife and fish issues, regulations, and proper identification of native species. - Provide long-term habitat availability through purchase, conservation easements, landowner incentives, management plans, and other means and implement restoration options.

Riparian/Wetland Objective RW6	
Species	All Riparian and Wetland Target Species
Units	All Units
Limiting Factor	Non-native Species
Timeframe	2005 to 2020+
Objective (Measurable Action)	Prevent establishment of new non-native species in all subunits when they are identified. Treat an average of 10% of acres over the next 10-15 years in those subunits for which the non-native vegetation index in the TBA spreadsheet tool exceeds a value of 5, consistent with management and mitigation plans.
Strategies	- Coordinate subbasin noxious weed activities with appropriate agencies and organizations. - Identify and address human impacts in riparian habitats with adaptive management techniques. - Protect, enhance and maintain riparian habitats with an emphasis on livestock watering facilities, fencing, and livestock management techniques in specific zones. - Coordinate efforts with all natural resource managers to develop comprehensive noxious weed management plans. - Identify and address direct and indirect human introduction and spread of noxious weeds utilizing adaptive management techniques. - Cooperate and coordinate with weed spraying, biological control, and other management techniques in an efforts to reduce noxious weeds.

Grassland/Shrub Biome

Grassland/Shrub Limiting Factors:

Forest Encroachment (GS1)
Land Conversion (GS2)
Non-native Species (GS3)
Overgrazing (GS4)

Grassland/Shrub Objective GS1	
Species	All Grassland/Shrub Target Species
Units	All Units
Limiting Factor	Land Conversion
Timeframe	2005 to 2020+
Objective (Measurable Action)	Using acquisitions, conservation easements and management agreements, conserve and restore 10% over the next 10-15 years in those subunits for which the Area Change Index in the TBA spreadsheet tool are greater than 5, consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to conduct grassland/shrub area problem assessments. Identify site-specific threats (problem assessment) that may be limiting focal and target species in areas that have not already been evaluated and identify and prioritize areas in identified subunits that are in need of protection and restoration. - Assess protection and restoration options for prioritized areas through the environmental analysis (NEPA) and management planning processes. - Improve grazing practices. Reduce negative effects of grazing by improving management practices. - Coordinate projects through the Focus Watershed Program to identify site-specific projects and to coordinate with landowners, agencies, and other funding sources. - Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means and implement restoration options. - Restore native grassland vegetation back onto previously converted areas

Grassland/Shrub Objective GS2	
Species	All Grassland/Shrub Target Species
Units	All Units
Limiting Factor	Forest Encroachment
Timeframe	2005 to 2020+
Objective (Measurable Action)	Restore grassland/shrubland communities on 10% of grassland acres over the next 10-15 years in those subunits for which the vegetation change Index in the TBA spreadsheet tool is 5 or above, consistent with management and mitigation plans.
Strategies	- Identify and analyze encroached areas of grassland habitats in the Flathead subbasin. - Identify grassland habitat losses and associated losses in biological functions and performance. - Coordinate efforts to develop comprehensive grassland protection, restoration, and enhancement plans that include prescribed fire for critical areas. - Cooperate and coordinate efforts to restore natural disturbance regimes (i.e., fires) in grassland habitats. - Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means. - Coordinate projects through the Focus Watershed Program to coordinate with landowners, agencies, and other funding sources.

Grassland/Shrub Objective GS3	
Species	All Grassland/Shrub Target Species
Units	All Units
Limiting Factor	Non-native Species
Timeframe	2005 to 2020+
Objective (Measurable Action)	Prevent establishment of new non-native species in all subunits when they are identified. Treat an average of 10% of acres over the next 10-15 years in those subunits for which the non-native infestation index in the TBA spreadsheet tool exceeds a value of 5, consistent with management and mitigation plans.
Strategies	- Cooperate and coordinate efforts to protect, enhance and rehabilitate grassland habitats with an emphasis in intermountain areas and intact grassland habitats. - Protect, enhance and maintain grassland habitats with an emphasis on livestock watering facilities, fencing, and livestock management techniques in specific zones. - Coordinate efforts with all natural resource managers to develop comprehensive noxious weed management plan for key grassland areas. - Identify and address direct and indirect human introduction and spread of noxious

Grassland/Shrub Objective GS3	
	weeds utilizing adaptive management techniques. - Cooperate and coordinate with weed spraying, biological control, and other management technique in an efforts to reduce noxious weeds. - Restore native vegetation on areas treated for noxious weeds to prevent re-establishment.

Grassland/Shrub Objective GS4	
Species	All Grassland/Shrub Target Species
Units	All Units
Limiting Factor	Overgrazing
Timeframe	2005 to 2020+
Objective (Measurable Action)	Restore grassland or shrubland communities on 10% of grassland/shrubland acres over the next 10-15 years in those subunits for which the grazing intensity Index in the TBA spreadsheet tool is greater than 5 and in areas where grazing intensity index is less than 5 but the habitat diversity value is greater than 6, consistent with management and mitigation plans.
Strategies	- Coordinate subbasin grassland activities with appropriate agencies and organizations. - Identify and address human impacts in grassland habitats with adaptive management techniques. - Protect, enhance and maintain grassland habitats with an emphasis on livestock watering facilities, fencing, and livestock management techniques in specific zones. - Coordinate projects through the Focus Watershed Program to identify site-specific projects and to coordinate with landowners, agencies, and other funding sources. - Provide long-term habitat protection through purchase, conservation easements, landowner incentives, management plans, and other means.

Xeric Forest Biome

Xeric Forest Limiting Factors:

Fire Exclusion (XF1)
Encroachment (XF2)
Forest Fragmentation (XF3)
Human/Wildlife Conflicts (XF4)

Xeric Forest Objective XF1	
Species	All Xeric Forest Target Species
Units	All Units
Limiting Factor	Fire Exclusion, Encroachment, and Fragmentation
Timeframe	2005 to 2020+
Objective (Measurable Action)	Restore fire-resistant xeric forest communities on 10% of acres over the next 10-15 years in those subunits for which the forest structure departure Index in the TBA spreadsheet tool is 5 or above, consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to identify and prioritize areas in identified subunits that are in need of treatment. - Assess treatment options (prescribed fire, mechanical treatments with fire, mechanical treatments without fire, etc.) for prioritized areas through the environmental analysis (NEPA) and management planning processes. - Schedule and implement treatments on identified priorities.

Xeric Forest Objective XF2	
Species	All Xeric Forest Target Species
Units	All Units
Limiting Factor	Human-Wildlife Conflicts
Timeframe	2005 to 2020+
Objective (Measurable Action)	Reduce human/wildlife conflicts in xeric forest areas by 10% over the next 10-15 years as measured by the number of conflicts reported to fish and wildlife management authorities.
Strategies	- Decommission unnecessary roads to reduce harassment of wildlife and encourage more uniform use of available wildlife habitat. - Develop cooperative projects with land owners to provide long-term solutions to wildlife conflicts including such things as electric fencing, guard dogs, bear proof garbage containers, etc. - Continue to develop and implement strategies to educate private landowners on how to coexist with wildlife and preserve or enhance habitat.

Xeric Forest Objective XF2	
	- Educate the public about native wildlife and fish issues, regulations, and proper identification of native species. - Provide long-term habitat availability through purchase, conservation easements, landowner incentives, management plans, and other means and implement restoration options.

Mesic Forest Biome

Mesic Forest Limiting Factors:

Fire Exclusion (MF1)
Forest Management (MF2)
Roads (MF3)
Non-native Species (MF4)

Mesic Forest Objective MF1	
Species	All Mesic Forest Target Species
Units	All Units
Limiting Factor	Fire Exclusion
Timeframe	2005 to 2020+
Objective (Measurable Action)	Using appropriate prescribed fire and mechanical treatments, alter an average of 10% of acreage in those subunits for which the Fire Interval Disruption Index in the TBA spreadsheet tool exceeds a value of 8.5, consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to identify and prioritize areas in identified subunits that are in need of treatment. - Assess treatment options (prescribed fire, mechanical treatments with fire, mechanical treatments without fire, etc.) for prioritized areas through the environmental analysis (NEPA) and management planning processes. - Schedule and implement treatments on identified priorities.

Mesic Forest Objective MF2	
Species	All Mesic Forest Target Species
Units	All Units
Limiting Factor	Forest Management
Timeframe	2005 to 2020+
Objective (Measurable Action)	Using appropriate silvicultural treatments, alter forest structure and composition on an average of 10% of acreage of in those subunits for which the Forest Structure Disruption Index in the TBA spreadsheet tool exceeds a value of 7, consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to identify and prioritize areas in identified subunits that are in need of restoration. - Assess restoration options (silvicultural treatments, road closures and removal, revegetation, etc.) for prioritized areas through the environmental analysis (NEPA) and management planning processes. Implement BMPs on all roads. - Schedule and implement treatments on identified priorities. - Encourage full implementation of BMPs on all forest lands in the subbasin. - Assure adequate attention is given to how forest management practices affect wildlife and to mitigating unavoidable impacts during the revision of the Flathead National Forest Plan.

Mesic Forest Objective MF3	
Species	All Mesic Forest Target Species
Units	All Units
Limiting Factor	Roads
Timeframe	2005 to 2020+
Objective (Measurable Action)	Manage motorized vehicle access to provide security for wildlife species sensitive to human disturbance, snag removal or other key habitat alterations by maintaining or enhancing habitat security and integrity over the next ten to fifteen years in those subunits for which the Road Density Index in the TBA spreadsheet tool exceeds 4 miles of road/square mile (or lower in critical habitat areas), consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to identify and prioritize roads in need of closure in identified subunits. - Assess options (road removal, seasonal closures — gates, Kelly humps, etc.) through the environmental analysis (NEPA) and management planning processes. - Schedule and implement closures or removals. - Implement BMPs on all forest roads.

Mesic Forest Objective MF4	
Species	All Mesic Forest Target Species
Units	All Units
Limiting Factor	Non-native Species
Timeframe	2005 to 2020+
Objective (Measurable Action)	Prevent establishment of new non-native species in all subunits when they are identified. Treat an average of 10% of acres over the next 10-15 years in those subunits for which the non-native vegetation index in the TBA spreadsheet tool exceeds a value of 7, consistent with management and mitigation plans.
Strategies	- Work with management agencies and other stakeholders to identify and prioritize areas in need of weed treatments in identified subunits. - Assess treatment options (chemical, biological, etc.) through the environmental analysis (NEPA) and management planning processes. - Schedule and implement treatments.

Administrative/Programmatic Objectives

The tables that follow present Flathead Subbasin administrative/programmatic objectives and strategies designed to facilitate appropriate funding, implementation, evaluation, and management activities.

Administrative/Programmatic Objectives:

Adequate resources (AP1)
Adequate regional and international coordination (AP2)
Independent peer-review and qualified scientific counsel (AP3)
Locally recognized stakeholder groups (AP4)
Distribution of information (AP5)

Administrative/Programmatic Objective AP1	
Objective (Measurable Action)	Provide adequate resources for program implementation and evaluation.
Where	All portions of the Flathead River Subbasin
Other/Notes	
Strategies	- Design and implement 5 and 10-year funding blocks to address appropriate temporal scales of successful habitat, ecosystem, and population restoration in the Flathead Subbasin. - Pursue and acquire additional funding sources to fully implement the Flathead Subbasin Plan.

Administrative/Programmatic Objective AP2	
Objective (Measurable Action)	Develop and maintain adequate regional and international coordination to efficiently and successfully implement the Flathead Subbasin Plan.
Where	All portions of the Flathead River Subbasin.
Other/Notes	
Strategies	- Support and enhance existing coordination forums and other forms of communication to meet regional and international coordination needs to efficiently and successfully implement the Flathead Subbasin Plan. - Provide for adequate regional participation and feedback in decision making processes that will impact fish and wildlife resources in the Flathead Subbasin that are affected by the Columbia River FCRPS - Reduce number of meetings (and associated costs) by reducing unnecessary process. - Optimize communication efficiency by using e-mail, conference calls, and video conferencing.

Administrative/Programmatic Objective AP3	
Objective (Measurable Action)	Continue to pursue and support independent peer-review and qualified scientific counsel to improve and maintain rigor of Subbasin Plan components.
Where	All portions of the Flathead River Subbasin
Other/Notes	
Strategies	- Request and facilitate scientific review during all critical implementation and evaluation phases of the Subbasin Plan.

Administrative/Programmatic AP4	
Objective (Measurable Action)	Support locally recognized stakeholder groups that improve coordination and implementation of existing local, state, and federal programs in the Flathead Subbasin.
Where	All portions of the Flathead River Subbasin
Other/Notes	-
Strategies	- Develop partnerships and collaborative approaches to raise awareness, share information, and provide recommendations to address and resolve important resource issues in the Subbasin. - Build and maintain connectivity between local communities, Tribal, state & federal agencies, and transboundary partners.

Administrative/Programmatic Objective AP5	
Objective (Measurable Action)	Improve distribution of information required to successfully implement the Subbasin Plan.
Where	All portions of the Flathead River Subbasin
Other/Notes	
Strategies	- Involve community stakeholder and public groups to provide valuable local historical and biological information to help successfully implement Subbasin Plan activities. - Provide and support education and outreach opportunities. - Maintain and support data storage and exchange.

10.3. Research, Monitoring and Evaluation (RM&E) Program

This RM&E program provides a framework for monitoring and evaluation of activities implemented under the Plan. Flathead Subbasin planners are aware of regional (Columbia Basin scale) efforts to standardize monitoring in state federal, and tribal salmon programs. To the extent appropriate, planners will coordinate with the Pacific Northwest Aquatic Monitoring Partnership (Partnership), and will incorporate recommendations for coordinating state, federal, and tribal monitoring practices, as presented in the partnership plan.

LINKS

For more information on the Pacific Northwest Aquatic Monitoring Partnership, go to: http://www.nwcouncil.org/fw/subbasinplanning/admin/guides/pnamp.pdf

Click Here

10.3.1. Adoption of Ecological and Scientific Management Framework Elements

Flathead River Subbasin Planners adopted a hierarchical, multi-scale scientific framework (Section 10.1.4.) to address primary and secondary limiting factors. This framework is composed of three step-down processes: one at the subbasin level and two different multi-scale decision pathways, one for on-site mitigation and the other for off-site mitigation (Figures 10.1 – 10.3).

10.3.2. Determination of RM&E needs

The Technical and Planning Team determined research and monitoring needs for the Flathead River Subbasin using Qualitative Habitat Assessment (QHA) and Terrestrial Biome Assessment (TBA) scores and their best collective scientific knowledge. After reviewing outputs from QHA and TBA, the Technical Team used the scores to identify the habitat attributes currently limiting fish and wildlife productivity and abundance in the subbasin. The planning team developed objectives and strategies to address those limiting factors (figure 10.5). They will then use the objectives to identify monitoring needs on a project-by-project basis, (i.e. restoration and protection projects will require monitoring activities specific to the strategies employed). Research needs will be defined by gaps in knowledge identified through QHA, TBA, and other analyses.

10.3.3 Development of research and monitoring objectives

Defining research and monitoring objectives is the next logical step in the development of an RM&E Program (figure 10.4). Managers in the subbasin will develop a comprehensive RM&E program prior to July 2005. Section 10.3.7

Figure 10.5. General logic path used to develop research and monitoring needs in the Flathead River Subbasin.

describes evaluation protocols that will be used in the development of the RM&E program.

10.3.4 Ongoing Research, Monitoring, and Evaluation Activities

The following RM&E activities are ongoing in the Flathead Subbasin. Additional information for BPA projects is listed at the end of each subsection.

LINKS

For a Protocol for Monitoring Trajectories of Bull Trout Populations Using Demographic Parameters in a Probabilistic Framework, go to Appendix 94.

Click Here

Fisheries and Aquatic Science

All on-the-ground BPA-funded projects described in the inventory include a number of monitoring, evaluation, and research activities. Specific monitoring strategies, including pre- and post-treatment sampling, have been designed for each completed and ongoing project. Monitoring includes parameters from the watershed scale to project-specific activities. These activities are combined with watershed-level, long-term, time-series data from habitat and population indices that evaluate direct and indirect effects of projects.

Specific ongoing monitoring activities led by Montana Fish, Wildlife & Parks include:

General

Concurrent with on-the-ground projects, we have maintained extensive monitoring, watershed assessment, and research components. Monitoring includes watershed-level monitoring of spawning substrate, redd counts, population estimates, and gill net monitoring series to assess direct and indirect

effects of various projects. Specific monitoring strategies, including pre- and post-treatment sampling, have been designed for each completed and ongoing project. We maintain this extensive monitoring program through a cooperative effort with MFWP Fisheries Management Staff and, to a lesser extent, other agencies. Concurrent with population monitoring in the Flathead River tributaries, personnel are evaluating rainbow trout and cutthroat trout interactions (genetic introgression, overlap in timing and location of spawning, etc.) in cooperation with the University of Montana (graduate research).

Necessary Research and Monitoring Activities

Biological monitoring data was proven to be critical during the development of models used in management of water resources and operation of Hungry Horse Dam (see above). The Hungry Horse model (HRMOD) was empirically calibrated using field data from an extensive sampling program during 1983 through 1990. Field data from 1991 through 1995 were used to refine and correct uncertainties in the model and refine a Flathead Lake component (Marotz et al. 1996). HRMOD was used to develop Integrated Rule Curves (IRC's) and the first version of an alternate flood control plan called VARQ. We expect that the recently completed IFIM and refined HRMOD models will be useful tools to evaluate the biological effects of dam operations recently adopted by NPCC in their Mainstem Amendment. The ultimate result has been the integration of fisheries operations with power production and flood control to reduce the economic impact of basin-wide fisheries recovery actions.

The physical and biological monitoring is used to monitor population trends necessary for the recovery of native resident species, including the threatened bull trout and westslope cutthroat trout. A solid working knowledge of each species' life history is a critical prerequisite to species recovery. Field studies designed to investigate the life history and factors limiting native fish populations require a combination of diverse field evaluation techniques.

In 2001, the Hungry Horse Mitigation Program began to develop and test a nonlethal technique to determine stock origin and life history of native migratory bull trout and westslope cutthroat trout (WCT) populations inhabiting the Flathead River drainage upstream of Flathead Lake. Results from 2002 and 2003 revealed that the technique will be useful for determining an individual fish's natal stream of origin. Trace elements in scales from juvenile WCT rearing in natal tributary streams were quantified and correlated with each stream. Results will be used to evaluate the effectiveness of habitat mitigation projects, protect existing populations and unique life history forms, and to locate and reduce hybrid (WCTxRBT) populations in the Flathead system. This nonlethal

technique examines specific parts of individual scales within limits of detection less than 100 mg/g and requires a suite of elemental analyses (i.e. Sr, Mg, Ca, Ba, Mn and specific isotopes of Sr) to establish baseline signatures for different streams. This technique may be the most effective method to differentiate trace element signatures in stream-dwelling salmonid populations due to the relatively large differences in geomorphology and lack of mixing between stream systems. Until recently, few studies had focused on resident salmonid populations in the Pacific Northwest (Wells et al. 2003), although this technique had been successfully applied to juvenile weakfish in estuaries along the Atlantic coast (Wells et al. 2000). Based on preliminary results, we plan to increase accuracy by using Strontium isotopes as additional markers in 2004 and 2005. We predict that this technique will allow researchers to subsample adult fish within a population to determine where the majority of genetically pure fish are originating (for protection of critical habitats). Monitoring will be enhanced when fish originating from restored sites can be identified to evaluate the relative effectiveness of various mitigation strategies. Sources of genetically introgressed fish will be used as a second layer of evidence to refine identification of natal streams for restoration actions. We will continue to evaluate applications of this technique by assessing the persistence of elemental signatures in fish scales and otoliths.

South Fork Flathead Westslope Cutthroat Trout Conservation Project

The project involves implementing a progressive recovery plan for candidate populations located in high elevation lakes. The entire recovery plan is expected to last for 10 years. There are nearly 40 alpine lakes in the South and Middle fork drainages that contain non-native or hybrid fish. Candidate lakes will be surveyed to develop detailed bathymetric maps and assess aquatic and terrestrial communities (i.e. fish, insect fauna, amphibians, birds etc.). Each treated lake will be restocked with native westslope cutthroat trout within 12 months of being treated.

Sekokini Springs Natural Rearing Facility

The Sekokini Springs site will be a keystone in the westslope cutthroat recovery program.

Genetic Inventories

We will continue to reduce the threat of hybridization to westslope cutthroat by rainbow trout and introgression with Yellowstone cutthroat trout. Hybridization / introgression has been mapped using telemetry and trapping. We will determine

LINKS

Reports on the BPA-funded MFWP R&M activities listed here can be downloaded at: http://www.bpa.gov/efw/pub/searchpublication.aspx. Note that at this website, some of these activities are reported on under larger projects, such as Hungry Horse Mitigation.

Click Here

recruitment and production potential into the Flathead proper by monitoring out-migrant fish from spawning streams. Where feasible, populations will be isolated from competition and/or hybridization from non-native trout by installing instream fish passage barriers. Subsequent migrant trapping efforts will be employed to remove adult spawners and relocate individuals to closed-basin lakes to provide a recreational fishery. Trapping efforts will continue approximately 6-8 years following installation of a barrier. If necessary, we will remove hybrid populations upstream of the barrier using chemical or mechanical means.

Fish genetics are monitored prior to and after treatment to assess trends in genetic purity. Samples are sent to appropriate genetics labs to determine genetic purity of for analysis of divergence of populations through allelle frequency from microsatellite or allozyme loci. Genetically pure donor populations will provide a source of genetic material to be used in future restoration activities at the Sekokini Springs Cutthroat Trout Natural Rearing Facility.

Tributary Habitat Monitoring

Conduct pre- and post-treatment surveys of streams, riparian areas and upland habitats in priority watersheds being restored in the Flathead system, following methods outlined by Rosgen (1996). The U.S. Forest Service has completed several watershed assessments throughout streams in the basin. We will implement a watershed-level fish and habitat monitoring strategy established in Knotek et al. (1997). Includes redd counts, juvenile estimates, substrate coring, gill-netting and migrant trapping.

Redd Counts and Population Estimation

Conduct annual migratory cutthroat and bull trout redd counts in index tributary reaches to monitor adult runs. Conduct annual cutthroat and bull trout juvenile estimates in tributaries to monitor recruitment and river population estimates in main stem and forks of Flathead River to assess fish abundance, species composition, and size structure. Conduct annual gill net series on Flathead Lake and Hungry Horse Reservoir.

Flathead River IFIM

Habitat suitability indexes for age-classes of bull trout and westslope cutthroat trout will be incorporated in the IFIM model. Radio-telemetry, SCUBA and snorkel techniques were used to collect micro and macrohabitat information at each fish location. Improved GIS and GPS capability has allowed us to overlay fish locations on high accuracy, geo-referenced maps. Micro and macro habitat

parameters (i.e. depth, velocity, substrate, habitat type etc.) are collected at each fish location. Suitability curves will be used in conjunction with the physical model for use in developing weighted useable area curves in the Flathead River downstream of Hungry Horse Dam. The Flathead River IFIM study will be completed in 2001. Results will be used to refine existing flow guidelines to better balance the needs of the aquatic ecosystem with power production demands. The 2000 Biological Opinion on bull trout identified additional research needs to assess ramping rates and how they influence fish and macroinvertebrate communities. Radio-telemetry will continue to be used to assess bull trout behavior and habitat use under various ramping rates. The null hypothesis is that habitat use and movements do not differ among various flow ramping rates (treatments) and stable flow conditions (control). We also propose to quantify differences in macroinvertebrate diversity and abundance under various operating strategies. The null hypothesis is that macroinvertebrate community diversity and abundance do not differ among various operating strategies.

LINKS

For information on the Council's Review of Strategies for Tributary Restoration, go to: http://www.nwcouncil.org/library/isab/isab2003-2.pdf

Click Here

Monitoring Selective Withdrawal at Hungry Horse Dam

A selective withdrawal system was installed in August 1996 which allowed dam operators to control temperatures in the tailrace, thus resorting temperatures to near pre-dam conditions. To assess the effectiveness of selective withdrawal we are assessing potential changes in productivity in Flathead River. Mountain whitefish growth rates pre- and post selective withdrawal were analyzed in 2001. The null hypothesis is that there are no differences in growth rates before and after installation of the selective withdrawal structure at Hungry Horse Dam. Current research will build on previous work. Water temperature is being monitored at 12 locations in Flathead River system. Results will improve the longitudinal resolution of the existing thermal model. Differences in macrozoobenthos diversity and abundance pre- and post-selective withdrawal are being quantified following the methodology outlined by Hauer et al. (1994). The null hypotheses are that there are no differences in the abundance and community composition of macroinvertebrates in the Middle Fork (control), South Fork (below Hungry Horse) and mainstem Flathead River.

Specific ongoing monitoring activities led by the Confederated Salish and Kootenai Tribes include:

Flathead Lake Gillnetting

The first monitoring activity we do is a standardized gillnetting series conducted annually during the spring cooperatively with MFWP. We have conducted this project since 1992 solely with BPA funding. This series is intended to provide trends in adult bull and cutthroat abundance. The series consists of 15 floating and 15 sinking gillnets. The importance of this series lies in the fact that it was initiated in 1981, prior to the large changes in the species assemblage of Flathead Lake, and is one of our longest running data sets. We would like to continue this effort indefinitely to provide an annual update of changes in the fish community. These are the fixed sampling sites where nets are set each spring. The reservation boundary cuts across the center of the lake and MFWP samples the north half and the tribes sample the south half.

Research, monitoring and evaluation to assess project success.

Criteria to measure the success of habitat and land management projects will be developed for each project and linked to project-specific objectives. These will include measurable improvements to water quality (temperature, dissolved gas, suspended sediments, etc.); improvements to stream channel dynamics and form (e.g., bed load movement, bank stability, channel pattern, and profile); changes in fish habitat conditions; and, improvements in riparian health assessment/MRA scores (Hansen 1996) or HGM assessment (Hauer et al. 2001) scores relative to pretreatment measurements. The translation of these habitat improvements into increased productivity of the fishery will take time and will be the result of cumulative efforts. Changes in fish biomass and in recruitment to adults will be measured through stock assessments (density, species composition, age structure), creel survey estimates (CPUE, angler days, and harvest), redd counts, and the number of migratory adults entering select spawning tributaries. Increases in juvenile recruitment (numbers of out-migrants) will also be monitored where feasible and appropriate. Other, more specific, evaluation criteria will be developed through the adaptive management process and will be based on monitoring results.

Habitat improvement projects

Monitoring of enhancement projects may contain any or all of the following components. Monitoring efforts will be determined based on how extensive the enhancement projects are, restoration techniques used, and the level of involvement of mitigation funds. At a minimum, photo-points will be established

for each project and sites will be photographed at five-year intervals. In addition, aerial photography of all project and enhancement areas will be obtained a minimum of once every ten years.

Stream Restoration

- Projects will be designed with the reference-reach approach. (A "reference reach" in the context of stream systems is a segment of river that is functioning at or near its potential in terms of stability and productivity.) The design will include in-channel habitat variables such as width/depth and pool/riffle ratios, and mean pool depth.
- Monitoring of specific fish habitat improvements will be based on the specific technique used. For example if substrate or woody debris are added to provide more cover, monitoring would include and assessment of use of that cover.
- Fine sediments will be monitored in critical areas (spawning areas)

Riparian Areas

- Long-term photographic records of changes in riparian condition will be maintained. Photo-points will be established within each parcel and mapped using GPS and distance measurements to permanent markers. Photos will be taken at periodic intervals and catalogued for interpretation of trends. In addition, aerial photographs will be obtained at a minimum of every ten years so that changes over time can be examined.
- To monitor improvements in the functioning of riparian areas to a proper functioning condition, Riparian Health Assessments (Hansen et al. 1995) will be conducted to determine baseline conditions. Areas will then be reassessed periodically to determine progress following management activities.
- To monitor the extent of riparian habitats, delineations of existing riparian areas will be made and compared with historical photos, if available. Areas will be re-measured periodically to determine progress toward goals.
- To measure increases in the percent of deciduous woody species in appropriate riparian areas, the percent cover of deciduous shrub and tree species within riparian areas under baseline conditions will be estimated. Areas will be re-sampled periodically to determine progress following management activities.

Water Quality/Quantity

- Initiate water quality protection measures, such as: coordinating with ongoing TMDL Program, developing shoreline development constraints

and protection measures, assuring the appropriate construction of septic systems and sewer districts, participating in basin-wide land-use issues, and acquiring important lake shorelines.
- Monitor stream temperatures
- Monitor stream flows where improvements are made to agricultural practices.

Fish population monitoring for streams
- Fish stock assessments (electrofishing or snorkel counts) to estimate density and characterize age structure and determine species composition.
- Where possible, obtain estimates of adult escapement and juvenile recruitment.
- Monitor fish harvest through creel surveys

Fish population monitoring for lakes
- Monitor species-specific population trends, age structure, and mortality rates of major fish species through the use of gill nets and other sampling methods.
- In Flathead Lake, monitor lake trout and lake whitefish fecundity and age at maturity through the use of all-series, multi-mesh gillnetting at 48 randomly located sites lakewide on an annual basis.
- In select water bodies, monitor phytoplankton, zooplankton, and *mysid* population trends through plankton and *mysis* monitoring conducted on a bimonthly and annual basis.
- Monitor fish harvest through a creel surveys.
- In Flathead Lake, monitor harvest and population changes using a model of lake trout population structure that predicts the results of changes in harvest.

Hatchery Stocks

Off-site stocking activities
- Monitor return to creel.
- Monitor cost/benefit ratio for fish raised
- Monitor for evidence of introgression of hatchery fish with native fish.

Supplementation and reintroduction activities
- Using appropriate estimators and techniques monitor pre- and post treatment fish populations.

Additional RM&E information for individual ongoing BPA funded projects in the Flathead Subbasin is listed below by project:

BPA Project 199101903: Hungry Horse Mitigation

- Monitor mitigation efforts and evaluate techniques to assure the greatest possible efficiency of mitigation expenditures.
    - Implement watershed-level fish and habitat monitoring strategy established in Knotek et al. (1997). Includes redd counts, juvenile estimates, substrate coring, gill-netting, etc.
    - Monitor flow regimes, fish community composition, riparian recovery, and instream habitat at Hay Creek (completed habitat and passage project).
    - Consider renewal of the 10 year landowner agreement that expired in 2001 for Elliott Creek (completed habitat project).
    - Monitor use of fish ladder, fish response to channel restoration, and riparian recovery at Taylor's Outflow (ongoing watershed restoration and passage project).
    - Monitor colonization rates of adult adfluvial cutthroat trout in 7 Hungry Horse Reservoir tributaries where passage was restored (completed passage projects).
    - Monitor channel morphology, riparian recovery, bank stability, and fish abundance in response to cattle exclusion at Griffin Creek.
    - Monitor fish growth, species composition, and angler use at past lake rehabs on Lion, Rogers, Bootjack, Murray, & Dollar lakes
    - Utilize redd counts, electrofishing, migration trapping, and habitat measurements to estimate the distribution and abundance of native migratory stocks and habitat changes with particular focus on past and present treatment areas.
    - Monitor riparian fencing on upper third of Dayton Creek drainage.
    - Evaluate and complete fish passage improvements in Paola Creek
    - Evaluate and improve fish passage through the culvert at the Highway 2 road crossing of Stanton Creek

- Monitor watershed level fish and habitat parameters in cooperation with fish management staff and other BPA projects.
    - Annually monitor spawning, incubation and habitat quality by McNeil method of streambed coring in 33 tributaries to assess

juvenile bull trout rearing habitat quality, and by substrate scoring in 21 tributaries.
- Conduct annual migratory cutthroat and bull trout redd counts in 45 index tributary reaches to monitor adult runs.
- Conduct annual cutthroat and bull trout juvenile estimates in 31 tributaries to monitor recruitment.
- Conduct river population estimates in main stem and forks of Flathead River to assess fish abundance, species composition, and size structure.
- Conduct annual gill net series on Flathead Lake and Hungry Horse Reservoir. This has been reduced to a single series each year.
- Collect samples for whirling disease and genetics testing on selected tributaries.

- Complete watershed assessments, site evaluations, and public scoping to identify and prioritize new projects.
  - Complete watershed assessment and water conservation plan for Dayton Creek drainage.
  - Complete watershed assessments for Big, Coal, Wheeler, Rock, and Branch Creeks to identify riparian areas that have experienced extensive clear cutting.
  - Evaluate and scope future candidates for lake rehabilitation.

BPA Project 199101901: Research, Monitor, and Restore Native Species

- Utilize a standardized gillnetting method to determine catch rates of westslope cutthroat and bull trout. Gillnets consist of five mesh sizes, and measure 250 ft long and 6 ft deep. Three sinking and three floating nets are set at five fixed locations near shore. This work now constitutes a time-series of trends in native species abundance that dates back to 1981.

- Continue the standardized roving creel survey (Malvestuto 1983) with randomized aerial angler counts to estimate annual harvest, catch rates, and angler pressure as conducted in 1992-93 (Evarts et al 1994) and 1998-99 (Hansen and Evarts in press).

- Sample the lake trout population during spawning season using gillnets to acquire measures of maturity and end of season growth rates. The nets are set lakewide in a stratified random design that assigns sampling intensity

within strata relative to the percent of the total represented by each stratum. There are five geographic strata and four depth strata. Gillnets consist of 10 meshes ranging in size from 0.75 in to 3.0 in bar measure, and 250 ft long and 8 ft deep. Age at maturity is determined by visual identification and otolith measurements, fecundity by subsampling ovaries, year class strength by developing the length-based population structure from mesh-selectivity adjusted catches, mortality rate from the descending limb of the catch curve, and growth rate from scale and otolith analysis.

- Determine growth rate, overwinter survival, and population structure of stocked fish in each of five reservoirs on a two-year cycle. Creel surveys will be conducted on each reservoir on a four year cycle. Fish will be sampled by multiple collection methods depending on reservoir morphometry. Small sample sizes (30-50 fish) are considered adequate to demonstrate growth rate and survival one year post planting. Creel surveys will be stratified to the peak angling seasons: July and August and the ice fishing period.

- Continue ongoing research into food-web interactions that bear heavily on native species abundance. This research is conducted cooperatively between agencies and universities and receives funding from other sources in addition to BPA. We are estimate zooplankton and Mysis relicta production directly using abundance of each species, number of eggs and egg development rates. Daytime zooplankton samples are collected above and below the thermocline during stratification and at 50m depth to the surface during isothermal conditions. Production methodology follows that of Borgmann et al (1984). Fish abundance and population structure are determined in part through Objective #3 and predation demand is estimated by gut analysis and projections of the Wisconsin bioenergetic model (Hewett and Johnson 1992).

- Conduct a comprehensive literature review and a series of interviews of academic experts on white sturgeon distribution. The scientific information acquired will be added to the existing collection of information held by the Kootenai tribal elders regarding the historic or current presence of white sturgeon in the Flathead basin. The information will ultimately be used to assist the regulatory agencies in responding to a proposal to release white sturgeon into Flathead Lake.

Montana Fish Wildlife & Parks has proposed to BPA to use quantitative biological models and field research to assess the biological consequences of various dam

operation strategies on aquatic resources in Montana. The original models and published field research provide some of the tools required to assess biological impacts of operational changes called for by the Council's Mainstem Amendments. The proposed monitoring strategies expand on the existing models using additional empirical data to assess alternative operations in greater detail (see Appendix 95).

LINKS

For MFWP's pending proposal to evaluate the biological effects of the Northwest Power and Conservation Council's Mainstem Amendments on the fisheries upstream and downstream of Hungry Horse and Libby Dams, Montana, go to Appendix 95.

Click Here

Wildlife

Specific ongoing monitoring activities led by Montana Fish, Wildlife & Parks include:

Nongame Monitoring

This ongoing MFWP wildlife mitigation project evaluates the effects of habitat enhancements at Hungry Horse and Libby reservoirs on breeding bird communities to determine if enhancement prescriptions for big game species effectively rehabilitate habitat for bird species as well. Nongame birds, which are widely recognized as one of the best indicators of terrestrial habitat quality, inhabited all the habitats lost in both project areas. There is growing international concern over the status and trend in many western bird populations and their relationships with habitat management practices. In order to optimize benefits to all wildlife, we need to determine whether activities done to benefit big game animals also benefit other species groups that depend on those habitats. A final summary report of this eight-year effort results will be used to review and develop new habitat enhancement proposals and methods for measuring wildlife benefits.

Population Monitoring

Big game, furbearer, and nongame populations in the Subbasin are monitored annually through a variety of surveys and inventories. State and tribal agencies conduct annual surveys of Subbasin species such as elk, mule deer, white-tailed deer, moose, mountain goats, and grizzly bears. MFWP also conducts breeding-bird surveys on each of its wildlife management areas as well as furbearer-track surveys during winter. Local organizations like the Montana Bald Eagle Working Group, Montana Loon Society, sportsman groups and other entities coordinate annual mammal counts, transportation-related mortality surveys, and bald eagle and common loon occupancy and productivity survey The National Audubon Society sponsors annual Christmas bird counts. There are annual breeding bird surveys conducted in the Flathead Subbasin as part of the national surveys coordinated by the USFWS.

Research

MFWP has been conducting a 12-year study of white-tailed deer in coniferous forests of northwestern Montana to develop techniques to determine basic biological and ecological parameters for white-tailed deer and relate those parameters to characteristics of individual habitats and potentially limiting factors.

Specific ongoing monitoring activities led by the Confederated Salish and Kootenai Tribes include:

General CSKT Monitoring Activities

Big Game

- Conduct aerial surveys of elk on one-fourth of the Wildlife Management Units on the Reservation to assess population trends and identify habitat management issues.
- Conduct aerial surveys of elk on the Ferry Basin Wildlife Management Unit to develop harvest strategies for the following year.
- Conduct aerial surveys of moose in appropriate Wildlife Management Units to assess population trends and identify management issues.
- Collect data on off-Reservation moose harvest and evaluate it with Montana Fish, Wildlife &Parks to determine harvest strategies.
- Conduct bighorn sheep aerial surveys on the Camas Wildlife Management Units in cooperation with Montana Fish, Wildlife and Parks to assess population trends, develop harvest strategies and consider other management issues.
- Actively monitor relocated bighorn sheep in the Hog Heaven Wildlife Management to assess the degree of success of the relocation project.
- Record incidental observations of mule deer and white-tailed deer during other aerial surveys to assess population trends and habitat management issues.
- Conduct aerial surveys of Rocky Mountain goats in coordination with Montana Fish, Wildlife &Parks to assess overall population trends and habitat management issues for the Mission Mountains population.
- Develop strategies to manage depredating big game animals on private property and assist the Tribal Fish and Wildlife Conservation Program in response.

Migratory Waterfowl

- Conduct aerial winter survey, in cooperation with the U. S. Fish and Wildlife Service and Montana Fish, Wildlife and Parks.

- Conduct waterfowl brood surveys at selected sites on the Reservation, in cooperation with the U. S. Fish and Wildlife Service.
- Operate two waterfowl hunter harvest check stations on the opening day of waterfowl hunting season to assess harvest trends.
- Capture and band a sample of local ducks as part of a nationwide duck recruitment research project.
- Continue with the reintroduction of trumpeter swans, in cooperation with the Trumpeter Swan Fund and monitor previously released swans.

Upland Gamebirds

- Conduct pheasant crowing surveys along four standardized routes to assess population trends.

Endangered, Threatened, and Sensitive Species

- Conduct standardized aerial surveys of wintering bald eagles to assess population trends.
- Conduct standardized aerial surveys for active bald eagle nests and fledging success to assess recovery and population trends.
- Record incidental observations of northern gray wolves for use in recovery efforts.
- Survey occupied and potential peregrine falcon nesting habitat for nesting activity.
- Survey grizzly bear use of insect concentration areas to assess use of the sites by bears and population trends.
- Conduct remote camera surveys of habitat at selected sites along the Mission Front to assess use by grizzly bears.
- Conduct annual reproductive surveys of common loon reproductive success to assess population trends.

Furbearers and Carnivores

- Conduct standardized remote camera surveys to attempt to develop population trends.
- Conduct standardized track surveys to assess population trends.
- Conduct high elevation aerial surveys to assess population levels.
- Collect hair samples from lynx for genetic and population analyses.

Non-Game Wildlife

- Conduct Breeding Bird Surveys on four standardized routes to assess population trends.
- Conduct capture and marking of Neotropical migrant birds at two sites to assess population trends and recruitment.

- Continue population monitoring of forest and grassland owls and other species, in cooperation with the Owl Research Institute.

Range Management

- Monitor range leases and approved mitigation procedures to determine success.

Kerr-Related Monitoring

Monitoring Habitat Acquisition Parcels and Enhancement Projects

Several methods are used to monitor the success of management efforts at habitat acquisition parcels and of enhancement projects. Efforts vary depending on the size of the project, the extensiveness of the habitat modification, and the level of funding involved. Three types of assessments are made. The first describes changes in vegetation and assess the health of wetland and riparian areas. The second uses physical and vegetation variables to assess the effects of changes on selected wildlife species using Habitat Evaluation Procedures (HEP), as described by Flood et al. (1977), Stiehl (1993) and Schramberger and Farmer, (1978). The third method establishes long-term photo-points of each project area and to obtain aerial photography of project sites.

Vegetation Monitoring and Assessment of Wetland and Riparian Health

Monitoring frequency is tied to documented habitat changes based on a visual evaluation of acquisition parcels. A baseline is established during the first year following acquisition of each parcel. Sites are visited each year and general trends in habitat responses to treatments are noted. If major changes are noted from conditions that were documented from the last monitoring data, another set of monitoring data is collected. It is expected that monitoring will be conducted more frequently during the first five to ten years following acquisitions. After initial responses are documented and changes are occurring more slowly, monitoring frequency is likely be collected only on a five-to-ten-year interval.

All Habitat Areas

- To evaluate changes in the extent of noxious weed species, the percent cover of noxious weed species is estimated under baseline conditions and then reevaluated as needed to determine progress. New infestations of weeds are mapped as they are located.

Riparian Habitat Areas

- To monitor improvements in the functioning of riparian areas to a proper functioning condition, Riparian Health Assessments (Hansen et al. 1995)

to determine baseline conditions are conducted. Areas are reassessed as needed to determine progress following management activities.

- To monitor the extent of riparian areas, delineations of the existing riparian areas are made and compared with historical photos, if available. Areas are re-measured as needed to determine progress toward goals.

- To measure the increase in the percent of deciduous woody species in appropriate riparian areas, the percent cover of deciduous shrub and tree species within riparian areas under baseline conditions is estimated. Areas are re-sampled as needed to determine progress following management activities.

Wetland Habitat Areas

- To monitor improvements in the functioning of wetland areas to a proper functioning condition as described by RWRP 2000, surveys to determine baseline conditions (as described by RWRP 2000) are conducted. Areas are resurveyed as needed to determine progress following management activities. Wetlands are also compared with reference wetlands where possible (eg., Borth 1998). Reference wetlands are wetlands functioning at or near their potential in terms of stability and productivity.

- To monitor the increase in wetland areas wetland acres, baseline acres of wetlands are established using the National Wetlands Inventory and field mapping of acquired parcels. Acres of newly created wetlands are mapped and acreage increases are summarized as they are established.

- To monitor the increase in the coverage of persistent emergent vegetation in appropriate-type wetlands, the coverage of persistent emergent vegetation under a baseline condition is estimated. Areas are re-sampled as needed to determine progress.

Grasslands

- To monitor the increase in nesting cover for ground-nesting birds, Visual Obscurity Readings (Martin et al. 1997) are used to assess nesting cover under baseline conditions. Areas are resurveyed as needed to assess changes.

- On grasslands, the percent cover of plant species under baseline conditions are estimated and re-sampled as needed to assess changes.

- To monitor the restoration of the low-shrub component to grasslands, the percent cover and height of shrubs under baseline communities are estimated and re-sampled as needed to assess changes.

Habitat Evaluation Procedures

Habitat Evaluation Procedures (HEP) are used to evaluate habitat quality of parcels acquired to mitigate the loss of habitats along Flathead Lake and the lower Flathead River. Habitats are evaluated upon acquisition and at periodic intervals to evaluate progress toward reaching the goal of increasing habitat units for species and communities targeted (i.e., wetland and riparian communities). HEP was not used to assess losses of habitat due to the operation of Kerr Dam and, therefore, there is no target level of habitat units to achieve to satisfy mitigation requirements. HEP will only be used to track the improvement of habitat quantity and quality of acquired parcels.

In addition to the habitat measurements, population information is gathered on three of these species at reference sites to help interpret the models. Densities of yellow warblers are assessed by mapping territories of singing males in several reaches of riparian habitats. Population levels of meadow voles are assessed using capture-mark-recapture techniques in several riparian and wetland-grassland-complex sites. Pair counts and brood counts of blue-winged teal are assessed on the Ninepipe-Kicking Horse wetland complex as part of ongoing waterfowl pair and brood counts.

Photographic Record

In addition to the above measures, we maintain long-term photographic records of changes in habitats. Photo-points are established within each parcel and mapped using GPS and measurements to permanent markers. Photos are taken at periodic intervals and catalogued for future comparisons. In addition, aerial photographs are obtained a minimum of every ten years so that changes over time can be mapped. Efforts are made to use landsat TM imagery to classify habitat types and track changes over time. The accuracy and efficiency of this method will be explored to be used over a much more extensive area on the Flathead Indian Reservation.

Special Habitat Enhancement Projects

Monitoring of enhancement projects may contain any or all of the components listed under monitoring of habitat acquisition parcels. Monitoring efforts are determined based on how extensive the enhancement project is, the type of habitats being treated, and the level of involvement of mitigation funds. At a minimum, monitoring photo-points are established for each project and photos taken at

five-year intervals. In addition, aerial photography of all project and enhancement areas are obtained a minimum of once every ten years.

Wildlife Surveys at Reference Sites
Small mammals, breeding birds, nesting waterfowl, and amphibians are surveyed at selected reference sites. Habitat variables are also sampled at these sites. The sites themselves are chosen based upon their similarity to habitats acquired and encompass a range of habitat quality. Key variables from these surveys are then monitored at mitigation sites to help determine the existing condition of the habitat as well as the success of monitoring habitat management efforts. Monitoring includes:

- Fixed radius point counts (Lichtenberg and Powell 1999; Ralph 1993,1995) to monitor breeding bird communities and relative abundance in wetland/grassland complex habitats. A modification of the BBIRD Grassland Vegetation Protocol (Martin et al, 1997) will be used to relate avian use of vegetation within the fixed radius rather than intensive nesting habitat surveys.
- Waterfowl pair counts and brood surveys to monitor waterfowl communities, relative abundance, and productivity.
- Small mammals surveys using assessment transects and more intensive live trapping grids to monitor small mammal communities. Efforts will be coordinated with ongoing research of small mammals on the Flathead Indian Reservation through the University of Montana and the Owl Research Institute.
- Amphibian surveys to determine presence/absence of individual species.

10.3.5. Future Comprehensive RM&E Plan

By July of 2005, a comprehensive RM&E Plan for the Flathead Subbasin will be developed. It will incorporate an adaptive management (AM) process.

10.3.6. Data and information archiving and availability

Data generated from implementation of the Subbasin Plan will be made available, housed, and archived at the various following locations.

For the Confederated Salish and Kootenai Tribes, project-specific fish and wildlife data are housed in reports, databases, and spreadsheets at the CSKT Natural Resources Department Office in Polson, MT.

Montana (MFWP) maintains a series of electronic, web-based databases that make fisheries data from the Montana portion of the Flathead Subbasin available:

1. Montana Fisheries Information System (MFish) contains an interactive database and map showing species distributions and population information:
   http://maps2.nris.state.mt.us/scripts/esrimap.dll?name=MFISH&Cmd=INST

2. The Montana Fishing Guide can be accessed at:
   http://fwp.state.mt.us/fishing/guide/default.aspx

3. Information and listings concerning Species of Species of Special Concern in Montana waters of the Subbasin can be viewed at:
   http://www.fisheries.org/AFSmontana/SSCpages/SSC.htm

4. Fish stocking information in Montana waters of the Subbasin can be accessed at:
   http://fwp.state.mt.us/fishing/stock02.asp

5. Project-specific fish and wildlife data are housed in databases and spreadsheets in MFWP's R-1 Office in Kalispell, MT.

British Columbia

British Columbia (BCMWLAP, UBC, DFO) maintains a series of electronic, web-based databases that make fisheries data from the BC portion of the Flathead Subbasin available.

Data generation and availability

Quantitative and qualitative primary data generated by BPA-funded subbasin projects will have no restrictions on their availability once they are internally reviewed. All project data reside locally, in various electronic formats. Public access to data will be granted in a manner consistent with the reporting requirements of BPA and other funding agencies. Access is also available through public and scientific meetings and publication of peer-reviewed proceedings, papers, and

reports. All project data will be compiled, analyzed, and reported in progress and annual reports to BPA and USFWS peer-reviewed publications, and various symposiums, conferences, and workshops. Information will be used in project management and implementation and shared with others planning to implement conservation culture for declining native species.

10.3.7 Evaluation protocols

Evaluation protocols implemented in the Subbasin

An array of evaluation protocols have been implemented in past fish and wildlife projects. These include:

- Evaluation of stream form and sediment loading
- Evaluations of thermal, CPUE, Vegetative, invertebrate community indices for stream enhancement projects
- Spawning and rearing habitat evaluations
- Movement and habitat use evaluations for focal fish species
- Entrainment evaluation
- Reservoir and mainstem primary, secondary and tertiary productivity levels
- Community dynamics, trophic ecology evaluations
- Water quality evaluations in mainstem, tributary, and reservoir habitat
- Evaluation of genetic variability, diversity, and integrity of focal fish and important wildlife species
- Evaluate parameters of fish and wildlife populations (e.g. growth, survival, condition, relative abundance, density, biomass, age and size structures)
- Limiting factors evaluations
- Hatchery program evaluations

- Habitat protection and improvement evaluations
- Non-native species removal evaluations.
- Evaluation of alternative hydro operations

Adaptive Management and its relevance to Subbasin evaluation protocols.

The following paragraph (Walters 1997) briefly summarizes adaptive management: "Although some peculiar and myopic definitions of adaptive management have appeared in a few settings (see review in Halbert 1993), today we generally use the term to refer to a structured process…that involves much more than simply better ecological monitoring and response to unexpected management impacts. In particular, it has been repeatedly argued (Holling 1978, Walters 1986, Van Winkle et al. 1997) that adaptive management should begin with a concerted effort to integrate existing interdisciplinary experience and scientific information into dynamic models that attempt to make predictions about the impacts of alternative policies. This modeling step is intended to serve three functions: (1) problem clarification and enhanced communication among scientists, managers, and other stakeholders; (2) policy screening to eliminate options that are most likely incapable of doing much good, because of inadequate scale or type of impact; and (3) identification of key knowledge gaps that make model predictions suspect."

Although simulations can help guide large empirical experiments and ultimately the direction of management programs: (1) many simulation models are not routinely validated, and (2) it is usually the empirical ecological experiments themselves, guided by simulations, that provide the valuable feedback, empirical treatment effect data, upon which courses of future management action can be charted (P. Anders, S. P. Cramer and Associates, pers. comm.).

Walters (1997) continues: "Most often, knowledge gaps involve biophysical processes and relationships that have defied traditional methods of scientific investigation for various reasons, and most often it becomes apparent, in the modeling process, that the quickest, most effective way to fill the gaps would be through focused, large-scale management experiments that directly reveal process impacts at the space-time scales where future management will actually occur. Thus, the design of management experiments then becomes a key second step in the process of adaptive management, and a whole new set of management issues arises about how to deal with the costs and risks of large-scale

experimentation (Walters and Green 1996). Indeed, AEAM modeling so regularly leads to recommendations for management experiments that practitioners like myself and colleagues at the University of British Columbia have come to use the terms "adaptive management" and "experimental management" as synonymous. In short, the modeling step in adaptive-management planning allows us, at least in principle, to replace management learning by trial and error (an evolutionary process) with learning by careful tests (a process of directed selection)".

Recommendations for habitat and biological objectives and RM&E activities will be generated, prioritized, and evaluated by agency personnel and others in the Subbasin.

Resulting future fish and wildlife project proposals and the iterative Adaptive Management process will generate additional evaluation protocols that will be incorporated into the Subbasin Plan.

10.4 Consistency with ESA and CWA requirements

The Flathead River Subbasin Assessment includes a description of the status of subbasin water quality conditions and status, trends, and threats to listed species. Individual focal species assessments further describe threats and limiting factors faced by focal species in the Subbasin, as well as those listed under the Endangered Species Act (ESA).

Table 10.3 shows how the Subbasin habitat and biological objectives are reflective of and integrated with recovery goals of ESA recovery plans and where they are supportive of and consistent with the federal Clean Water Act (CWA). The majority of subbasin habitat and biological objectives directly support goals and objectives in relevant ESA recovery plans and involve activities that help satisfy CWA objectives in the Subbasin. More detailed information on how subbasin habitat and biological objectives are linked to ESA recovery plans can be found in focal species assessments and in individual objectives and strategies tables for bull trout and white sturgeon.

10.5 Prioritization of Strategies (Measures/ Projects) in the Flathead Subbasin

Background

As part of the subbasin planning process, planners were asked by Bonneville Power Administration and the Northwest Power Planning and Conservation

Table 10.3. Priority, code, and description of habitat and biological objectives, BPA funded projects that address these objectives, and whether they address ESA and CWA responsibilities. Objectives titles were shortened for inclusion in this table; objecitve codes, full objective titles and supporting strategies can be found in the objectives and strategies tables.

Priority Score (U,H,R)	Objective Number	Prioritized Flathead River Subbasin Objectives (Habitat and Biological)	199101901	199101903	199101904	199608701	200200300	Addresses ESA	Addresses CWA
U	M3,RW1, RW3	Bring Hungry Horse Dam operations 50% closer to normative conditions	X	X		X		X	X
U	T6, GS1, RW2	Protect Class 1 habitat	X	X		X	X	X	X
U	BT2, WCT2, WCT4	Achieve population goals in terms of abundance and distribution	X	X				X	
U	WCT4	Remove non-native species or introgressed populations and repopulate with compatible, genetically pure westslope cutthroat trout.	X	X				X	
U	BT1, WCT1	Maintain or increase number of genetically pure local populations	X	X				X	
U	BT3	Achieve population trend that is accepted, under contemporary standards of the time, as stable or increasing	X	X		X	X	X	
U	BT4, WCT3, GS3, MF4, RW6	Prevent further expansion, suppress and where possible remove non-native species	X	X			X	X	
H	M2, T3, R3	Improve/Restore habitat diversity	X	X		X		X	X
H	M1,T1	Improve/Restore riparian habitat condition	X	X		X	X	X	X
H	M4,T4	Reduce delivery of fine sediments	X	X		X	X	X	X
H	T2	Improve channel stability to a level equivalent to the channel stability habitat restoration score of reference streams	X	X		X	X	X	X
H	T5	Restore passage to migratory fish by removing potential man-caused barriers	X	X		X	X	X	
H	L1,R1	Restore shoreline conditions to a level equivalent to the shoreline condition habitat restoration score of reference lakes	X	X		X	X	X	X
H	L2	Reduce pollutants to a level equivalent to the pollution habitat restoration score of reference lakes.	X	X		X	X	X	X
H	R1	Revegetate top ten fee of varial zone substrate	X	X				X	X
H	R2	Reduce reservoir drawdown and reduce frequency of HHR refill failure to within 5 feet of full pool as compared to historic operation.	X	X		X			X
H	R2	Implement Article 63(1) of the Kerr Project license		X				X	X
H	R4	Increase seasonal or in-seasonal reservoir retention time by 5 days relative to past operations in similar water years.		X		X			
H	HAR1	Harvest Objective	X	X	X			X	

BPA Projects (click for more information)

1. *Project Number 199101903:* Hungry Horse Mitigation
http://www.cbfwa.org/cfsite/ResultProposal.cfm?PPID=MC2002199101903

2. *Project Number 199101904:* Stocking of offsite waters for Hungry Horse Mitigation
http://www.cbfwa.org/cfsite/ResultProposal.cfm?PPID=MC2002199101904

3. *Project Number 199101901:* Research, Monitor, and Restore Native Species
http://www.cbfwa.org/cfsite/ResultProposal.cfm?PPID=MC2002000024019

4. *Project Number 200204200:* Riparian Habitat Protection — Weaver Slough and McWinegar Slough
http://www.cbfwa.org/cfsite/ResultProposal.cfm?PPID=MC2002000024012

5. *Project Number 200200300:* Secure and Restore Critical Habitats
http://www.cbfwa.org/cfsite/ResultProposal.cfm?PPID=MC2002000024018

Council to present an approach for prioritizing management strategies to assist the Council in making recommendations for specific projects for BPA funding.

Flathead Subbasin planners recognize that achieving the objectives in the subbasin plan is not the sole responsibility of the Bonneville Power Administration (as guided by the Northwest Power Act and the Council's 2000 Fish and Wildlife Program). Complementary action by other governmental agencies and funding sources, including Canadian entities where appropriate, and citizens of the Northwest, will be needed to fully achieve all of the objectives. Consequently, projects proposed for BPA funding through the NWPCC Fish and Wildlife Program must meet all of the prioritization criteria to be considered further.

Tier I (Coarse-scale) Prioritization Criteria

The following criteria are designed to ensure that all proposed projects and measures address BPA's responsibilities under the Northwest Power Act).

1. The project protects, mitigates, or enhances fish and wildlife affected by hydropower development within the Columbia Basin (Section 4(h)(5).

2. The project complements the activities of federal, state, and Tribal fish and wildlife managers (Section 4(h)(6)(A) and is consistent with the objectives and strategies in the Flathead Subbasin Plan.

3. The project is based on and supported by the best available scientific knowledge 4(h)(6)(B).

4. The project is consistent with the legal rights of Indian Tribes 4(h)(6)(D)

After applying Tier 1 criteria, the highest priority projects will be ongoing projects that address urgent and high priority objectives in the Flathead Subbasin Plan, consistent with the biological objectives in the Council's 2000 Fish and Wildlife Program (Resident Fish Losses, Substitution for Anadromous Fish Losses, and Wildlife Losses).

Tier II Prioritization Criteria

If all Tier 1 criteria are met, Subbasin Planners will use the following prioritization criteria to guide BPA funding in the Flathead Subbasin:

1. Projects that provide long-term protection will be given a higher priority than projects that provide shorter-term protection, all other factors being equal.

2. Terrestrial projects that also provide benefit for aquatic focal species (and vice versa) will be considered a higher priority than strategies that only benefit terrestrial or aquatic species or habitats separately.

3. Projects that increase the survival and reproductive success of fish and wildlife species native to the project area will be given a higher priority. Special consideration will be given to projects that benefit fish and wildlife species in depleted or special conservation status, including ESA.

4. Projects that increase the area of productive habitat accessible or utilized by native fish and wildlife species present in the project area will be given a higher priority, as will projects that provide benefits to multiple species or that have other beneficial watershed productivity implications.

5. Projects that are measures identified in specific fish and wildlife management, conservation, or recovery plans will be given a higher priority.

6. Proposed projects with techniques and methodologies that have a high degree of likelihood of achieving proposed results under the full range of normally experienced operating conditions will be given a higher priority.

Projects that demonstrate cost effectiveness in achieving project purposes (relative to similar projects and alternative means of achieving the same proposed result) will be given a higher priority.

7. Projects that provide additional opportunities for biological benefits will be given a higher priority.

8. Projects that make maximum effective use of program funds by involving other non-federal funding sources in the proposed project and funding from all sources in related restoration activities will be given a higher priority. Project proposals that demonstrate thorough project coordination with appropriate federal, tribal, state, local, and private entities including local landowners will be given a higher priority.

9. Projects that can be completed and yield proposed benefits in a timely manner will be given a higher priority.

LINKS

References for the Management Plan are included in the references section of the Assessment; go to:

Click Here

10.6 References

To avoid redundancy and reduce the overall size of the plan, references for the Management Plan are included in the references section of the Flathead Subbasin Assessment (see links column).