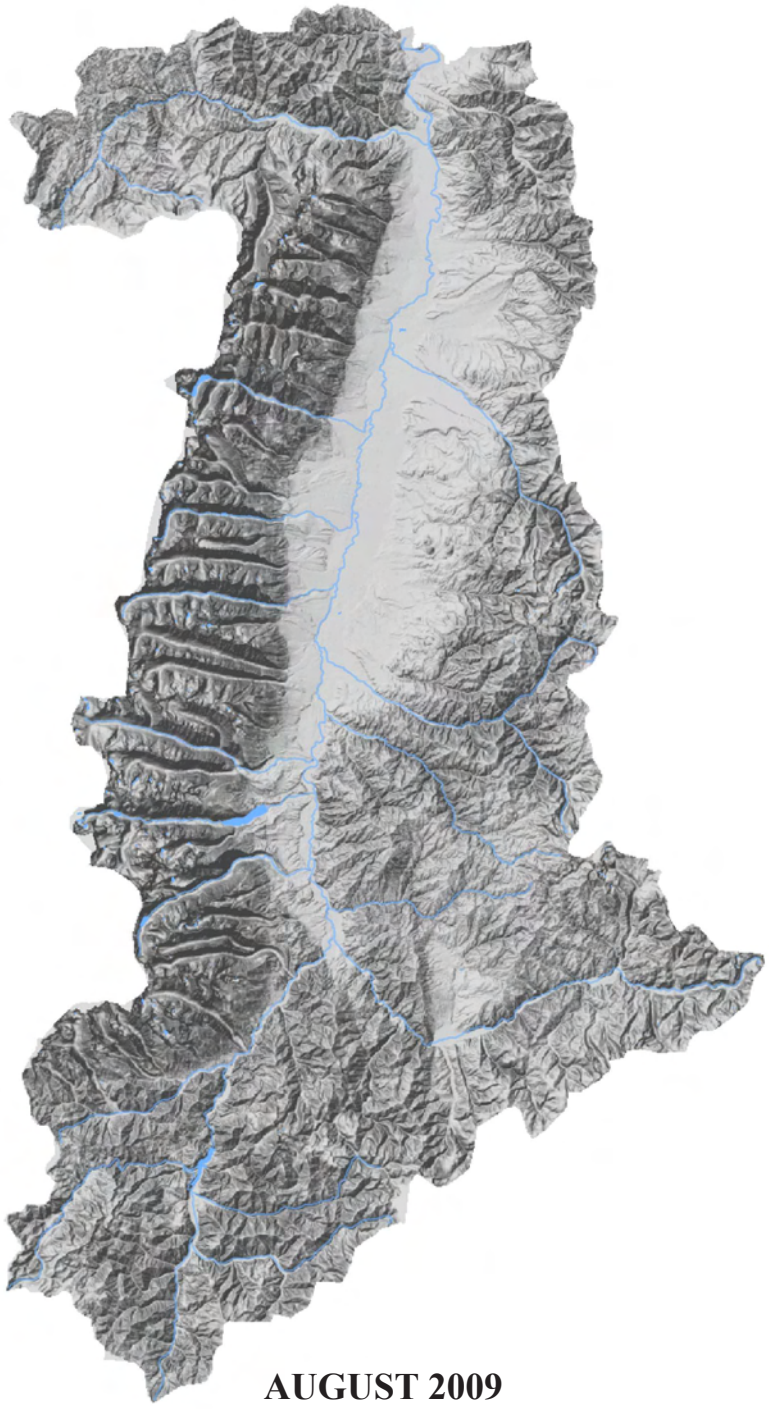
BITTERROOT RIVER SUBBASIN MANAGEMENT PLAN FOR FISH AND WILDLIFE CONSERVATION



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A number of agencies, groups, and entities participated in the development of this Bitterroot River 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 Planning 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 Bitterroot River 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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Table of Contents

Table of Tables

Chapter 3

Chapter 5

Table of Figures

Chapter 3

Chapter 5

Chapter 1 Introduction

This Management Plan is the third component of the Bitterroot Subbasin Plan. The first component, the Assessment, forms the scientific and technical foundation of the Subbasin Plan by identifying conservation species and habitats and the limiting factors impeding biological performance of fish and wildlife populations. The second component, the Inventory, contains a summary of existing plans and protections and a matrix of restoration projects over the past 10 years.

The Management Plan describes a vision and guiding principles for the subbasin, identifies objectives for addressing limiting factors to focal species and habitats, and sets forth strategies to achieve objectives. It also outlines a research, monitoring, and evaluation program based on an adaptive management framework. Its goal is to protect, mitigate, and enhance aquatic and terrestrial habitats and focal and target species populations over the next 10 to 15 years.

Many of the strategies presented here are interrelated, and often they apply to multiple objectives; therefore, the successful implementation of one strategy will help to ensure the success of others, furthering the overall goal of protecting and enhancing species populations and habitats. In addition to the biological focus, the objectives and strategies also have important social, political, and economic implications. Implementing the strategies to achieve biological and habitat objectives will require the cooperation of a wide range of stakeholders, including managers, private landowners and local communities.

Multiple agencies and entities at the federal, tribal, state, and local levels are responsible for managing and protecting fish and wildlife populations and their natural habitats. Numerous conservation groups and citizen coalitions are involved in preserving and protecting natural resources, including fish and wildlife. This document is a working fish and wildlife management plan. The hope is that it will serve to integrate and guide the direction and activities of agencies, departments, and organizations, helping to ensure they work in a coordinated and effective fashion.

Chapter 2 Vision and Scientific Guiding Principles

2.1 Overall Vision for Northwest Power and Conservation Council (NWPCC) Fish and Wildlife Program

The vision for the NWPCC 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 (NWPCC 2009). 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, the vision will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. Where this is not feasible,

other methods that are compatible with naturally reproducing fish and wildlife populations will be used, including certain forms of artificial production. Where impacts have irrevocably changed the ecosystem, the Program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem. Actions taken under this Program must be cost-effective and consistent with an adequate, efficient, economical, and reliable electrical power supply.

The development and operation of the hydrosystem is not the only human cause of adverse effects to fish and wildlife in the Columbia River Basin. However, improving conditions for fish and wildlife affected by the hydrosystem is a responsibility that the Council and its Program shares with citizens, private entities, and government agencies throughout the region.

2.2 Vision for the Bitterroot Subbasin

The vision is a statement of the intended outcome that would result from implementing the subbasin plan. Actions taken at the subbasin level should be consistent with and designed to fulfill the vision, and thus the vision guides the development of biological objectives and the selection of strategies.

> *The vision for the Bitterroot Subbasin is a healthy, productive watershed sustaining abundant and diverse fish and wildlife communities and providing social, cultural, and economic well-being for present and future generations of people. It is a subbasin that effectively employs an inclusive, consensus-based approach to conservation and restoration in order to protect fish and wildlife and their habitats, consistent with the customs and quality of life valued by the communities within the subbasin.*

2.3 Scientific Foundation and Principles of the NWPCC Fish and Wildlife Program

This section describes the scientific foundation for the NWPCC Fish and Wildlife Program (Program) and is summarized from NWPCC (2009). The scientific foundation reflects the best available scientific knowledge, and the scientific principles summarize this knowledge at a broad level. The action taken at the basin, province, and subbasin levels to fulfill the vision should be consistent with and based upon these principles.

2.3.1 Purpose of the Scientific Foundation

While the vision is a policy choice about what the Program should accomplish, the scientific foundation describes our best understanding of the biological realities that will govern how the vision is accomplished. The scientific foundation is not only the basis for the working hypotheses that underlie the Program but also provides specific guidance for Program measures.

2.3.2 Scientific Principles

In addressing the needs of Columbia River basin fish and wildlife, the NWPCC recognizes the need for prompt action to arrest declines in many populations despite a limited or conflicting scientific basis. Congress specifically addressed this challenge by directing the NWPCC, in the Northwest Power Act, to use the best *available* scientific information and not to await scientific certainty prior to acting. The NWPCC remains committed to using adaptive management as one tool to continually improve the Program's scientific foundation.

As part of the scientific foundation, the Program recognizes eight principles of general application. The scientific principles are grounded in established scientific literature to provide a stable foundation for the Program. Although scientific knowledge will improve over time, modification of the principles should occur only after due scientific deliberation. The NWPCC charges the Independent Scientific Advisory Board with the primary role in reviewing and recommending modifications to the scientific principles. All actions taken to implement this Program must be consistent with the following 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 necessary 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 scales of space and time. Higher-level ecological patterns and processes constrain, and in turn reflect, localized patterns and processes. No single, intrinsically correct description of an ecosystem exists, 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 nonlocal 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 role 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 ecosystem conditions. Our 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.

2.4 Guiding Principles for the Bitterroot Subbasin

The Bitterroot Subbasin Plan was developed with seven principles in mind to help guide implementation of subbasin objectives and strategies:

Principle 1: Protect, enhance, and restore habitats in a way that will sustain and recover native aquatic and terrestrial species with emphasis on recovery of Federally listed threatened and endangered species and State of Montana Species of Concern.

Principle 2: Emphasize the long-term protection of habitats that play a key role in maintaining biodiversity.

Principle 3: Emphasize the protection and restoration of habitats that benefit both aquatic and terrestrial species.

Principle 4: Improve water quality throughout the subbasin.

Principle 5: Protect open space, incorporating both social concerns and biological conservation concerns.

Principle 6: Sustain agriculture, forestry, and other natural resource-based economies in concert with native aquatic and terrestrial species, and encourage new industries that contribute to clean air and water.

Principle 7: Promote local decision-making through a voluntary, non-regulatory approach that contributes to natural-resource problem solving through cooperative, subbasin-wide conservation efforts.

Chapter 3 Objectives and Strategies

3.1 Fish and Wildlife Program Basin-level Biological Objectives

This section describes the biological objectives developed by the NWPCC for the Columbia River basin and is summarized from NWPCC (2009). These objectives describe the physical and biological changes needed to achieve the basin-wide vision. They are useful for determining the amount of basin-wide change needed to fulfill the vision, determining the cost-effectiveness of various basin-wide strategies and assessing overall Program effectiveness.

Biological objectives have two components: (1) biological performance, which describes population responses to habitat conditions (in terms of capacity, abundance, productivity, and life-history diversity); and (2) environmental characteristics, which describe the environmental conditions necessary to achieve desired population characteristics.

3.1.1 Objectives for Biological Performance

The NWPCC recognizes that significant losses of fish, wildlife, and their habitats have occurred due to the development and operation of the Columbia River basin hydropower system. Consistent with the Northwest Power Act, these losses establish the basis for population objectives.

Resident Fish Losses

The development and operation of the hydrosystem has resulted in losses of native resident fish and resident fish diversity for species such as bull trout, cutthroat trout, kokanee, white sturgeon, and other species. The following objectives address resident fish losses:

- Complete the assessments of resident fish losses resulting from the development and operation of the hydrosystem, when and where there is agreement on the appropriate methodology and prioritization of an assessment. As these are available, the NWPCC will consider adopting the loss assessments into the Program.
- Maintain and restore healthy ecosystems and watersheds that preserve functional links among ecosystem elements to ensure the continued persistence, health, and diversity of all species including game fish species, non-game fish species, and other organisms.
- Protect and expand habitat and ecosystem functions in order to increase the abundance, productivity, and life-history diversity of resident fish at least to the extent that resident fish have been affected by the development and operation of the hydrosystem.
- Achieve, within 100 years, population characteristics of resident fish species that represent on average full mitigation for losses of resident fish.

Wildlife Losses

Development and operation of the hydrosystem resulted in wildlife losses through construction of dams and inundation of habitat, direct operational losses, and secondary losses. The Program includes measures and implements projects to acquire and protect habitat units as mitigation for construction and inundation losses. The Program maintains a commitment to mitigate for operational and secondary losses that have not been estimated or addressed. The following objectives address wildlife losses more specifically:

- Complete mitigation to address the assessed losses caused by construction of the hydrosystem facilities and the resulting inundation of land. Where appropriate prioritization exists and agreements exist on the methodology, complete wildlife loss assessments for losses caused by operation of the hydropower projects.
- Develop and implement habitat acquisition and enhancement projects to fully mitigate for identified losses.
- Coordinate habitat restoration and acquisition activities throughout the basin with fish mitigation and restoration efforts to promote terrestrial and aquatic area connectivity.
- Maintain the values and characteristics of existing, restored and created habitat.
- Monitor and evaluate habitat and species responses to mitigation actions.

3.1.2 Objectives for Environmental Characteristics

Basin-level environmental characteristics describe the kinds of environmental changes needed across the Columbia River Basin to achieve the basin-wide biological performance objectives. The following objectives address environmental characteristics:

- Identify and protect habitat areas and ecological functions that are relatively productive for spawning, resting, rearing, and migrating salmon and steelhead in the mainstem. Restore and enhance habitat areas that connect to productive areas to support expansion of productive populations and to connect weaker and stronger populations so as to restore more natural population structures.
- Protect, enhance, restore, and connect freshwater habitat in the mainstem and tributaries for the life history stages of naturally spawning anadromous and resident salmonids.
- Protect and enhance ecological connectivity between aquatic areas, riparian zones, floodplains, and uplands. Enhance the connections between rivers and their floodplains, side channels, and riparian zones.
- Manage mainstem riparian areas to protect aquatic conditions and form a transition to floodplain terrestrial areas and side channels.
- Identify, protect, enhance, and restore the functions of alluvial river reaches. Where feasible, reconnect protected and enhanced tributary habitats to protected and enhanced habitats, especially in areas with productive populations.
- Allow for biological diversity to increase among and within populations and species to increase ecological resilience to environmental variability.
- Expand the complexity and range of habitats to allow for greater life history and species diversity.
- Manage human activities to minimize artificial selection or the loss of life history traits.
- Where feasible, support patterns of water flow that more closely approximate natural hydrographic patterns in terms of quantity, quality, and fluctuation. Ensure that any changes in water management are premised upon and proportionate to scientifically demonstrated fish and wildlife benefits.
- Frame habitat restoration in the context of measured trends in water quantity and quality.
- Allow for seasonal fluctuations in flow. Reduce large and rapid short-term fluctuations.
- Decrease the disparity between water temperatures and the naturally occurring regimes of temperatures throughout the basin. To the extent possible, use stored water to manage water temperatures downstream from storage reservoirs where temperature benefits from releases can

be shown to provide improved fish survival.

- Identify, protect, enhance, restore, and connect ecosystem functions in the Columbia River estuary and near-shore ocean discharge plume as affected by actions within the Columbia River mainstem. Evaluate flow regulation and changes to estuary-area habitat and biological diversity to better understand the relationship between estuary ecology and near-shore plume characteristics and the productivity, abundance, and diversity of salmon and steelhead populations.

3.2 Subbasin-level Aquatic Objectives and Strategies

The Aquatic Technical Subcommittee, made up of biologists, hydrologists, researchers and land managers working in the subbasin (see Appendix 12), developed the aquatic objectives and strategies in response to the vision for the subbasin, the current biological and ecological conditions, and the economic and social realities described in the Assessment.

The biological objectives for aquatic focal species describe the social and biological changes within the subbasin needed to achieve the vision. The Assessment defines the focal species and the limiting factors for each habitat. The subcommittee refined the limiting factors analysis to a list of key factors affecting each focal species and aquatic habitat and then developed objectives and associated strategies for each.

3.2.1 Aquatic Objectives and Strategies

Table 3.1 describes the biological objectives developed by the Aquatic Technical Subcommittee. Objectives were designed to mitigate aquatic limiting factors identified for focal species in the Assessment. They developed objectives for each focal species and for categories of habitat, including the mainstem Bitterroot River and tributary streams. They developed the objectives for reaches of tributaries on public land separately from those on private land because of the contrast in habitat conditions and management objectives that directly influence the type of strategies needed to address limiting factors in those areas.

Table 3.1. Bitterroot Subbasin aquatic management objectives.

Objective ID	Objective
Biological	
BULL TROUT	
BT1	Maintain or increase the number of fish in resident bull trout populations and increase the number of migratory fish.
BT2	Where possible, reduce further expansion or suppress non-native species that have been determined to be a significant threat to bull trout.
BT3	Achieve an overall bull trout population trend that is accepted to be stable or increasing based on at least 10 years of monitoring data.
BT4	Evaluate needs and opportunities to increase populations of bull trout throughout the subbasin by 2015.
WESTSLOPE CUTTHROAT TROUT	
WCT1	Maintain or increase the total number of genetically pure local populations and maintain the broad distribution of local populations.
WCT2	Maintain or increase the number of fish in the migratory population.
WCT3	Where possible, reduce further expansion, suppress, or eradicate species that hybridize and directly compete with westslope cutthroat trout.
WCT4	Evaluate needs and opportunities to increase populations of westslope cutthroat trout throughout the subbasin by 2015.
Habitat	
MAINSTEM	
M1	Provide stream temperature connectivity in the form of cold water refugia from tributaries to support movement of focal species.
TRIBUTARIES	
Tributary (Public)	
T1	Reduce the delivery of human-caused fine sediments to the maximum extent possible.
T2	Maintain existing levels of prime, functioning tributary habitat.
Tributary (Private)	
TP1	Restore stream flows to levels that will support focal species survival.
TP2	Restore habitat diversity to support sustainable population levels of focal species.

Tables 3.2 through 3.15 describe the aquatic management strategies developed to achieve biological objectives. Several different strategies were selected to meet each biological objective.

Table 3.2. Bitterroot subbasin aquatic management strategies that apply to all aquatic objectives.

ALL AQUATIC OBJECTIVES **Limiting Factors: N/A**
Strategy 1: Coordinate subbasin activities with appropriate agencies and organizations.
Strategy 2: Develop a local stakeholder group to identify and plan site-specific projects and direct BPA funding to projects on the ground.
Strategy 3: Develop decision pathways or other prioritization strategies to support stakeholder group's decision making.
Strategy 4: Create a citizen group to facilitate land-owner awareness of subbasin planning efforts and provide outreach to land owners in the priority 'Active Restoration' subwatersheds.
Strategy 5: Develop and implement educational programs based on subbasin planning efforts.

Table 3.3. Aquatic management strategies to achieve (bull trout) Objective BT1.

OBJECTIVE BT1: Maintain or increase the number of fish in resident bull trout populations and increase the number of migratory fish. Limiting Factors: Growth & Survival, Isolation	
Strategy 1: Remove barriers interfering with bull trout migration or that restrict the use of suitable habitat.	
1a	Identify barriers to bull trout passage and implement actions to provide passage.
1b	Remove priority barriers where it is determined to be feasible and cost effective.
1c	Provide passage around known barriers where removal is not feasible.
1d	Consider removal of natural barriers.
1e	Evaluate selective passage at Painted Rocks Reservoir.
Strategy 2: Eliminate entrainment in ditches.	
2a	Identify irrigation ditch entrainment sites impacting bull trout populations.
2b	Screen high priority ditches.
2c	Establish infrastructure for maintaining ditch screens.
2d	Eliminate unneeded diversion ditches.
2e	Install ditch siphons where necessary.
Strategy 3: Minimize unintentional bull trout mortality through regulations, guidelines, and education.	
Strategy 4: Conduct a genetic inventory to understand the genetic baseline and importance of tributary stream sub-populations.	
4a	Incorporate the conservation of genetic attributes into project selection and prioritization matrices.
4b	Coordinate genetic mapping with other subbasins in the Clark Fork River system.
Strategy 5: Implement Habitat Related Objectives M1, T1, T2, TP1 and TP2.	

Table 3.4. Aquatic management strategies to achieve (bull trout) Objective BT2.

OBJECTIVE BT2: Where possible, reduce further expansion or suppress non-native species that have been determined to be a significant threat to bull trout. **Limiting Factors: Growth & Survival, Non-native species**
Strategy 1: Implement education and outreach programs on the effects of non-native fish and aquatic nuisance species to prevent further introductions.
Strategy 2: Evaluate biological, economical, and social effects of control or eradication of nonnative fish. Possible methods of control or eradication include: electrofishing, swamping of high elevation lakes, or the use of piscicides such as antimycin or rotenone.
Strategy 3: Develop a decision pathway for determining appropriateness of non-native fish removal and prioritization of locations.
Strategy 4: Continue to manage non-native fish species for increased harvest.
Strategy 5: Implement research to evaluate species interactions in terms of risks to bull trout populations.

Table 3.5. Aquatic management strategies to achieve (bull trout) Objective BT3.

OBJECTIVE BT3: Achieve an overall bull trout population trend that is accepted to be stable or increasing based on at least 10 years of monitoring data. **Limiting Factors: Growth and Survival, Isolation, and Non-native species**
Strategy 1: Implement strategies for Objectives BT1, BT2, M1, T1, T2, TP1, and TP2.

Table 3.6. Aquatic management strategies to achieve (bull trout) Objective BT4.

OBJECTIVE BT4: Evaluate needs and opportunities to increase populations of bull trout throughout the subbasin by 2015. **Limiting Factors: N/A**
Strategy 1: Implement strategies for Objectives BT1, BT2 and BT3 that involve developing decision pathways for project selection and prioritization.
Strategy 2: Implement subbasin-wide aquatic strategies.
Strategy 3: Implement Research, Monitoring & Evaluation plan.

Table 3.7. Aquatic management strategies to achieve Objective WCT1.

OBJECTIVE WCT1: Maintain or increase the total number of genetically pure local populations and maintain the broad distribution of local populations. **Limiting Factors: Isolation, Non-native species**	
Strategy 1: Conduct sampling to establish the genetic baseline and monitor genetic changes.	
1a	Place preference on strategies that will protect or enhance genetically pure populations.
1b	Evaluate construction of barriers to protect genetically pure populations.
1c	Evaluate non-native species control or eradication.
1d	Integrate genetic baseline data with non-native species to characterize risks to genetically pure populations and incorporate risk threat into a decision-making framework.
Strategy 2: Eliminate entrainment in ditches.	
2a	Identify irrigation ditch entrainment sites that are impacting bull trout populations.
2b	Screen high priority ditches.
2c	Establish infrastructure for maintaining ditch screens.
2d	Eliminate unneeded diversion ditches.
2e	Install ditch siphons where necessary.
Strategy 3: Evaluate potential differences in the effects of introduced fishes on westslope cutthroat trout between subwatersheds.	
Strategy 4: Continue to monitor the effects of existing harvest regulations on westslope cutthroat trout populations.	
Strategy 5: Develop a decision pathway for selecting and prioritizing strategies that incorporate genetic integrity and risk level.	
Strategy 6: Place preference on strategies that will benefit populations with a documented fluvial component. Implement strategies related to Objective WCT2.	
Strategy 7: Implement strategies related to Objective WCT3.	

Table 3.8. Aquatic management strategies to achieve (westslope cutthroat trout) Objective WCT2.

OBJECTIVE WCT2: Maintain or increase the number of fish in the migratory population. **Limiting Factors: Isolation, Non-native species**	
Strategy 1: Continue to monitor fluvial fish movement to prioritize tributaries for restoration and conservation.	
Strategy 2: Remove barriers interfering with westslope cutthroat trout migration or restricting the use of suitable habitat.	
2a	Identify barriers for westslope cutthroat trout passage and implement actions to provide passage.
2b	Remove priority barriers where it has been determined to be feasible and cost effective.
2c	Provide passage around known barriers where removal is not feasible.
2d	Consider removal of natural barriers.
2e	Evaluate selective passage at Painted Rocks Reservoir.
Strategy 3: Implement strategies related to objectives M1, T1, T2, T3, TP1, TP2, and TP3.	
Strategy 4: Include the documented use by fluvial westslope cutthroat trout as priority criteria in decision pathways.	

Table 3.9. Aquatic management strategies to achieve (westslope cutthroat trout) Objective WCT2.

OBJECTIVE WCT3: Where possible, reduce further expansion, suppress, or eradicate species that hybridize and directly compete with westslope cutthroat trout. **Limiting Factors: Non-native species**
Strategy 1: Implement education and outreach programs on the effects of non-native fish and aquatic nuisance species to prevent further introductions.
Strategy 2: Evaluate the biological, economical, and social effects of control or eradication of nonnative fish. Possible methods of control or eradication include: electrofishing, swamping of high elevation lakes with genetically pure stock, or the use of piscicides such as antimycin or rotenone.
Strategy 3: Develop a decision pathway for determining appropriateness of non-native fish removal and prioritization of locations.
Strategy 4: Continue to manage non-native fish species for increased harvest.
Strategy 5: Implement research to evaluate species interactions in terms of risks to westslope cutthroat trout populations.

Table 3.10. Aquatic management strategies to achieve (westslope cutthroat trout) Objective WCT4.

OBJECTIVE WCT4: Evaluate needs and opportunities to increase populations of westslope cutthroat trout throughout the subbasin by 2015. **Limiting Factors: N/A**
Strategy 1: Implement strategies for Objectives WCT1, WCT2 and WCT3 that involve developing decision pathways for project selection and prioritization.
Strategy 2: Implement subbasin-wide aquatic strategies.
Strategy 3: Implement Research, Monitoring & Evaluation plan.

Table 3.11. Aquatic management strategies to achieve (mainstem) Objective M1.

OBJECTIVE M1: Provide stream temperature connectivity in the form of cold water refugia from tributaries to support movement of focal species. **Limiting Factors: Temperature**	
Strategy 1: Implement strategies for Objectives T3, TP1, and TP2.	
Strategy 2: Develop a temperature model and map for the mainstem Bitterroot River and major tributary streams to identify limiting areas.	
Strategy 3: Continue to manage releases from Painted Rocks reservoir for late season flows.	
Strategy 4: Pursue more efficient water uses from mainstem irrigation diversions.	
4a	Coordinate with water users to develop specific goals and projects.
Strategy 5: Identify floodplain and riparian restoration and enhancement opportunities along the mainstem river.	
5a	Develop integrated floodplain map showing protected areas, classification of human impacts, wetland mapping, and other resource values related to mainstem river habitat to aid in project planning and prioritization.
5b	Pursue floodplain conservation easements.
5c	Implement floodplain wetland creation and enhancement and riparian revegetation restoration projects.
5d	Work with landowners to improve grazing practices.
53	Develop and implement riparian and floodplain BMP outreach.

Table 3.12. Aquatic management strategies to achieve (public-lands tributaries) Objective T1.

OBJECTIVE T1: Reduce the delivery of human-caused fine sediments to the maximum extent possible. **Limiting Factors: Habitat Integrity**	
Strategy 1: Where a final TMDL is in place, implement associated restoration strategies.	
Strategy 2: Identify, prioritize and upgrade problem roads.	
2a	Place a priority on road decommissioning.
2b	Ensure the application of BMPs during road maintenance.
Strategy 3: Identify, prioritize, and address general sediment sources, including eroding streambanks and fire-related sediment sources.	
3a	Implement streambank stabilization measures where necessary with an emphasis on revegetation techniques.
3b	Implement riparian revegetation projects.

Table 3.13. Aquatic management strategies to achieve (public-lands tributaries) Objective T2.

OBJECTIVE T2: Maintain existing levels of prime, functioning tributary habitat. **Limiting Factors: Temperature, Habitat Integrity**
Strategy 1: Ensure that Forest Plan revisions support focal species conservation and restoration.
Strategy 2: Conduct habitat inventories to establish baseline conditions.

Table 3.14 Aquatic management strategies to achieve (private-lands tributaries) Objective TP1.

OBJECTIVE TP1: Restore stream flows to levels that will support focal species survival. **Limiting Factors: Dewatering, Temperature, Habitat Integrity**	
Strategy 1: Conduct assessments, both on the ground and aerially, to identify the extent of tributary dewatering.	
Strategy 2: Develop a decision pathway for determining instream flow conservation prioritization.	
Strategy 3: Improve instream flows in all high priority streams based on criteria included in decision pathway.	
3a	Purchase water rights from willing sellers.
3b	Increase water conservation and irrigation efficiency through conversion of flood irrigation systems to sprinklers and the piping and lining of irrigation ditch systems.

Table 3.15. Aquatic management strategies to achieve (private-lands tributaries) Objective TP2.

OBJECTIVE TP2: Restore habitat diversity to support sustainable population levels of focal species that function naturally. **Limiting Factors: Habitat integrity, dewatering, temperature**	
Strategy 1 Conduct assessments to determine locations of habitat limitations (riparian and instream habitat).	
Strategy 2: Develop decision pathways to assist in project selection and prioritization. Decision pathways should integrate a range of criteria including: focal species population status, feasibility, land owner cooperation, etc.	
Strategy 3: Assess and mitigate nonpoint thermal pollution.	
3a	Assess and attempt to mitigate the effects of thermal increases (unnatural, nonpoint sources) on bull trout and westslope cutthroat trout when those effects negatively impact receiving waters and migratory corridors downstream.
Strategy 4: Enforce water quality standards and implement total maximum daily load programs where in place.	
Strategy 5: Improve grazing practices.	
5a	Reduce negative effects of grazing with improved grazing management.
5b	Install riparian fencing where investigation indicates such actions are likely to benefit native fish, either locally or downstream.
Strategy 6: Protect riparian habitats.	
6a	Where possible, provide long-term habitat protection through land purchase, conservation easements, landowner incentives, management plans, or other means.
Strategy 7: Develop riparian and stream education and outreach programs.	
7a	Create and enhance local education programs that promote voluntary conservation along streams and riparian areas, and provide incentives where possible.
Strategy 8: Promote local government policies to protect riparian areas and streams.	
Strategy 9: Protect and improve stream flows.	
9a	Maintain flows that sustain and promote ecological processes through purchasing and leasing of water rights and water conservation agreements.
Strategy 10: Remove roads. Where possible, remove, recontour, or relocate roads that impact the function of riparian and stream habitat.	
Strategy 11: Implement stream enhancement or restoration.	
11a	Where opportunities exist, work on private lands to improve instream habitat or stream-channel form and function, placing emphasis on integrating multiple disciplines to achieve restoration objectives and landowner needs.

3.2.2 Aquatic Prioritization Approach and Criteria

This section describes the approach the Aquatic Technical Subcommittee used to select priority areas for implementing management strategies. The overall approach was to identify watersheds where focal species (bull trout and westslope cutthroat trout) populations are present and relatively stable and where restoration, conservation, or management actions over the next 10-15 years would most benefit focal species. To do this, the subcommittee developed prioritization criteria based on the following guiding biological population viability principles described in BNF (2006).

1. The larger the population the greater the chance of their persistence through time and disturbance (bigger is better than smaller).
2. Population recovery potential is greater in closer proximity to strong source populations (closer is better than farther).
3. Well connected populations allow for maintenance of biological diversity (genetic exchange), dispersal into unpopulated areas, and resilience to habitat disturbance (connected is better than disjointed).
4. Preserving genetic and phenotypic diversity requires maintaining populations through a wide geographic range in a variety of habitats.
5. Maintenance of strong populations in the best possible habitats throughout the subbasin and preserving metapopulation structure and function are the best ways to minimize risk of extinction.

The subcommittee also chose to adopt the Restoration Strategy Classes used in the U.S. Forest Service's (USFS) Aquatic Multi-Scale Assessment and Planning Framework (BNF 2006, LNF 2006). Table 3.16 describes the three restoration prioritization classes— Conservation, Active Restoration, and Deferred Restoration—and the associated selection criteria. The classes correspond to those used in the class 1-5 system described in Table 8-1 in *Upstream* (National Research Council, 1996) in the following way: 'Conservation' = Class I Waters; 'Active Restoration' = Class 2 Waters and 'Deferred Restoration' = Class 3 waters. Bitterroot Subbasin planners and Aquatic Technical Subcommittee members decided that being consistent with USFS prioritization classes is appropriate because it will result in conservation and restoration actions being integrated with USFS management of focal aquatic species and habitats.

Based on the Aquatic Multi-Scale Assessment and Planning Framework used by the USFS, restoration activities would focus on those subwatersheds designated as Active Restoration over the next 10-15 years and would be prioritized based on the following broad criteria: (1) potential to restore or enhance habitat to conserve existing strong populations of focal species; (2) potential to restore, conserve, or enhance habitat in subwatersheds in close proximity to strong populations of focal species; (3) potential to restore, conserve, or enhance habitat used for spawning by fluvial fish of either focal species, and (4) potential to restore connectivity within and between active restoration subwatersheds. This translates to the following primary criteria used to identify Active Restoration subwatersheds:

- Subwatershed is a bull trout stronghold but habitat improvement opportunities exist (i.e. not a conservation subwatershed), or
- Subwatershed is in close proximity to bull trout stronghold, or
- Subwatershed has documented use by fluvial migratory cutthroat trout.

Subwatersheds in the Active Restoration class are the highest priority areas for implementing the restoration strategies identified in this management plan in the current planning cycle of 10-15 years.

Table 3.16. Bitterroot Subbasin aquatic prioritization categories and criteria applied to 6th-field HUCs.

Prioritization Class	Definition	General Criteria	Specific Criteria
Conservation	Watersheds that are at or very close to Desired Conditions based on ability to support populations of bull trout and westslope cutthroat trout or restoration measures have been implemented to allow trend toward desired conditions over time. All reasonable restoration measures have been implemented to the degree possible.	High quality habitats with little opportunity or need to improve and strong focal species populations (i.e. subwatershed ranks low for most risks and threats).	(1) Bull trout stronghold (population status = '111' or present, strong) **or** (2) Bull trout core area (excluding Bitterroot mainstem) **and** (3) High quality habitat: subwatershed ranks low (1) or moderate (2) for the following threats: dewatering, livestock grazing, temperature, road-related, and watershed integrity. **Note: Due to the wide distribution of westslope cutthroat trout populations, cutthroat population status was not used as defining criteria for conservation watersheds.*
Deferred Restoration	Watersheds that are a low priority for restoration during the current planning period of 10 to 15 years.	(1) Focal species absent or depressed with little potential for reestablishing populations (i.e. subwatershed ranks High or Extreme for extinction risk and high for most risks and threats) or (2) High to moderate quality habitats and populations where restoration activities have been identified but are not a high priority to be implemented.	Not 'Conservation' **and** Not 'Active Restoration'
Active Restoration	Watersheds that are a high priority for aquatic restoration during the next 10 to 15 years. They generally do not meet desired conditions, but have a high potential to move toward desired conditions with appropriate restoration measures.	Restoration actions have the potential to improve overall population status of focal species (i.e. restore connectivity between sub-populations by addressing limiting factors).	Not 'Conservation' **and** Documented use by fluvial Westslope cutthroat trout **or** bull trout stronghold **or** Close proximity to bull trout stronghold or Final TMDL in place

Although many restoration and conservation actions are needed in those watersheds not selected for active restoration, the strategies outlined in this plan are those that must be implemented in the short term (next 10 to 15 years) to maximize the likelihood of survival and long-term persistence of bull trout and westslope cutthroat trout.

Longer-term conservation of focal species will require broader strategies and the implementation of actions in subwatersheds not identified as 'Active Restoration'. For this reason, restoration and conservation will also be pursued opportunistically as it arises in subwatersheds categorized for 'Deferred Restoration' within the 10-15 year time frame. For example, projects will be pursued in 'Deferred Restoration' subwatersheds where a high potential for significant improvements to habitat are present, where streamflow conservation opportunities arise, where conservation or restoration actions will benefit both terrestrial and aquatic species, or where projects are supported by numerous partners. Similarly, opportunities for active restoration also exist in subwatersheds identified as 'Conservation'. Restoration actions in these subwatersheds would also be pursued opportunistically during the current 10-to-15 year time frame addressed by this management plan.

This approach is also consistent with the Montana Bull Trout Recovery Plan, which recommends focusing restoration on protecting and restoring core areas that contain the best remaining spawning and early rearing habitat for bull trout in each restoration/conservation area, maintaining the genetic diversity represented by the remaining local populations, and reestablishing and maintaining historical connectivity within and between areas where and when possible. Because of the importance of core areas to the conservation and restoration of bull trout in Montana, overall restoration will be based on the protection of core areas. Because multiple populations are less likely to go extinct at the same time due to natural events, the viability of bull trout will be greatly enhanced by maintaining multiple populations in multiple restoration/conservation areas. These considerations were used in development of the goal, objectives, and restoration criteria for restoration of bull trout in Montana (MBTRT 2000). Appendix 9 includes restoration strategies included in the Bull Trout Recovery Plan (USFWS 2002) and Montana bull trout restoration Plan (MBTRT 2000).

3.2.3 Aquatic Prioritization Results

Figure 3.1 shows the restoration prioritization designation of subwatersheds in the Bitterroot subbasin. Table 3.17 lists the subwatersheds by restoration class. Table 3.18 provides a summary of how each 'Active Restoration' subwatershed fits into the overall strategy of focal species conservation and recovery. This prioritization framework will serve as a coarse filter for making decisions on where to focus near-term restoration efforts to benefit focal species populations.

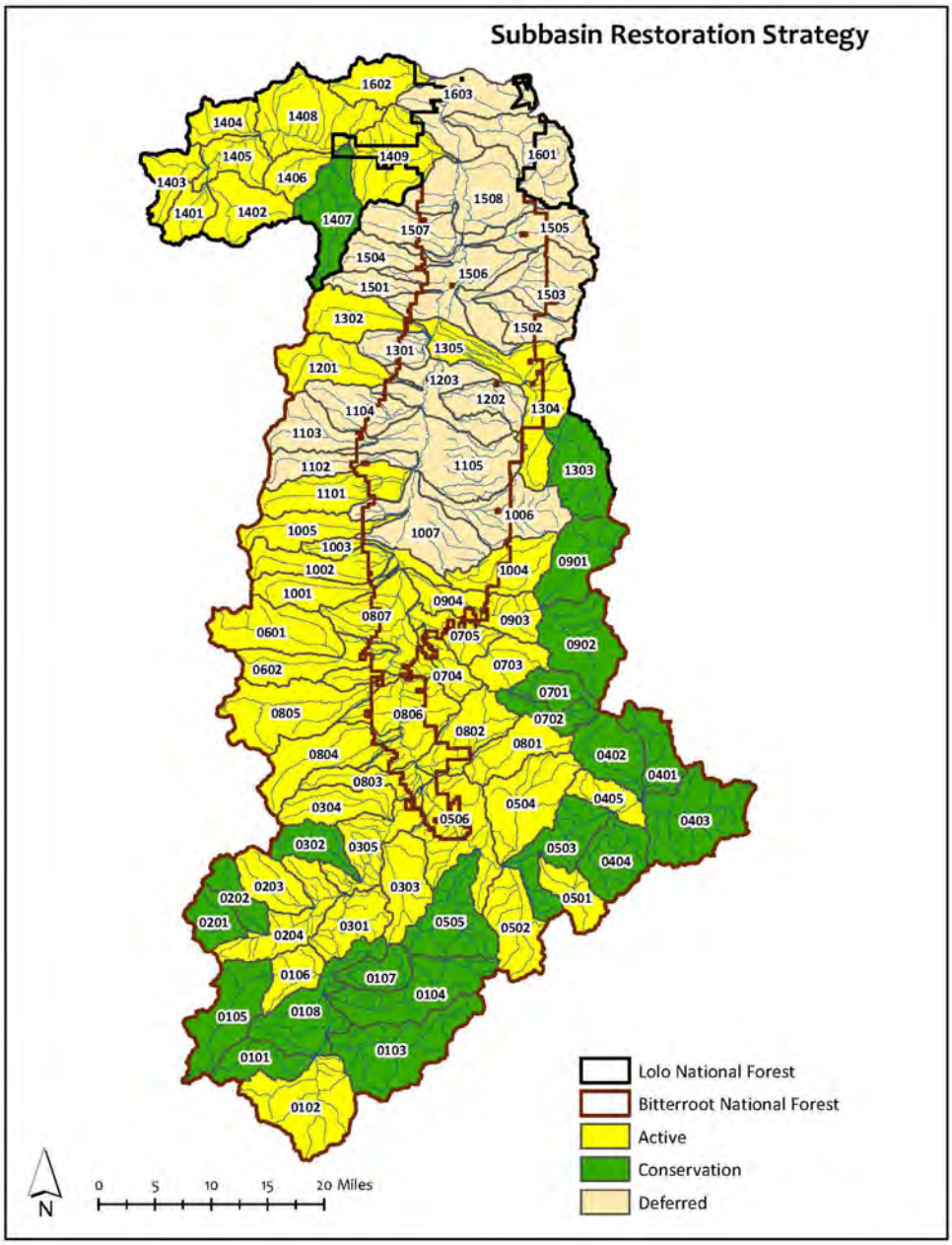

Figure 3.1. Bitterroot Subbasin results of restoration prioritization by 6th-field HUC.

Table 3.17. Tabular display of restoration classes by 6th-field HUC.

6th-field HUC	Last 4 digits of 6th-field HUC	6th-field HUC (Subwatershed) Name	Restoration Class
170102050101	0101	Deer Creek	Conservation
170102050102	0102	West Fork Bitterroot River-Beaver Creek	Active
170102050103	0103	Hughes Creek	Conservation
170102050104	0104	Overwhich Creek	Conservation
170102050105	0105	Upper Blue Joint Creek	Conservation
170102050106	0106	Lower Blue Joint Creek	Active
170102050107	0107	Slate Creek	Conservation
170102050108	0108	West Fork Bitterroot River-Painted Rock Lake	Conservation
170102050201	0201	Sheephead Creek	Conservation
170102050202	0202	Watchtower Creek	Conservation
170102050203	0203	Little West Fork	Active
170102050204	0204	Nez Perce Fork-Nelson Lake	Active
170102050301	0301	West Fork Bitterroot River-Mud Creek	Active
170102050302	0302	Boulder Creek	Conservation
170102050303	0303	Piquette Creek	Active
170102050304	0304	Trapper Creek	Active
170102050305	0305	West Fork Bitterroot River-Lloyd Creek	Active
170102050401	0401	Moose Creek	Conservation
170102050402	0402	Martin Creek	Conservation
170102050403	0403	East Fork Bitterroot River-Clifford Creek	Conservation
170102050404	0404	Meadow Creek	Conservation
170102050405	0405	East Fork Bitterroot River-Bertie Lord Creek	Active
170102050501	0501	Tolan Creek	Active
170102050502	0502	Camp Creek	Active
170102050503	0503	East Fork Bitterroot River-Jennings Camp Creek	Conservation
170102050504	0504	Cameron Creek	Active
170102050505	0505	Warm Springs Creek	Conservation
170102050506	0506	East Fork Bitterroot River-Laird Creek	Active
170102050601	0601	Lost Horse Creek	Active
170102050602	0602	South Lost Horse Creek	Active
170102050701	0701	Divide Creek	Conservation
170102050702	0702	Upper Sleeping Child Creek	Conservation
170102050703	0703	Middle Sleeping Child Creek	Active
170102050704	0704	Little Sleeping Child Creek	Active
170102050705	0705	Lower Sleeping Child Creek	Active
170102050801	0801	Upper Rye Creek	Active
170102050802	0802	Lower Rye Creek	Active
170102050803	0803	Bitterroot River-Chaffin Creek	Active

6th-field HUC	Last 4 digits of 6th-field HUC	6th-field HUC (Subwatershed) Name	Restoration Class
170102050804	0804	Tin Cup Creek	Active
170102050805	0805	Rock Creek	Active
170102050806	0806	Bitterroot River-Darby	Active
170102050807	0807	Bitterroot River-Lick Creek	Active
170102050901	0901	Daly Creek	Conservation
170102050902	0902	Upper Skalkaho Creek	Conservation
170102050903	0903	Middle Skalkaho Creek	Active
170102050904	0904	Lower Skalkaho Creek	Active
170102051001	1001	Roaring Lion Creek	Active
170102051002	1002	Sawtooth Creek	Active
170102051003	1003	Bitterroot River-Canyon Creek	Active
170102051004	1004	Gird Creek	Active
170102051005	1005	Blodgett Creek	Active
170102051006	1006	Willow Creek	Deferred
170102051007	1007	Bitterroot River-Woodside	Deferred
170102051101	1101	Mill Creek	Active
170102051102	1102	Fred Burr Creek	Deferred
170102051103	1103	Sweathouse Creek	Deferred
170102051104	1104	Bear Creek	Deferred
170102051105	1105	Bitterroot River-Birch Creek	Deferred
170102051201	1201	Big Creek	Active
170102051202	1202	Willoughby Creek	Deferred
170102051203	1203	Bitterroot River-Spooner Creek	Deferred
170102051301	1301	McCalla Creek	Deferred
170102051302	1302	Kootenai Creek	Active
170102051303	1303	Upper Burnt Fork Bitterroot River	Conservation
170102051304	1304	Lower Burnt Fork Bitterroot River	Active
170102051305	1305	Burnt Fork Bitterroot River-Stevensville	Active
170102051401	1401	West Fork Lolo Creek	Active
170102051402	1402	East Fork Lolo Creek	Active
170102051403	1403	Granite Creek	Active
170102051404	1404	Howard Creek	Active
170102051405	1405	Upper Lolo Creek	Active
170102051406	1406	West Fork Butte Creek	Active
170102051407	1407	South Fork Lolo Creek	Conservation
170102051408	1408	Lolo Creek-Grave Creek	Active
170102051409	1409	Lower Lolo Creek	Active
170102051501	1501	Bass Creek	Deferred
170102051502	1502	Ambrose Creek	Deferred
170102051503	1503	Threemile Creek	Deferred
170102051504	1504	Sweeney Creek	Deferred

6th-field HUC	Last 4 digits of 6th-field HUC	6th-field HUC (Subwatershed) Name	Restoration Class
170102051505	1505	Eightmile Creek	Deferred
170102051506	1506	Bitterroot River-Larry Creek	Deferred
170102051507	1507	Swan Creek	Deferred
170102051508	1508	Bitterroot River-North Woodchuck Creek	Deferred
170102051601	1601	Miller Creek	Deferred
170102051602	1602	O'Brien Creek	Active
170102051603	1603	Bitterroot River-Hayes Creek	Deferred

Table 3.18. Summary of Active Restoration subwatersheds in the Bitterroot Subbasin and how subwatershed fits into the overall conservation strategy for focal species.

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102051403	Granite Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	WCT4-1,2,3 T1-1,2,3 T2-1,2 TP2-1,2,4,6,7,8,9
170102051404	Howard Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	WCT4-1,2,3 T1-1,2,3 T2-1,2 TP2-1,2,4,6,7,8,9
170102051405	Upper Lolo Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT2-2,3 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050102	West Fork Bitterroot River-Beaver Creek	Active	BT, WCT	Stronghold for both bull trout and westslope cutthroat trout, including presence of fluvial life history forms and spawning and rearing habitat. Conservation and improvements to this population are integral to the overall conservation strategy.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,4,5,6,7 WCT2-1,2,3,4 WCT3-1,2,3,4,5,6 WCT4-1,2,3 M1-1 T1-1,2,3 T2-1,2 TP2-3
170102050106	Lower Blue Joint Creek	Active	BT, WCT	Opportunities for improvements to the upper West Fork strongholds.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,4 WCT2-2 T1-1,2,3 T2-1,2 TP2-3
170102050203	Little West Fork	Active	BT, WCT	Opportunities for improvements to the upper West Fork strongholds.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,4 WCT2-2 T1-1,2,3 T2-1,2 TP2-3

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050204	Nez Perce Fork-Nelson Lake	Active	BT, WCT	Fluvial westslope cutthroat Stronghold and remnant run of fluvial bull trout make this a priority for conservation of and improvements aimed at focal fish species. Also, close proximity to other strongholds.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,4,5,6 WCT2-1,2,3,4 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP2-3
170102050301	West Fork Bitterroot River-Mud Creek	Active	BT, WCT	Opportunities for improvements to the upper West Fork strongholds.	BT1-1,3,5 BT3-1 BT4-1,2,3 WCT1- WCT2-2 T1-1,2,3 T2-1,3 TP2-3
170102050303	Piquette Creek	Active	BT, WCT	One of only four larger spawning and rearing tributaries to the Lower West Fork. Restoration actions in this watershed are essential and should focus on riparian and instream habitat improvements, sediment reduction and elimination of barriers.	BT1-1,3,5 BT3-1 BT4-1,2,3 WCT2-2 T1-1,2,3 T2-1,2 TP2-1,2,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050304	Trapper Creek	Active	BT, WCT	Close proximity to strongholds, including upper West Fork and Nez Perce Fork. Restoration actions should focus on riparian and instream habitat improvements, sediment reduction, and elimination of barriers.	BT1-1,3,5 BT3-1 BT4-1,2,3 WCT2-2 T1-1,2,3 T2-1,2 TP2-1,2,6,7,8,9,11
170102050305	West Fork Bitterroot River-Lloyd Creek	Active	BT, WCT	Close proximity to strongholds including upper West Fork and Nez Perce Fork. Restoration actions should focus on riparian and habitat improvements, sediment reduction, and elimination of barriers.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT2-2 T1-1,2,3 T2-1,2 TP2-1,2,6,7,8,9,11
170102050405	East Fork Bitterroot River-Bertie Lord Creek	Active	BT, WCT	Important migratory corridor for fluvial bull trout and westslope cutthroat trout. Fish move between over-wintering habitat in the mainstem Bitterroot and spawning and rearing habitat in the upper East Fork. Restoration actions should focus on reducing riparian impacts from the East Fork Highway and associated developments.	BT1-5 T1-2,3 T2-1,2 TP2-1,2,3,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050501	Tolan Creek	Active	BT, WCT	Strong population of bull trout with potential for improvements that could improve numbers of fluvial fish in the East Fork population.	BT1-2,5 WCT1-2 WCT2-1,2,3,4 T1-2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,5,6,7,8,9,10,11
170102050502	Camp Creek	Active	BT, WCT	Remnant and imperiled bull trout population but healthier neighboring populations (such as Tolan, Meadow, and Warm Springs) provide potential to improve or recover bull trout in this subwatershed and East Fork.	BT1-5 T1-2,3 TP2-1,2,3,5,6,7,8,9,10,11,
170102050504	Cameron Creek	Active	WCT	Widely distributed population of westslope cutthroat trout with potential for habitat improvements that could improve numbers of fluvial fish in the East Fork population. No bull trout permanently reside in the Cameron drainage. An incidental fluvial bull trout has been shown to enter the lower mile of Cameron Creek to hold and feed for short periods of time (several weeks) during their upstream spawning migration in the East Fork.	WCT2-1,2,3,4 WCT4-1,2,3 T1-2,3 T2-1,2 TP2-1,2,3,5,6,7,8,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050506	East Fork Bitterroot River-Laird Creek	Active	BT, WCT	Important migratory corridor for fluvial bull trout and westslope cutthroat trout. Fish move between over-wintering habitat in the mainstem Bitterroot and spawning and rearing habitat in the upper East Fork.	BT1-1,2,3, 5 BT3-1 BT4-1,2,3,5 WCT2-1,2,3,4 WCT4-1,2,3 T1-2,3 T2-1,2 TP2-1,2,3,5,6,7,8,9,10,11
170102050601	Lost Horse Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton a high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds and still have documented fluvial cutthroat trout use.	BT1-1,3,5 BT4-1,2,3 WCT2-1,2,4 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,6,7,8,9,10,11
170102050602	South Lost Horse Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton a high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds with documented fluvial cutthroat trout use.	BT1-1,3,5 BT4-1,2,3 WCT2-1,2,4 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050703	Middle Sleeping Child Creek	Active	BT, WCT	Contains decent bull trout and westslope cutthroat trout populations, and there is an abundance of good historic spawning and rearing habitat present. Therefore there is potential for improving these populations and connecting to other population strongholds.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,5 WCT2-2,3 WCT4-1,2,3 T1-1,2,3, T2-1,2 TP2-1,2,3,4,5,6,7,8,9,10,11
170102050704	Little Sleeping Child Creek	Active	WCT	Good historic spawning for westslope cutthroat trout and potential to improve population and connect with Sleeping Child population.	WCT1-1,2,5 WCT2-2,3 WCT4-1,2,3 T1-1,2,3, T2-1,2 TP2-1,2,3,4,5,6,7,8,9,10,11
170102050705	Lower Sleeping Child Creek	Active	BT, WCT	Contains decent bull trout and westslope cutthroat trout populations, and there is an abundance of good historic spawning and rearing habitat present. Therefore there is potential for improving these populations and connecting to other population strongholds.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,5 WCT2-2,3 WCT4-1,2,3 T1-1,2,3, T2-1,2 TP2-1,2,3,4,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050801	Upper Rye Creek	Active	WCT	Restoration would add it to the neighboring Skalkaho and Sleeping Child watersheds to create a large block of good focal-fish-species habitat on the eastside of the subbasin.	T1-1,2,3 T2-1,2 TP2-1,2,3,4,5,6,7,8,9,10,11
170102050802	Lower Rye Creek	Active	WCT	Restoration would add it to the neighboring Skalkaho and Sleeping Child watersheds to create a large block of good focal-fish-species habitat on the eastside of the subbasin.	T1-1,2,3 T2-1,2 TP2-1,2,3,4,5,6,7,8,9,10,11
170102050803	Bitterroot River-Chaffin Creek	Active	BT, WCT	Bitterroot River mainstem upstream of Hamilton provides migratory corridor for both focal species and connects remaining bull trout strongholds.	BT1-2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT4-1,2,3 TP1-1,2,3 TP2-1,2,6,7,8,9,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050804	Tin Cup Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds and still have documented fluvial cutthroat trout use.	BT1-2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT2-1,3,4 WCT4-1,2,3V T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11
170102050805	Rock Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds that still have documented fluvial cutthroat trout use. A few also contain small resident bull trout populations and receive use by low numbers of fluvial bull trout.	T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050806	Bitterroot River-Darby	Active	BT, WCT	Bitterroot River mainstem upstream of Hamilton provides migratory corridor for both focal species and connects remaining bull trout strongholds.	BT1-2 BT3-1 BT4-1,2,3 WCT1-2 WCT2-3 WCT4-1,2,3 M1-1,2,3,4,5 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11
170102050807	Bitterroot River-Lick Creek	Active	BT, WCT	Bitterroot River mainstem upstream of Hamilton provides migratory corridor for both focal species and connects remaining bull trout strongholds.	BT1-2 BT3-1 BT4-1,2,3 WCT1-2 WCT2-3 WCT4-1,2,3 M1-1,2,3,4,5 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102050903	Middle Skalkaho Creek	Active	BT, WCT	Upper Skalkaho is a native fish stronghold and supports the best bull trout and westslope cutthroat trout populations on the eastside of the subbasin. Restoration actions here will provide potential for expanding habitat for focal species strongholds in upper Skalkaho.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-2,4,5 WCT2-2,3 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11
170102050904	Lower Skalkaho Creek	Active	BT, WCT	Potential for expanding habitat for focal species strongholds in upper Skalkaho.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-2,4,5 WCT2-2,3 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102051001	Roaring Lion Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds that still have documented fluvial cutthroat trout use.	BT1-2,5 WCT1-2,6 WCT2-1,3,4 WCT4-1,2,3 T2-1,2 TP2-1,2,3,6,7,8,9,11
170102051002	Sawtooth Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds that still have documented fluvial cutthroat trout use.	WCT1-1,6 WCT2-1,3,4 T2-1,2 TP1-1,2,3 TP2-1,2,3,6,7,8,9,11
170102051003	Bitterroot River-Canyon Creek	Active	BT, WCT	Bitterroot River mainstem upstream of Hamilton provides migratory corridor for both focal species and connects remaining bull trout strongholds.	BT1-2 BT3-1 BT4-1,2,3 WCT1-2 WCT2-3 WCT4-1,2,3 M1-1,2,3,4,5 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102051004	Gird Creek	Active	BT, WCT	Upper reaches on Forest Service land are a stronghold for bull trout. Little opportunity for re-connecting with other strongholds, but conservation of population is a high priority.	BT1-4 BT2-5 WCT1-1, 2, 3
170102051005	Blodgett Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds that still have documented fluvial cutthroat trout use.	BT1-2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,4,5,6 WCT2-1,3,4 WCT4-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,11
170102051101	Mill Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds that still have documented fluvial cutthroat trout use.	BT1-2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT2-1,3,4 WCT4-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102051201	Big Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds that still have documented fluvial cutthroat trout use.	BT4-1,2,3 WCT4-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,6,7,8,9,11
170102051302	Kootenai Creek	Active	BT, WCT	High quality habitat and close proximity to bull trout strongholds make this and other west-side drainages south of Hamilton high priority for active restoration with the future goal of re-establishing connected fluvial focal species populations. Most are also cutthroat trout strongholds that still have documented fluvial cutthroat trout use.	BT1-2,3,5 BT3-1 BT4-1,2,3 WCT1-1,2,5,6 WCT2-1,3,4 WCT4-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11
170102051304	Lower Burnt Fork Bitterroot River	Active	BT, WCT	Headwaters of Burnt Fork have a stable bull trout population and strong westslope cutthroat trout populations. Although re-connecting this population to other bull trout strongholds is unlikely in the short-term, the Burnt Fork subwatershed is a high priority for active conservation or habitat improvement.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT4-1,2,3 T1-1,2,3 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102051305	Burnt Fork Bitterroot River-Stevensville	Active	BT, WCT	Headwaters of Burnt Fork have a stable bull trout population and strong westslope cutthroat trout populations. Although re-connecting this population to other bull trout strongholds is unlikely in the short-term, the Burnt Fork subwatershed is a high priority for active conservation or habitat improvement.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT4-1,2,3 T1-1,2,3 TP1-1,2,3 TP2-1,2,3,4,5,6,7,8,9,10,11
170102051401	West Fork Lolo Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	WCT2-2,3 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP2-1,2,4,6,7,8,9
170102051402	East Fork Lolo Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	WCT2-2,3 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP2-1,2,4,6,7,8,9

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102051406	West Fork Butte Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	
170102051408	Lolo Creek-Grave Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT2-2,3 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,6,7,8,9,10,11

6th Field Hydrologic Unit	Subwatershed Name	Restoration Class	Focal Species	How this HUC fits into overall Subbasin Aquatic Conservation Strategy	Priority Strategies
170102051409	Lower Lolo Creek	Active	WCT	Lolo Creek is the primary tributary in the northern portion of the subbasin and may still have a remnant fluvial cutthroat trout population. Efforts should seek to conserve existing strongholds of westslope cutthroat trout and improve habitat for fluvial cutthroat trout.	BT1-1,2,3,5 BT3-1 BT4-1,2,3 WCT1-2 WCT2-2,3 WCT4-1,2,3 T1-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,3,4,6,7,8,9,10,11
170102051602	O'Brien Creek	Active	WCT	There is documented use of this drainage by fluvial cutthroat trout. Use by fluvial fish is rare in subwatersheds in the north portion of the subbasin, therefore, restoration and conservation in this subwatershed should be actively pursued.	WCT1-1,5,6 WCT2-1,3,4 WCT4-1,2,3 T2-1,2 TP1-1,2,3 TP2-1,2,6,7,8,9,11

3.2.4 Near Term Opportunities

Near term opportunities have been identified for watershed restoration and protection based on habitat quality, community composition, native species abundance, and ESA requirements. Our near-term opportunities for restoration are those that are (1) necessary for the recovery of listed species and (2) in slightly to moderately degraded habitats important to focal and target species. More severely degraded subwatersheds with introduced species and limited or nonexistent native fish populations will be addressed over a longer period of time. Near-term opportunities are described by subwatershed below:

West Fork Headwaters (170102050102)

- Reduce road densities.
- Eliminate fish-barrier culverts (11 known or suspected barriers).

Nez Perce Fork (170102050204)

- Eliminate fish-barrier culverts (9 known or suspected barriers).
- Make improvements to FS Road 468 and its spurs to reduce sediment inputs and improve in-stream shading.

Piquett (170102050303)

- Reduce road densities and the number of stream crossings (3 known or suspected barriers).
- Implement sediment reduction actions.

Meadow Creek (170102050404)

- Implement measures to reduce localized livestock grazing impacts on Forest lands.

Camp Creek (170102050502)

- Reduce road densities and the number of stream crossings.
- Implement sediment reduction actions.
- Reduce livestock grazing impacts on all ownerships.
- Increase stream shading.
- Re-route Camp Creek out of the U.S. Highway 93 ditch.

Middle East Fork (170102050503)

- Reduce road densities and the number of stream crossings.
- Reduce impacts caused by the encroachment of the East Fork Highway and its associated developments.

Cameron Creek (170102050504)

- Implement measures to reduce livestock grazing impacts on all lands.
- Increase stream shading.
- Reduce road densities and the number of stream crossings.
- Eliminate fish passage barriers on state and private lands.

Lower East Fork (170102050506)

- Reduce road densities and the number of stream crossings.
- Reduce impacts caused by the encroachment of U.S. Highway 93.
- Increase stream shading.

Upper Sleeping Child (170102050701)
- Reduce road densities and the number of stream crossings.
- Eliminate fish barriers.

Middle Sleeping Child (170102050703)
- Reduce road densities and the number of stream crossings.
- Eliminate fish barriers.
- Improve riparian and in-stream habitat.

Little Sleeping Child (170102050704)
- Reduce road densities and the number of stream crossings.
- Eliminate fish barriers (Priority barrier: old DNRC dam on the reservoir below Hamburger Flat).
- Improve riparian and in-stream habitat on a watershed scale.

Lower Sleeping Child (170102050705)
- Improve riparian and in-stream habitat.
- Screen irrigation ditches.
- Eliminate barriers.

Rye (170102050801)
- Reduce road densities and relocate sediment contributing road segments (Forest Service Roads 75 and 321).
- Reforestation and sediment reduction actions on clearcut sections.

Middle Skalkaho (170102050903)
- Lease water rights to ensure a fish-passable connection with the Bitterroot River.
- Reduce road densities and stream crossings.

Lolo Creek (170102051401 thorough 1405)
- Eliminate barriers.
- Reduce road densities and stream crossings.
- Improve in-stream habitat and stabilize streambanks.

3.3 Subbasin Level Terrestrial Habitat Objectives and Strategies

The Terrestrial Technical Subcommittee, which is made up of biologists and land managers working in the subbasin, developed objectives and strategies in response to the vision for the subbasin, the current biological and ecological conditions, and the economic and social realities described in the assessment.

Unlike the aquatic objectives, which were written terms of population-related attributes of focal species, the terrestrial habitat objectives are described in terms of changes needed in priority habitats. Species-centered objectives and strategies were not appropriate for wildlife because there is not adequate information available. Instead, wildlife objectives focus on habitat and wildlife strategies focus on the ecological function of the habitat related to target species. Terrestrial species were used but only to define

functional habitat and in some cases to inform the research, monitoring, and evaluation component of this plan.

The Assessment defines draft priority habitat types, their respective target species, and the limiting factors for each habitat. The subcommittee modified the list of target species and the limiting factors and then developed objectives and associated strategies for each habitat. To refine the objectives and strategies, three smaller teams were formed: a riparian/wetland team, a grassland/sage team, and a dry/mesic forest team. It was particularly important that some members of the smaller teams working on objectives and strategies were professionals representing key land management agencies (e.g. USFS, Montana Department of Natural Resources, Montana Fish, Wildlife & Parks), and in some cases non-profit organizations involved in land conservation (Bitter Root Land Trust and Rocky Mountain Elk Foundation). These professionals made sure that the team's results were realistic and achievable.

Whenever possible, objectives were prioritized within each habitat type. The objectives are listed in order of priority, and their relationship is discussed in the justification section.
Strategies under each objective are also listed in order of priority.

One of the primary considerations in ranking objectives and strategies is the Council's directive to "build from strength" (i.e., efforts to improve wildlife habitat begins with protecting and supporting the most productive habitat first). As such, general prioritization rules for objectives and strategies include:

1. Increase protection of highest quality land first (to some minimal protection status), then concentrate on lower quality land.
2. Strategies that provide long-term protection will be a higher priority than strategies that provide shorter-term protection, all other factors being equal.
3. Strategies that meet multiple objectives are a higher priority than strategies that benefit a limited number of objectives.
4. Strategies that provide benefits for focal and target species will be a higher priority than strategies that only benefit terrestrial wildlife.

Data gaps are an important issue in developing wildlife objectives and strategies in the Bitterroot Subbasin. Terrestrial vertebrate monitoring programs are very limited in the Bitterroot. Although some monitoring programs exist on USFS-administered lands, little is known about habitat status and presence/absence of target species on private lands, which are particularly critical to riparian/wetland, grassland/sage, and dry forest habitat conservation. New information, for example, on presence of various target species (much of it unpublished), was incorporated into the process, but the data gaps on species and habitat quality remain substantial. Addressing these data gaps is a high priority because the lack of knowledge is a major obstacle to developing quantitative biological objectives for many habitats. Improving baseline information will be instrumental in implementing effective adaptive management in the subbasin for terrestrial wildlife species.

3.3.1 Terrestrial Habitat Objectives and Strategies

This section presents the biological objectives and strategies for each habitat type, and these are summarized in tables 3.19 through 3.22. The tables include the target species, limiting factors, and an

overview of the objectives for each habitat type. A justification section is included with each biological objective. It explains why a particular target was chosen (or why it was impossible to give a quantitative target) and provides a rationale for prioritization. The justification references information from the Assessment, which was used to support the objectives and strategies. Where possible, objectives were prioritized within each habitat type. The objectives are listed in order of priority, and their relationship is discussed in the justification section under each habitat type. Strategies are also listed in order of priority.

Table 3.19. Terrestrial habitat objectives.

Objective ID	Objective
RIPARIAN AND WETLAND HABITATS	
RW1	Protect all existing riparian habitat in all sections of Game Management Unit 260 (from Missoula to Darby) to maintain healthy populations of all riparian deciduous forest and shrub riparian target species in each section of the GMU, and maintain connectivity of habitat/ wildlife corridors throughout the river floodplain.
RW2	Protect at least 50 percent of existing high-quality riparian habitat on private land in each tributary Game Management Unit, and conserve and manage all public land riparian habitat to maintain healthy populations of appropriate deciduous riparian forest species, all shrub riparian and all riparian coniferous forest target species in each GMU.
RW3	Protect and manage all existing wetlands in the Bitterroot River mainstem geologic floodplain area (GMU 260), and all high-quality tributary wetlands to maintain or improve subbasin populations of wetland target species by 2025.
GRASSLAND AND SAGEBRUSH/SHRUB HABITATS	
GSS1	Protect at least 30,000 new acres of Class 1 and Class 2 grassland and sagebrush/shrub habitat, including 20,000 acres in the lower and middle Bitterroot, and at least 10,000 acres in the upper Bitterroot (above Darby) by 2025.
GSS2	Improve, enhance and conserve the 30,000 new acres of grassland/sagebrush/shrub habitat protected under Objective #1.
DRY FOREST AND MESIC FOREST	
DFMF1	Maintain, conserve and manage all Class 1 (high-priority) dry forest and mesic forest habitats in all game management units, including securing protection for at least 5,000 additional acres of private land in the dry forest type by 2025, and maintain the populations of all target species in each game management unit.
DFMF2	**Objective 2 –** Restore and maintain Class 2 (priority) dry forest and mesic forest habitats in all units, including habitat restoration on 20,000 acres of dry forest and restoration of at least 20 percent of USFS mesic forests to appropriate fire regime condition classes, while maintaining or increasing populations of all target species.
DFMF3	**Objective 3 –** Restore examples of locally uncommon Class 2 mesic forest subhabitats including ecologically functional subalpine spruce-fir, western larch, burned forest, and white bark pine ecosystems, and achieve measurable increases of aspen/mixed broadleaf inclusions where opportunities exist on the landscape by 2025.
DFMF4	**Objective 4 –** Rehabilitate Class 3 dry and mesic forest habitats where opportunities exist.

Table 3.20. Summary of target species, limiting factors, objectives, and strategies developed to achieve objectives in Riparian and Wetland habitats in the Bitterroot Subbasin.

RIPARIAN AND WETLAND HABITATS **Limiting Factors: Altered hydrology, altered channels, fragmented by development, grazing regime, weeds and exotic species, wildlife-human conflicts.**	
Target Species Deciduous Riparian Forest	Hooded merganser *(Lophodytes cucullatus)* Bald eagle *(Haliaeetus leucocephalus)* Lewis' woodpecker *(Melanerpes **lewis**)* Red-naped sapsucker *(Sphyrapicus nuchalis)* Least flycatcher *(Empidonax minimus)* Veery *(Catharus fuscescens)* Red-eyed vireo *(**Vireo** olivaceus)* Hoary bat *(Lasiurus cinereus)* Fringed Myotis *(**Myotis** thysanodes)* Townsend's big-eared bat *(Corynorhinus townsendii)* Beaver *(Castor Canadensis)*
Target Species Wetlands	American bittern *(Botaurus lentiginosus)* Trumpeter swan *(Cygnus buccinators)* Common loon *(Gavia immer)* Marsh wren *(Cistothorus palustris)* Western toad *(Bufo boreas)* Transient shorebirds *(*various species*)*
Target Species Riparian Coniferous Forest	Cordilleran flycatcher *(Empidonax occidentalis)* Northern bog lemming *(Synaptomys borealis)* Long-toed salamander *(Ambystoma macrodactylum)*
Target Species Shrub Riparian	Moose *(Alces alces)* Willow flycatcher *(Empidonax traillii)*
Objective RW1: Protect all existing riparian habitat in all sections of Game Management Unit 260 (from Missoula to Darby) to maintain healthy populations of all riparian deciduous forest and shrub riparian target species in each section of the GMU, and maintain connectivity of habitat/wildlife corridors throughout the river floodplain.	
Strategy 1: Permanently protect riparian habitat on private lands in GMU 260 through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, and other land-protection tools.	
Strategy 2: Encourage and assist private and state landowners on the river mainstem to access appropriate riparian habitat restoration/management programs including weed management, grazing improvements, and revegetation with native species.	
Strategy 3: Collaborate with federal, state and county policymakers to encourage maintenance of natural channels and flood hydrology to improve floodplain function and riparian deciduous forest regeneration along the Bitterroot River.	
Strategy 4: Encourage state and county policymakers to preserve natural riparian vegetation in all flood-prone areas and minimize residential development and destruction of remaining native riparian vegetation in floodplain fringes.	

RIPARIAN AND WETLAND HABITATS
Objective RW2: Protect at least 50 percent of existing high-quality riparian habitat on private land in each tributary Game Management Unit and conserve and manage all public land riparian habitat to maintain healthy populations of appropriate deciduous riparian forest species, all shrub riparian, and all riparian coniferous forest target species in each GMU.
Strategy 1: Permanently protect riparian habitat on private lands through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, and other land protection tools.
Strategy 2: Encourage and assist private, state, and federal landowners to access appropriate riparian habitat restoration and management programs for tributaries, including natural channel stabilization, weed management, grazing improvements, revegetation with native species, and conservation planning.
Strategy 3: Complete and implement forest travel management plans and road maintenance plans for USFS lands that improve riparian forest habitat quality and respond to specific riparian wildlife habitat and security needs.
Objective RW3: Protect and manage all existing wetlands in the Bitterroot River mainstem geologic floodplain area (GMU 260) and all high-quality tributary wetlands to maintain or improve subbasin populations of wetland target species by 2025.
Strategy 1: Permanently protect high-quality wetland habitats on private lands through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, USDA-NRCS programs (e.g. Wetland Reserve), and other tools.
Strategy 2: Collaborate with federal, state and county policymakers to encourage maintenance of natural channels and flood hydrology to improve floodplain function and maintenance of natural wetlands in the Bitterroot River floodplain and floodplain fringe.
Strategy 3: Encourage and assist private and state landowners to access appropriate wetland habitat restoration/management programs including weed management, grazing improvements, and revegetation with native species.
Strategy 4: Increase public awareness and understanding of wetland and riparian habitat values, and specific wetland/riparian wildlife habitat security needs.

Objective 1 Justification: The riparian deciduous forest (black cottonwood/aspen/red-osier dogwood) habitats in the Bitterroot River geologic floodplain—roughly defined by Montana FWP Game Management Unit 260—are among the largest, most valuable habitats of their type in western Montana. The State of Montana Comprehensive Fish and Wildlife Conservation Strategy has named this area one of four Tier I Terrestrial Conservation Focus Areas in the Columbia River basin area of the State. Montana Audubon has nominated it as a National Audubon Society 'Important Bird Area'.

Approximately 16,000 acres of riparian habitats exist in Game Management Unit 260, including riparian deciduous forests, shrub riparian, and mixed broadleaf/conifer riparian. These are probably the most valuable lands for conservation in the Bitterroot Subbasin due to their: (1) high intrinsic value as wildlife habitat; (2) importance to the integrity of the Bitterroot River aquatic ecosystem; (3) importance as a north-to-south wildlife travel corridor; and (4) close association with approximately 6,000 acres of wetlands (sloughs, ponds, impoundments) also located on the river floodplain. Based on the NWPCC's "build from strength" approach, the protection of these relatively extensive riparian habitats is the first step toward longer-term riparian habitat management and regeneration and connectivity of low-elevation corridors.

Except for the Lee Metcalf National Wildlife Refuge (2,800 acres) most of the Bitterroot River riparian corridor is private land, although some is protected by conservation easements. Securing further conservation easements or similar protection is the highest priority strategy due to the residential development pressures that exist along all watercourses in the Bitterroot Subbasin. Improved management of these lands by private landowners—especially grazing management that will encourage forest and shrub regeneration and weed management—is a high-priority strategy. But it will only be effective in the long term in combination with strategies 1 and 3. Long-term maintenance of these forests requires that the Bitterroot River continues to access its natural floodplain so that black cottonwood stands can regenerate. This is also the justification for why establishing policies that maintain natural channels and flood hydrology is a high-priority strategy.

Objective 2 Justification: Tributaries to the Bitterroot River support riparian coniferous forests and shrub riparian habitats in their upper reaches and stringers of shrub riparian and deciduous riparian forest as they cross the valley and link with the Bitterroot River floodplain. These tributary riparian habitats are important because: (1) they are critical components of healthy aquatic ecosystems in the tributaries; (2) they provide in-situ habitat for many riparian target species, some of which are only found in higher elevation settings, and (3) the tributaries provide fish and wildlife travel corridors between the mainstem Bitterroot River and its riparian/wetland complexes and the National Forest habitats in the uplands of the subbasin.

Tributary riparian habitats are under tremendous pressure for residential development, which is fragmenting these narrow habitats and reducing their integrity and ecological function. The strategy of protecting 50 percent of tributary riparian areas in each Game Management Unit is ambitious because of the highly-dispersed location of these habitats and the large number of private landowners involved in some cases. But it is justified by the importance of these habitats to the integrity of subbasin fish and wildlife populations. Forest roads are often located in tributary riparian habitats on USFS-administered lands. A number of wildlife species are subject to human-wildlife conflicts in these areas, and habitat has been compromised by past timber harvests. USFS road maintenance and appropriate travel management are a high priority for these upland tributaries.

Objective 3 Justification: Natural wetlands are a rare feature in the subbasin. The largest open water wetlands are artificial and include the impoundments at Lee Metcalf Refuge, Lake Como, and Painted Rocks Reservoir. Many of the other large wetland areas are floodplain features, such as sloughs formed in the Bitterroot River's geologic floodplain or features created by manipulation of the river and tributaries for irrigation. These features are often highly-associated with riparian forests and shrublands and need to be protected in conjunction with those habitats. Policies associated with riparian protections would also protect floodplain wetland features. The education-outreach strategy for elevating public understanding of riparian/wetland habitat values is an important part of policy work and can motivate wetland landowners to participate in protection and management programs.

Table 3.21. Summary of target species, limiting factors, objectives, and strategies developed to achieve objectives in Grassland and Sagebrush habitats in the Bitterroot Subbasin.

GRASSLAND AND SAGEBRUSH/SHRUB HABITATS **Limiting Factors: Agricultural land conversion, fragmentation by development, grazing regime, weeds and exotics, wildlife-human conflicts.**	
Target Species Grassland	Elk *(Cervus Canadensis)* Rocky Mtn bighorn sheep *(Ovis canadensis* canadensis) Preble's shrew *(Sorex preblei)* Long-billed curlew *(Numenius americanus)* Grasshopper sparrow *(Ammodramus savannarum)* Bobolink *(Dolichonyx oryzivorus)* Barn owl *(Tyto alba)* Western Skink *(Eumeces skiltonianus)*
Target Species Sagebrush/Shrub (Bitterbrush/Mountain Mahogany)	Elk *(Cervus Canadensis)* Mule deer (*Odocoileus hemionus*) Brewer's sparrow (*Spizella breweri*)
Objective GSS1: Protect at least 30,000 new acres of Class 1 and Class 2 grassland and sagebrush/shrub habitat, including 20,000 acres in the lower and middle Bitterroot and at least 10,000 acres in the upper Bitterroot (above Darby) by 2025.	
Strategy 1: Permanently protect Class 1 grasslands and sagebrush/shrub habitat on private lands through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, and other land-protection tools.	
Strategy 2: Collaborate with landowners, NGOs, local, state, and federal agencies to identify and accomplish the most efficient, effective, and scientifically-sound conservation outcomes for grassland/sagebrush/shrub areas.	
Objective GSS2: Improve, enhance, and conserve the 30,000 new acres of grassland/sagebrush/shrub habitat protected under Objective #1.	
Strategy 1: Encourage and assist landowners to access appropriate grassland/sage management programs, including weed management, grazing improvements, and conservation planning.	
Strategy 2: Encourage use of land conservation programs that reduce wildlife damage and wildlife harassment problems.	
Strategy 3: Where practical encourage re-establishment of native plant communities on all degraded sites.	
Strategy 4: Increase public awareness and understanding of grassland and sagebrush/shrub habitat values.	
Objective GSS3: Enhance the condition of Class 2 and other high-quality grassland and sagebrush/ bitterbrush habitat on public and private lands through federal, state, and local programs.	
Strategy 1: Provide additional technical assistance and financial incentives to actively manage remaining grassland and sagebrush/shrub habitats.	
Strategy 2: Collaborate with federal, state and county policymakers to increase funding for programs that benefit grassland/sagebrush/shrub conservation.	

Objective 1 Justification: The Bitterroot Subbasin was originally known as an area of extensive low-elevation grasslands, but much of the area has been transformed into agricultural lands and is now subject to residential subdivision. There are approximately 350,000 acres of grassland, sage, and altered herbaceous pasture lands in the subbasin, but only about 125,000 acres of grassland and 17,000 acres of sage-shrubland are believed to be in large, unfragmented tracts suitable as habitat for many of the target species. Only 13 percent of the large grassland tracts and 32 percent of the large sage-shrub tracts are on public land or in conservation easements; therefore, it is important to protect a significant area of the remaining higher-quality grasslands and sagelands on private land. The quantitative objective of 30,000 acres of new grassland and sage to be protected were derived from the expert opinion of land conservation professionals working in the subbasin. The number is based on perceived opportunities over the next 15 years. Much of this potential new protected acreage is in large private ranches, many of which have not been adequately surveyed for target species.

Objective 2 Justification: Once the selected grassland and sagebrush-shrub habitat patches are protected, management of these 30,000 acres is urgent in order to reduce the negative impact of significant limiting factors and improve habitat quality. This requires management of grazing, weed, and human-wildlife conflicts, some of which can be included in land-protection instruments such as easements. But equally important is public education about the value of grassland-sage habitat because there is limited public understanding of the ecological value of these habitats, their relative scarcity in the Columbia basin portion of Montana, and the urgent need to protect them. Developing funding mechanisms to support landowners efforts to restore and conserve these areas is also a high priority.

Objective 3 Justification: Class 2 grasslands are also important, especially in areas such as the western side of the subbasin and in the lower elevations where few if any Class 1 grasslands exist. These Class 2 grassland/sage areas have potential for restoration of native vegetation but are often already affected or vulnerable to noxious weed infestations. In order to conserve some examples of grassland and sage habitats throughout the subbasin, it will be necessary to actively manage remaining parcels for habitat value and promote their protection along with similar actions for riparian areas and dry forests, habitats which are often adjacent to grasslands.

Table 3.22. Summary of target species, limiting factors, objectives and strategies developed to achieve objectives in Dry and Mesic forest habitats in the Bitterroot Subbasin.

DRY FOREST AND MESIC FOREST **Limiting Factors: Fragmented by roads, timber management, fire regime, insects and disease, weeds and exotic species.**	
Target Species Dry Forest	Flammulated owl *(Otus flammeolus)* Cassin's finch *(Carpodacus cassinii)* Northern alligator lizard *(Elgaria coerulea)* Western skink *(Eumeces skiltonianus)*
Target Species Mesic Forest – Moist Conifer	Fisher *(Martes pennanti)* Hoary bat *(Lasiurus cinereus)* Fringed Myotis ***(Myotis** thysanodes)* Townsend's big-eared bat *(Corynorhinus townsendii)* Brown creeper *(Certhia americana)* Vaux's swift *(Chaetura vauxi)* Winter wren *(Troglodytes troglodytes)* Northern Goshawk *(Accipiter gentilis)* Williamson's sapsucker *(Sphyrapicus thyroideus)* Pileated woodpecker *(Dryocopus pileatus)*
Target Species Mesic Forest – Subalpine Spruce-Fir	Great gray owl *(Strix nebulosa)* Clark's nutcracker *(Nucifraga Columbiana)*
Target Species Mesic Forest – Burned Forest	Black-backed woodpecker (*Picoides arcticus*) Three-toed woodpecker (*Picoides tridactylus*) Olive-sided flycatcher (*Contopus cooperi*)
Target Species Mesic Forest – Aspen/Broadleaf Inclusions	Ruffed grouse (*Bonasa umbellus*) Red-naped sapsucker (*Sphyrapicus nuchalis*)
Target Species Mesic Forest – Subalpine/Alpine	Gray-crowned Rosy finch (*Leucosticte tephrocotis*) Black Swift (*Cypseloides niger*) Peregrine Falcon (*Falco peregrinus*) Wolverine (*Gulo gulo*) Mountain goat (*Oreamnos americanus*) Pika (*Ochotona princeps*)
Target Species Mesic Forest – General	Gray wolf (*Canis lupus*)
Objective DFMF1: Maintain, conserve and manage all Class 1 (high-priority) dry forest and mesic forest habitats in all game management units, including securing protection for at least 5,000 additional acres of private land in the dry forest type by 2025 and maintaining the populations of all target species in each game management unit.	
Strategy 1: Seek private or state conservation easements and/or management agreements on Class 1 private forests.	

DRY FOREST AND MESIC FOREST
Strategy 2: Execute ponderosa pine habitat restoration projects (thinning, prescribed burn, etc.) for Class 1 dry forest habitats.
Strategy 3: Encourage a natural fire regime in all Class 1 dry and mesic forests, where appropriate, to maintain habitat quality.
Strategy 4 (lower priority): Encourage aggressive weed management in dry forests to maintain or improve native plant diversity.
Objective DFMF2: Restore and maintain Class 2 (priority) dry forest and mesic forest habitats in all units, including habitat restoration on 20,000 acres of dry forest and restoration of at least 20 percent of USFS mesic forests to appropriate fire regime condition classes, while maintaining or increasing populations of all target species.
Strategy 1: Actively manage forest vegetation to address insect-disease and fire regime issues and to restore forest habitat quality for all target species.
Strategy 2: Manage vegetation to improve forest habitat diversity for all target species.
Strategy 3: Complete and implement forest travel management plans that respond to wildlife habitat security needs.
Objective DFMF3: Restore examples of locally uncommon Class 2 mesic forest subhabitats including ecologically functional subalpine spruce-fir, western larch, burned forest, and white bark pine ecosystems and achieve measurable increases of aspen/mixed broadleaf inclusions where opportunities exist on the landscape by 2025.
Strategy 1: Promote and develop specific management projects to restore examples of uncommon mesic forest types
Strategy 2: Explore opportunities for restoring uncommon mesic forest types that coincide with the maintenance and restoration of Class 1 and 2 habitats.
Objective DFMF4: Rehabilitate Class 3 dry and mesic forest habitats where opportunities exist.
Strategy 1: Explore opportunities for restoring Class 3 forests that coincide with the maintenance and restoration of Class 1 and 2 habitats.

Objective 1 Justification: This objective is focused only on dry forest (ponderosa pine dominant) because this habitat type has been significantly degraded in the Bitterroot Subbasin due to its accessibility, pressure from historical timber harvest, and vulnerability to alteration of fire regimes. Although as much as 150,000 acres of this forest type may exist in the subbasin, it tends to be found interspersed with grasslands and mixed mesic forests; only 23,000 acres of larger patches of dry forest have been mapped. Many of these large patches of dry forest are partially on private land or on USFS-administered lands very near to private land boundaries. Securing conservation easements on patches of Class 1 dry forest on private land is a first step in protecting these high-quality habitat areas from degradation. However, it is understood that essentially all dry forest in the subbasin requires restoration work, including improvement of fire regimes. Many dry forest areas also require weed management to reach their full habitat potential.

Objective 2 Justification: Class 1 and 2 mesic forests are almost entirely within the Bitterroot and Lolo National Forests in the subbasin (except "checkerboard" areas owned by The Nature Conservancy and Plum Creek Timber Company in the northern end of the subbasin). The Bitterroot National Forest staff provided the key input to develop this objective for dry forest and mesic forest restoration. Several target species use late-seral or old-growth moist conifer forest habitats, so the presence of old-growth within a patch was used as an indicator of habitat quality—but only on the Bitterroot National Forest. Data from both National Forests also was critical in determining the effect of various limiting factors on the dry and mesic forest areas. Restoring appropriate fire regimes in publically owned mesic and dry forests is the highest priority strategy, because it is expected to result in multiple positive effects. Insect infestations have been very high in the last five years, and are a major management issue. Therefore insect-disease management is a part of the highest priority strategy.

Objective 3 Justification: The four mesic forest sub-types mentioned in this objective are quite scarce on the landscape, but they provide key habitat for a number of target species. Subalpine spruce-fir and whitebark pine are high-elevation forest types found entirely on USFS-administered lands. Western larch is found only in the northwestern part of the Bitterroot Subbasin at low to mid-elevations (mostly in Lolo National Forest), and could be incorporated into mesic forest management projects in that area. Burned forest is preferred habitat for a number of target species. Wildfire management policy is a critical factor in determining future extent of that sub-habitat.

Objective 4 Justification: Class 3 forests, and many smaller unclassified forest patches are also important habitat elements. Although they may not provide optimal habitat for many target species, they do provide habitat corridors and connectivity between higher-quality habitat patches. For this reason, Class 3 forests should be incorporated into habitat management projects when possible.

3.3.2 Terrestrial Habitat Prioritization Approach and Criteria

A key part of prioritizing conservation actions is the evaluation and ranking of land units for habitat conservation potential. Evaluating and classifying habitat units will assist in applying the biological objectives and their strategies in the appropriate places. Ranking the conservation value of habitat units will guide future project selection.

The most rational unit for conservation action varies according to the type of habitat. For terrestrial wildlife, the approach begins by focusing on 'habitat patches', areas characterized as predominantly one of four major habitat types: grassland, sage/shrub, dry forest or mesic forest. The following general principles guided the selection of habitat patches:

1. The larger the habitat patch the greater the chance of target species' persistence through time and disturbance (bigger is better than smaller).
2. Population recovery potential is greater in closer proximity to large protected habitats with strong source populations (closer is better than farther).
3. Well-connected populations allow for maintenance of biological diversity (genetic exchange), dispersal into unpopulated areas, and resilience to habitat disturbance (connected is better than disjointed).

4. Preserving genetic and phenotypic diversity requires maintaining populations through a wide geographic range, in this case throughout the subbasin, in a variety of habitat subtypes.
5. Maintenance of strong target species populations in the best possible habitats throughout the subbasin and preserving metapopulation structure and function are the best ways to minimize risk of extinction.

Since many of the target wildlife species for these habitats depend on large, relatively intact areas of their preferred habitat type, the largest habitat patches of each type on the landscape were selected and evaluated and ranked for conservation value. Therefore, this is not a comprehensive inventory of each habitat type in the subbasin, but a sub-sample of the largest habitat patches.

A slightly different approach is needed for wetland and riparian habitat because these habitats are scarce in the Bitterroot Subbasin and appear in the GIS analysis as large numbers of small, disjunct fragments (polygons). Therefore, for wetland and riparian habitats habitat polygons were consolidated into subsets of data, dividing the subbasin into 14 "regional subsets" based on Game Management Units (Figure 3.2). Regional subsets in each Game Management Unit were then analyzed. Therefore, the final rankings of riparian and wetland habitat conservation priorities appear as "regions" of the subbasin.

Table 3.23 defines the classes of habitat patches, or regions. Scoring criteria were developed according to available data sources. The critereia may differ based on available data.

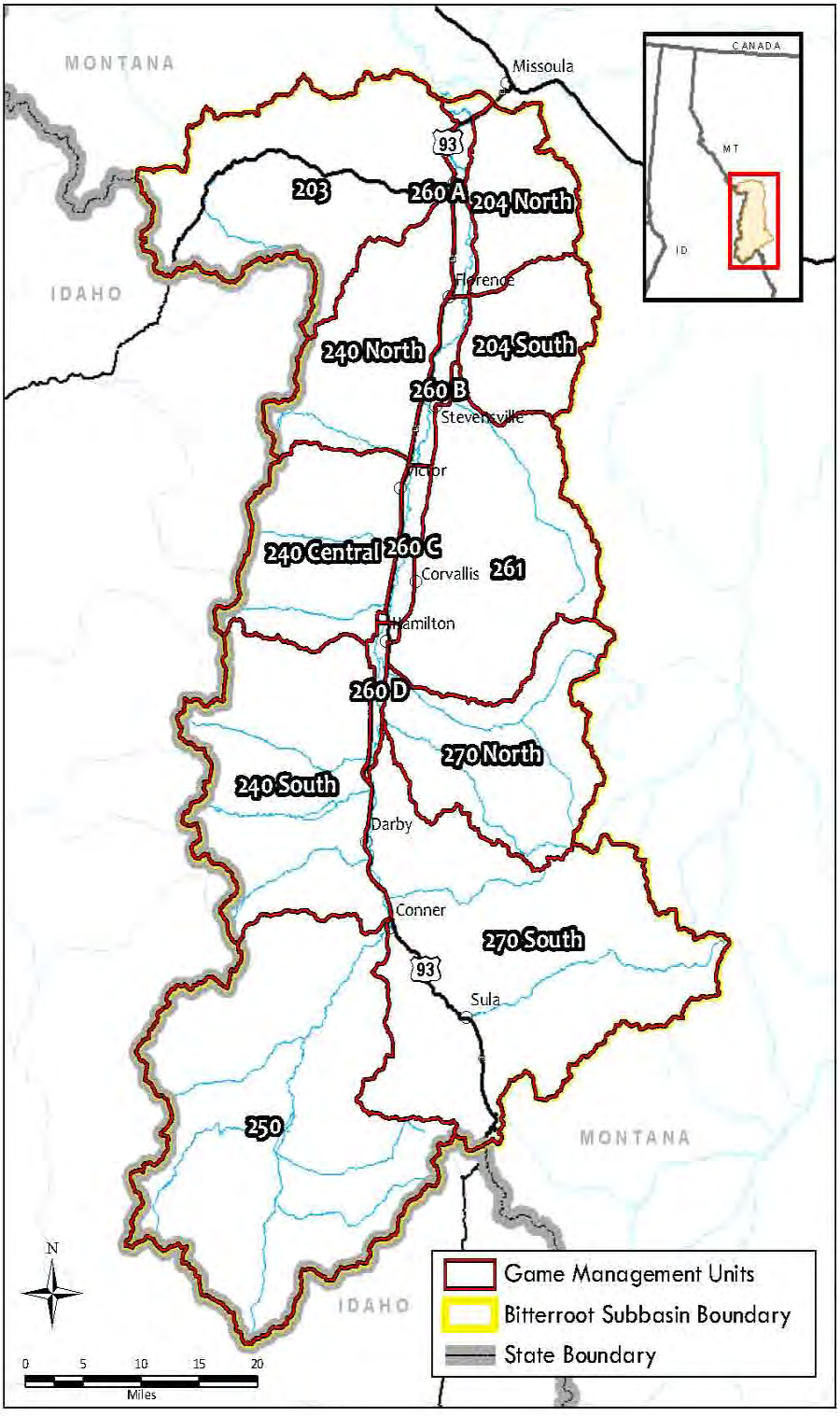

Figure 3.2. Game Management Unites (GMUs) used in prioritization of riparian and wetland habitats in the Bitterroot Subbasin.

Table 3.23. Bitterroot Subbasin terrestrial habitat prioritization categories and criteria.

Prioritization Category	General Definition	General Criteria	Specific Scoring Criteria
Class 1	High Conservation Priority	High quality habitat area with relatively few limiting factors, confirmed presence of target species, and valuable habitat size and diversity. May not be in or near existing conservation lands, but often is so located.	Grassland/sage: >9/18 Dry Forest: >12/24 Mesic Forest: >12/20 Riparian/Wetland: >6/14
Class 2	Conservation Priority	Medium to high quality habitat area, may have significant degradation due to limiting factors, but if so has restoration potential. Biological values at least medium, but data often lacking to give higher score. Land conservation status variable.	Grassland/sage: 4-7/18 Dry Forest: 7-11/24 Mesic Forest: 8-11/20 Riparian/Wetland >2/14
Class 3	Deferred Conservation Priority	Low to medium quality habitat area with significant limiting factors and/or social attributes that limit habitat value and/or restoration potential.	Grassland/sage: <4 Dry Forest: <7 Mesic Forest <8 Riparian/Wetland: none

Riparian and Wetland Habitat Criteria

Riparian and wetland habitats are the highest priority for conservation and restoration in the subbasin because of their importance to a large number of terrestrial and aquatic species and their overall scarcity on the landscape. Therefore, all remaining riparian and wetland habitats have conservation priority. These areas were evaluated distinctly, and no units were categorized as Class 3 (Deferred Conservation Priority). Table 3.24 describes the criteria used to prioritize riparian habitats, and Table 3.25 describes the criteria used to prioritize wetland habitats.

Table 3.24. Riparian habitat prioritization criteria, ratings, and data sources.

Criteria	Criteria Rating	Data Source/Analysis
LIMITING FACTORS (Major/*minor*):		
Altered channels (dikes, bank protection affecting floodplain function)	None	No consistent data source available
Fragmented by development (Roads and timber activity: USFS only)	2= >50% of land in buffer is riparian habitat 1=>25% and <50% is riparian 0=<25% of buffer is riparian	GAP data—acres of habitat within 250 ft. buffer on each side of stream within USFS
Fragmented by development: other lands	2= <1 dwelling/70 acres of buffer 1= 1 dwelling/25-70 acres 0= 1 dwelling/<25 acres	Ravalli and Missoula County structure layers overlay on 250 ft. stream buffer

Criteria	Criteria Rating	Data Source/Analysis
Fragmented by development: other lands	2= >15 acres of riparian habitat/dwelling 1=>6 acres of riparian habitat/ dwelling 0=<6 acres of riparian habitat/ dwelling	GAP riparian habitat layer, with number of dwellings within the 250 ft. buffer
Grazing regime	None	No consistent data source available
Wildlife/human conflicts	None	No consistent data source available
Weeds and exotic species	None	
Agricultural land conversion	None	
BIOLOGICAL & HABITAT ATTRIBUTES:		
Presence of MT Species of Concern	No data used	Data sources do not represent whole landscape
Density and continuity of riparian habitat on landscape: USFS land	2=>40 acres riparian habitat/ mile of stream 1= 10-40 acres habitat/mile 0=<10 acres habitat/mile	GAP Data, USGS hydrology data set; analysis by GMU
Density and continuity of riparian habitat on landscape: private/state/ other land	2=>40 acres riparian habitat/ mile of stream 1= 10-40 acres habitat/mile 0=<10 acres habitat/mile	GAP Data, USGS hydrology data set; analysis by GMU
Physical diversity of habitat		
Vegetative diversity of habitat		
SOCIAL ATTRIBUTES:		
Land ownership/Conservation status and conservation need by Game Management Unit	2=Greater than 75% of habitat on non-USFS land 1=10-75% of habitat on non-USFS lands 0=<10% on non-USFS lands	GAP data set, MT Cadastral data

Table 3.25. Wetland habitat prioritization criteria, ratings, and data sources.

Criteria	Criteria Rating	Data Source/Analysis
LIMITING FACTORS (Major/*minor*):		
Altered hydrology	None	
Altered channels or channel form (dikes, bank stabilization, channelization)	None	
Weeds and exotic species	None	
Wildlife/human conflicts	None	
*Fragmented by development**	2= <1 dwelling/70 acres of wetlands on private/other lands 1= >1 dwelling/70 acres of wetlands and <1 dwelling/25 acres on private/ other lands 0= >1 dwelling/25 acres of wetlands on private/other lands	GAP data, plus number of dwellings on 250 ft. buffers along all streams within each Game Management Unit
BIOLOGICAL & HABITAT ATTRIBUTES:		
Presence of MT Species of Concern	None	
Size of habitat: USFS lands	2=>1000 acres total of wetlands in the GMU 1=>100 acres of wetlands 0=<100 acres of wetlands	GAP data, analyzed per GMU boundaries on USFS lands
Size of habitat: private/other lands	2=>1000 acres total of wetlands in the GMU 1=>100 acres of wetlands 0=<100 acres of wetlands	GAP data, analyzed per GMU boundaries on private/other lands
Density and continuity of wetland habitat on private/other lands (within the riparian buffer of 250 ft. on each side of stream)	2= >20 acres wetlands/mile of stream 1=>5 acres wetlands/mile of stream 0=< 5 acres of wetlands/mile of stream	GAP data, analyzed within the buffer area along all streams in the GMU.
Vegetative diversity of habitat	None	
Physical diversity of habitat	None	
SOCIAL ATTRIBUTES:		
Land ownership/Conservation status and conservation need by Game Management Unit	2=Greater than 75% of habitat on non-USFS land 1=10-75% of habitat on non-USFS lands 0=<10% on non-USFS lands	GAP data set, MT Cadastral data

**Although "fragmented by development" is not a key limiting factor for wetlands (due to the fact that the habitat itself is not fragmented), the physical proximity of development is a contributing cause to "wildlife/human conflicts," and sometimes to "weeds and exotics" and "altered channels." Therefore, it serves as a surrogate measure for these limiting factors in the wetlands analysis.*

Grassland and Sagebrush Habitat Criteria

Table 3.26 describes the criteria used to prioritize grassland and sagebrush habitats in the subbasin.

Table 3.26. Grassland and sagebrush habitat prioritization criteria, ratings, and data sources.

Criteria	Attribute Rating	Data Source
LIMITING FACTORS:		
Agricultural land conversion (prior cultivation, fragmentation by cultivated fields)	2= <5% of buffer in cultivation 1= >5% and <25% of buffer is in cultivation 0= >25% of buffer in cultivation	GAP data analysis with buffer of ¼ mile around grassland/sage habitat patch: analyze how much of this buffer is in agriculture
Fragmented by development (roads, residential, commercial, powerlines)	2= no roads 1= <2 miles roads/mile2 0= >2 miles roads/mile2	Geospatial data sets: Density of dwellings: acres/ structure
Grazing regime	1= significantly better than average -1 = significantly worse than average	Expert opinion.
Weeds and exotic species	1= significantly better than average -1 = significantly worse than average	Expert opinion.
Wildlife/human conflicts	None	No consistent data source
BIOLOGICAL & HABITAT ATTRIBUTES:		
Presence of Grassland/Sage target species	3=At least three target species confirmed 2=two species of big game winter range 1=one species of big game winter range 0= no elk/mule deer winter range	Expert opinion.
Size of contiguous habitat	3= >10,000 acres 2= >2560 and<10,000 acres 1= >640-2560acres 0=<640 acres (sage areas 160-640 ac. will also be mapped)	Geospatial sets GAP Data
Vegetative and physical diversity of habitat	1= significantly more diverse than average -1= significantly less diverse than average	Expert opinion.
Heart of the Rockies landscape importance (HOR is a broad, multi-state conservation analysis of the Northern Rockies, including landscape-level corridors)	2= all of habitat patch within a Heart of the Rockies core area 1= part of habitat within HOR core area 0= none of the habitat within a HOR core area	HOR mapping for Bitterroot Subbasin

Criteria	Attribute Rating	Data Source
SOCIAL ATTRIBUTES:		
Land ownership/Conservation status*USFS, USFWS, DNRC, FWP, and other state/county lands with a conservation mission as well as private conservation easements	2= >50% of habitat patch in conservation ownership 1= >25% and <50% of habitat patch in conservation ownership 0= <25% of habitat patch in conservation ownership	MT Cadastral data
Adjacent to existing conservation lands	2=<1/4 mile to conservation lands 1=<1/2 mile to conservation lands 0=>1/2 mile to conservation lands	MT Cadastral data,
Existing structures	2=<1 structure/160 ac. 1=1 structure/40-160 acres 0=>1 structure/40 acres	Ravalli and Missoula Co. structure data base, GAP data

Dry and Mesic Forest Habitat Criteria

Table 3.27 describes the criteria used to prioritize dry and mesic forest habitats in the subbasin.

Table 3.27. Dry and mesic forest habitat prioritization criteria, ratings, and data sources.

Criteria	Attribute Rating	Data Source
LIMITING FACTORS (Major/minor):		
Fragmented by Roads	2=roadless 1=<2 mile/mile2 0=>2 mile/mile2	USFS road data set plus county road data
Timber management (impact is change from unmanaged age-class structure)	2= >25% old growth 1=1-25% old growth 0= no old growth.	USFS timber data “old-growth” layer for Bitterroot NF, no equivalent layer for Lolo NF. Lolo NF forests given 0.
Fire regime (alterations are changes in frequency and intensity of fire from pre-contact history)	2=natural fire regime 1= minor to mod. Alteration to regime 0= highly altered	USFS fire history data (categories from USFS metadata)
Insects and disease	2= zero insect damage (%) 1=1-10% insect damage 0=>10% insect damage	USFS Regional Office aerial survey data,
Criteria	**Attribute Rating**	**Data Source**
Wildlife/human conflicts	None.	

BIOLOGICAL & HABITAT ATTRIBUTES:		
Presence of Target species (dry forests only)	1= known big game winter range 0= no documented big game winter range	Big game range maps from MT FWP
Size of contiguous habitat	3=>10,000 acres 2=>2560-10,000 acres 1= 640-2560 acres 0=<640 acres	GAP Data
Vegetative and physical diversity of habitat	1= significantly higher than average diversity -1= significantly lower than average diversity	Expert opinion
SOCIAL ATTRIBUTES:		
Land ownership/Conservation status (*USFS, USFWS, DNRC, FWP, and other state/county lands with a conservation mission as well as private conservation easements)*	2=Greater than 50% conservation lands 1=25-50 conservation lands 0=<25% conservation lands	MT Cadastral data
Adjacent to existing conservation lands	2=<1/4 mile to conservation lands 1=<1/2 mile to conservation lands 0=>1/2 mile to conservation lands	MT Cadastral and conservation easement GIS layer
Existing structures	2=<1 structure/160 ac. 1=1 structure/40-160 acres 0=>1 structure/40 acres	MT Cadastral data: Dwelling density, acres/structure
Restoration Projects done	1= restoration projects done 0= no restoration projects	Expert opinion

3.3.3 Terrestrial Habitat Prioritization Results

Habitat patches and riparian/wetland regions were prioritized using a combination of geographic information system (GIS) analysis and qualitative input from teams of local experts, including biologists, range managers, and land conservation organization professionals. The GIS analysis provided maps and quantitative information on habitat characteristics for all large habitat patches. The local experts reviewed the results of the GIS analysis and used their personal knowledge to provide qualitative input on the limiting factors and the biological and social attributes of each habitat patch.

The results of the GIS analysis and the scores provided by the experts for each criterion were then summed to get a total score. The priority ranking of each habitat patch or riparian/wetland region derives directly from their total scores, i.e., the habitat patches with highest total scores were ranked Class 1 "High Conservation Priority," those with medium scores were ranked Class 2 "Conservation Priority," and the lowest scoring habitat patches were ranked "Deferred Conservation Priority."

Figures 3.3 through 3.8 and Tables 3.28 through 3.33 summarize the results for habitat prioritization. The habitat patches in each conservation priority class are color-coded. Appendix 13 includes the full scoring data used to arrive at the prioritization scores.

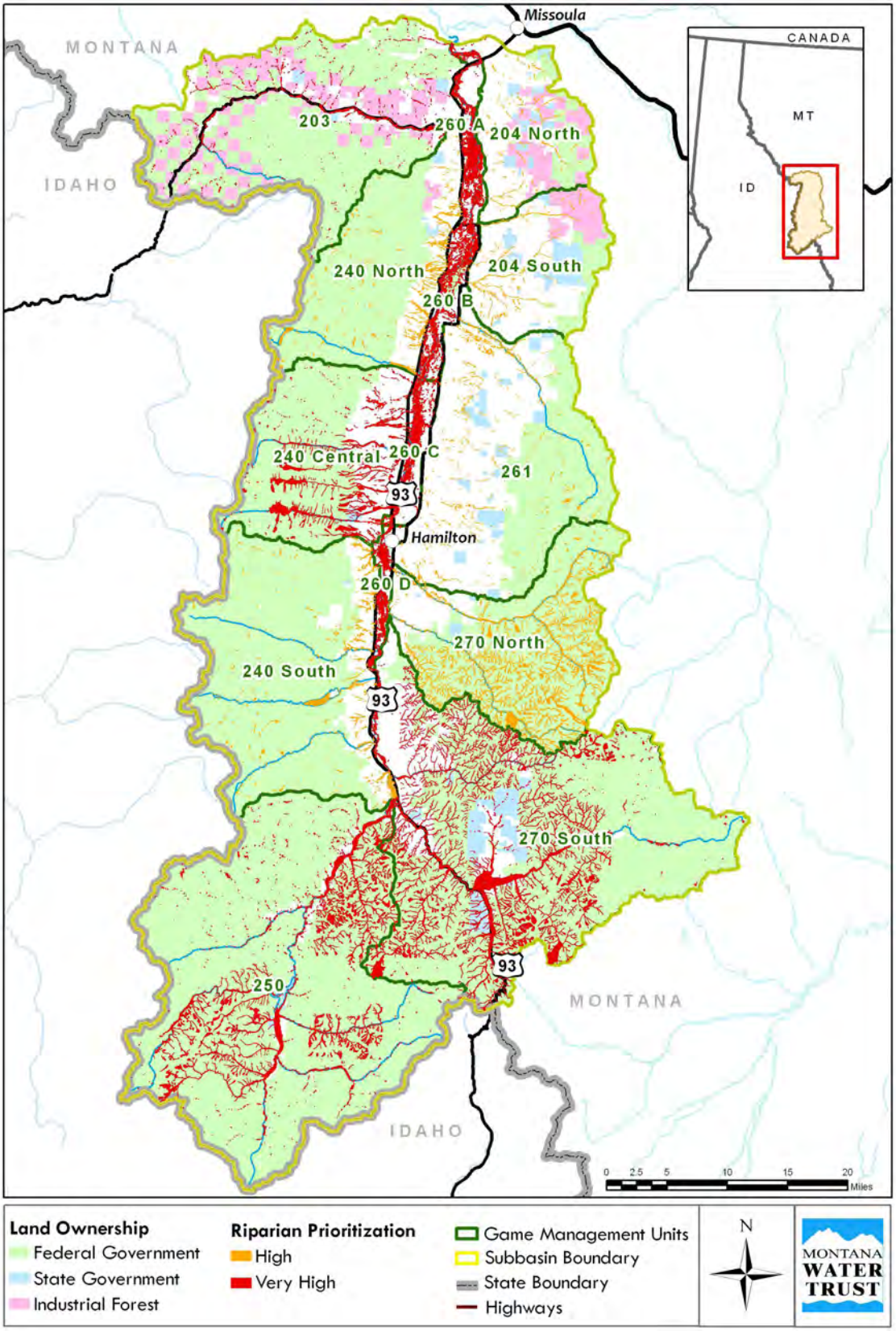

Figure 3.3. Priority riparian habitats for the Bitterroot Subbasin (electronic versions of terrestrial habitat conservation priority maps at a large scale with detail allowing more precise location of each habitat patch are available from authors).

Table 3.28. Riparian habitat conservation priority areas by Game Management Unit (GMU).

Game Management Unit	Total Acres	Total Score	Class
203	3147	6	**Class 1**
204 North	980	1	Class 2
204 South	1027	3	Class 2
240 Central	8722	8	**Class 1**
240 North	3266	4	Class 2
240 South	4348	4	Class 2
250	19817	6	**Class 1**
260 A	5569	9	**Class 1**
260 B	4722	11	**Class 1**
260 C	4338	6	**Class 1**
260 D	2629	7	Class 1
261	2573	2	Class 2
270 North	11225	5	Class 2
270 South	27442	9	**Class 1**
Total acres	99805		

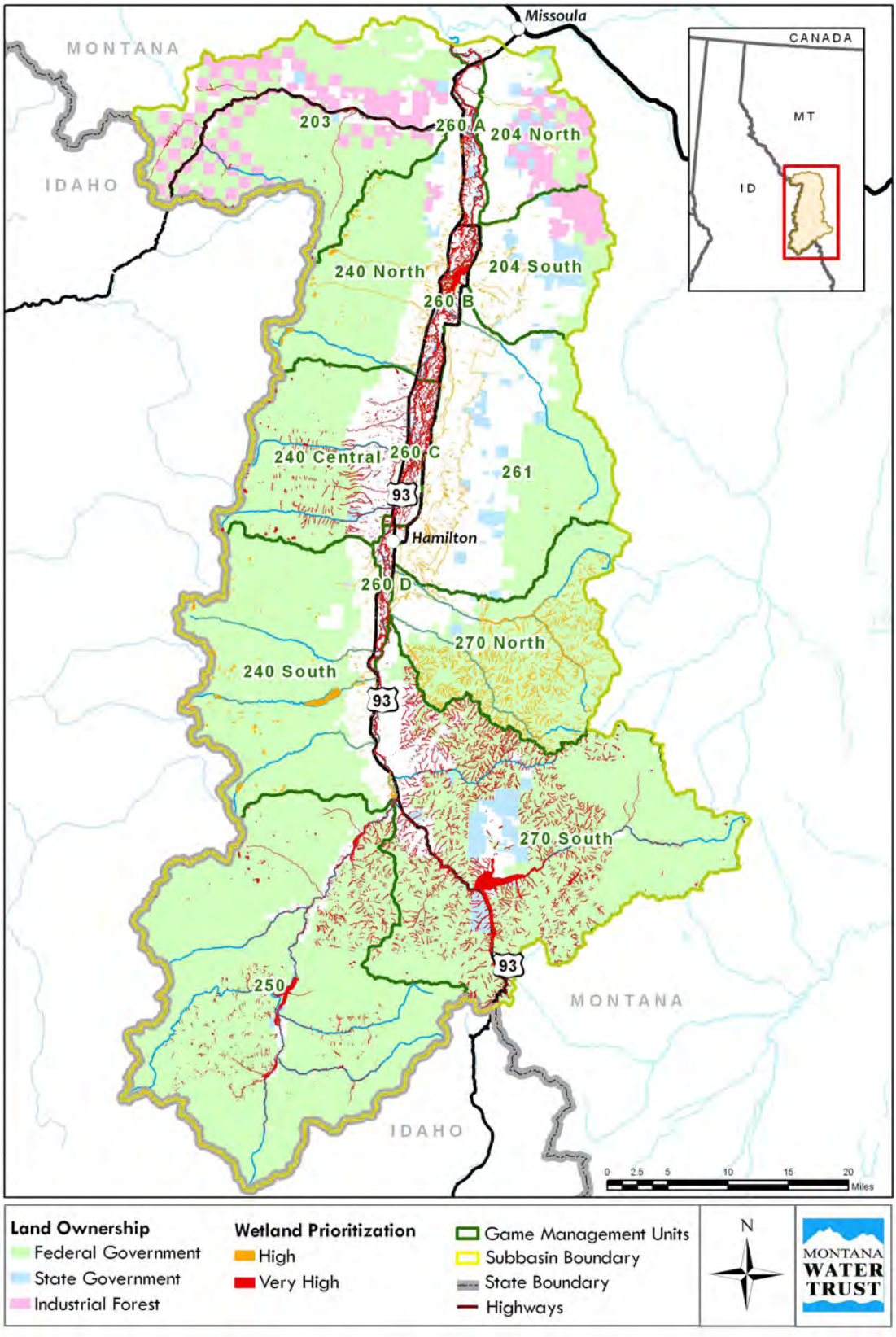

Figure 3.4. Priority wetland habitats for the Bitterroot Subbasin (electronic versions of terrestrial habitat conservation priority maps at a large scale with detail allowing more precise location of each habitat patch are available from authors).

Table 3.29. Wetland habitat conservation priority areas by Game Management Unit (GMU).

Game Management Unit	Total Acres	Total Score	Class
203	467	5	Class 2
204 North	48	2	Class 2
204 South	215	4	Class 2
240 Central	1639	4	Class 2
240 North	1247	5	Class 2
240 South	2607	6	**Class 1**
250	3441	7	**Class 1**
260 A	1770	6	**Class 1**
260 B	3391	8	**Class 1**
260 C	2035	6	Class 1
260 D	882	6	**Class 1**
261	763	4	Class 2
270 North	4955	4	Class 2
270 South	12457	8	**Class 1**
Total acres	35917		

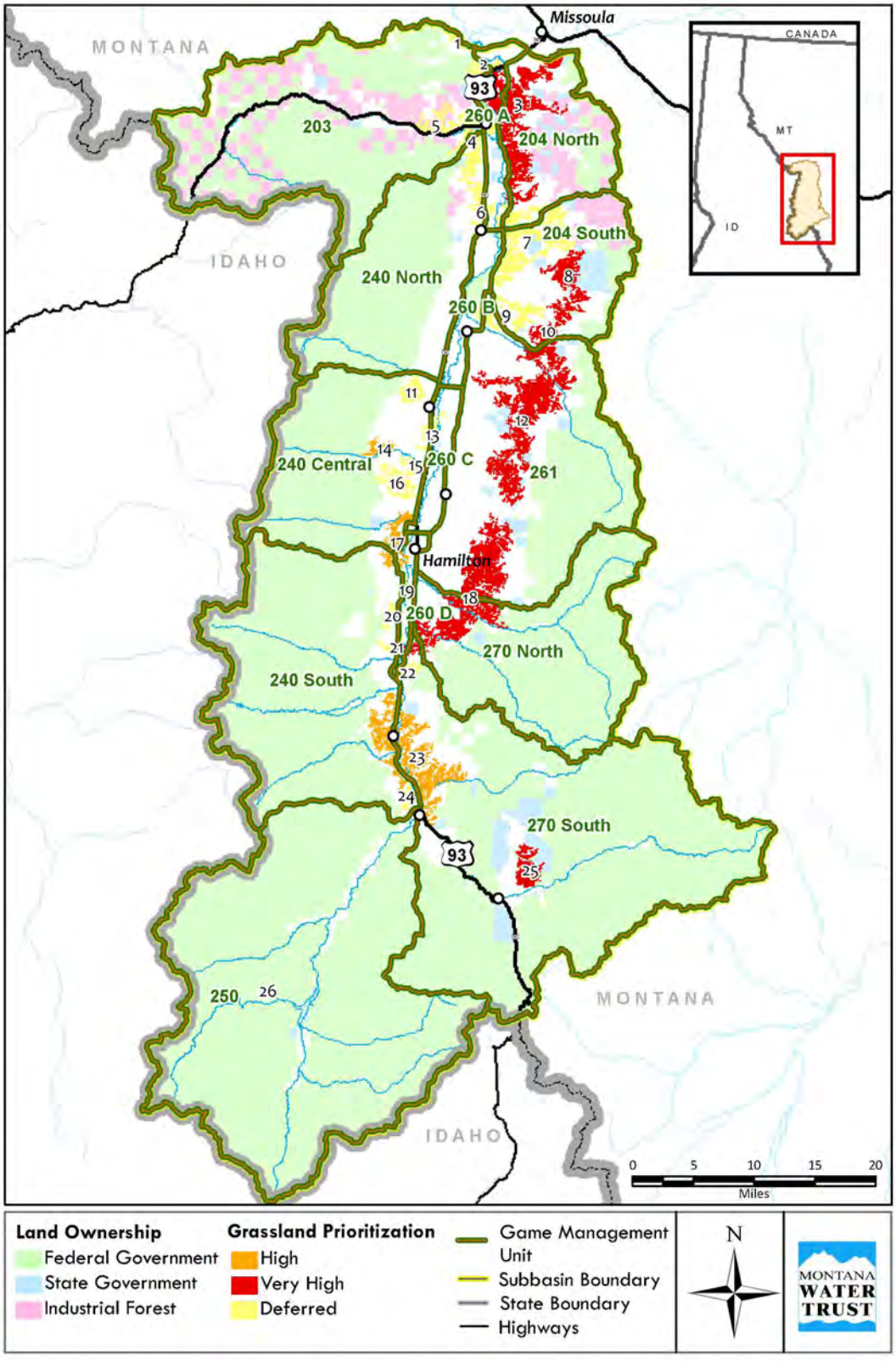

Figure 3.5. Priority grassland habitats for the Bitterroot Subbasin (electronic versions of terrestrial habitat conservation priority maps at a large scale with detail allowing more precise location of each habitat patch are available from authors).

Table 3.30. Grassland habitat conservation priority areas for the Bitterroot Subbasin.

New Parcel ID	Total Acres	Game Management Unit	Total Score	Class
1	782	203	4	Class 2
2	1,291	203	5	Class 2
3	17,402	204 North	10	**Class 1**
4	5,884	240 North	5	Class 2
5	2,486	203	5	Class 2
6	2,698	240 North	3	Class 3
7	11,177	204 South	5	Class 2
8	3,862	204 South	13	**Class 1**
9	4,342	261	5	Class 2
10	5,749	261	10	**Class 1**
11	1,883	240 Central	5	Class 2
12	17,031	261	11	**Class 1**
13	1,446	260 C	2	Class 3
14	807	240 Central	7	Class 2
15	974	240 Central	1	Class 3
16	2,467	240 Central	4	Class 2
17	3,355	240 Central	6	Class 2
18	19,248	270 North	11	**Class 1**
19	844	260 D	2	Class 3
20	1,055	240 South	3	Class 3
21	1,034	240 South	4	Class 2
22	934	270 South	5	Class 2
23	14,488	270 South	8	Class 2
24	872	250	5	Class 2
25	3,037	270 South	14	**Class 1**
Total acres	125,149			

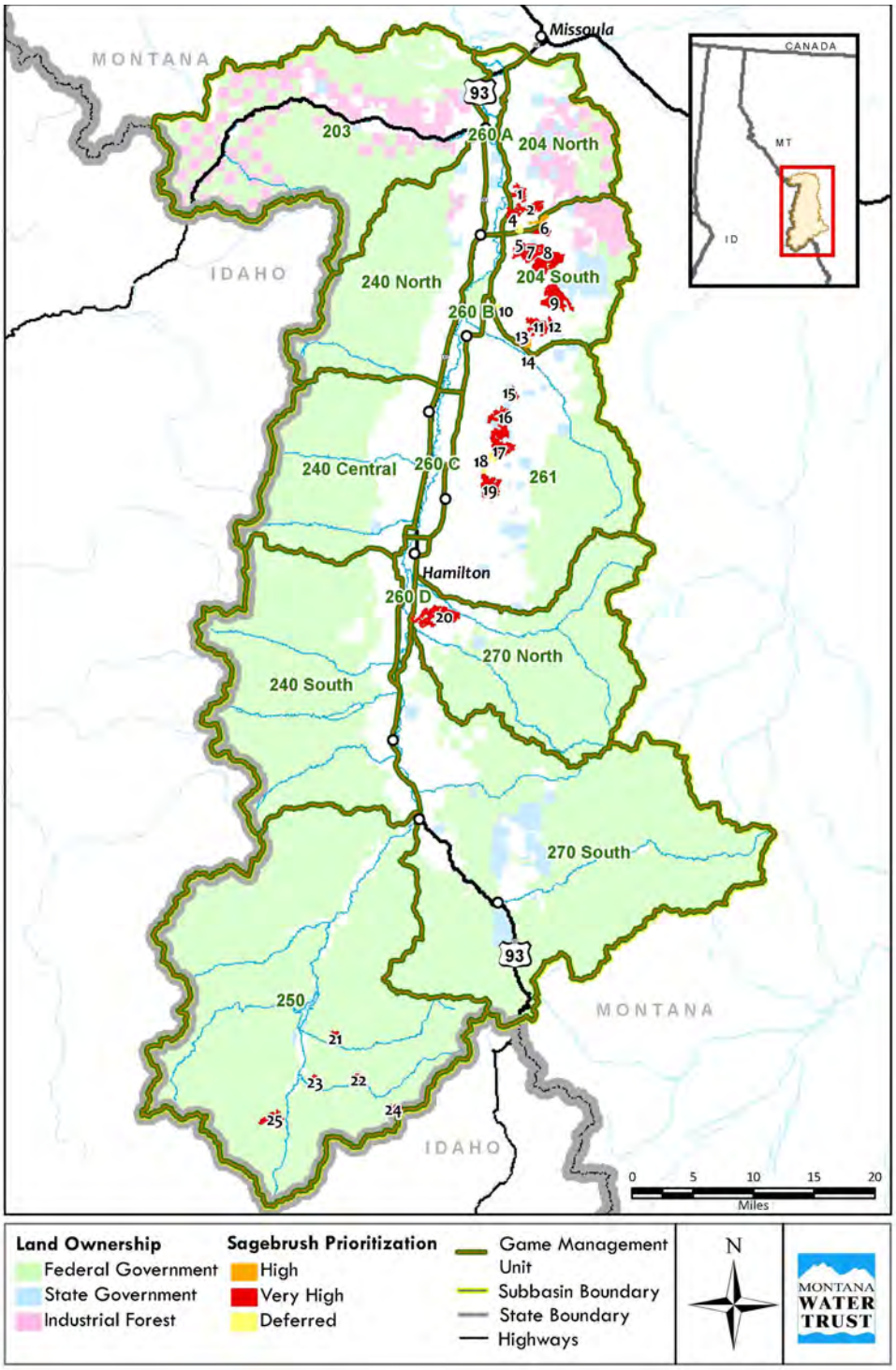

Figure 3.6. Priority sagebrush habitats for the Bitterroot Subbasin (electronic versions of terrestrial habitat conservation priority maps at a large scale with detail allowing more precise location of each habitat patch are available from authors).

Table 3.31. Sagebrush habitat conservation priority areas for the Bitterroot Subbasin.

New Parcel ID	Total Acres	Game Management Unit	Total Score	Class
1	526	204 North	10	**Class 1**
2	694	204 North	8	Class 2
3	279	204 South	7	Class 2
4	311	204 North	8	Class 2
5	192	204 North	2	Class 3
6	340	204 South	8	Class 2
7	1,474	204 South	10	**Class 1**
8	1,666	204 South	12	**Class 1**
9	1,820	204 South	12	**Class 1**
10	215	204 South	2	Class 3
11	676	204 South	8	Class 2
12	202	204 South	11	**Class 1**
13	191	204 South	9	Class 2
14	169	204 South	6	Class 2
15	412	261	9	Class 2
16	797	261	11	**Class 1**
17	1,942	261	11	**Class 1**
18	413	261	2	Class 3
19	1,312	261	11	**Class 1**
20	2,109	270 North	13	**Class 1**
21	174	270 South	14	**Class 1**
22	183	250	15	**Class 1**
23	160	250	13	**Class 1**
24	186	250	14	**Class 1**
25	511	250	12	**Class 1**
Total acres	16,954			

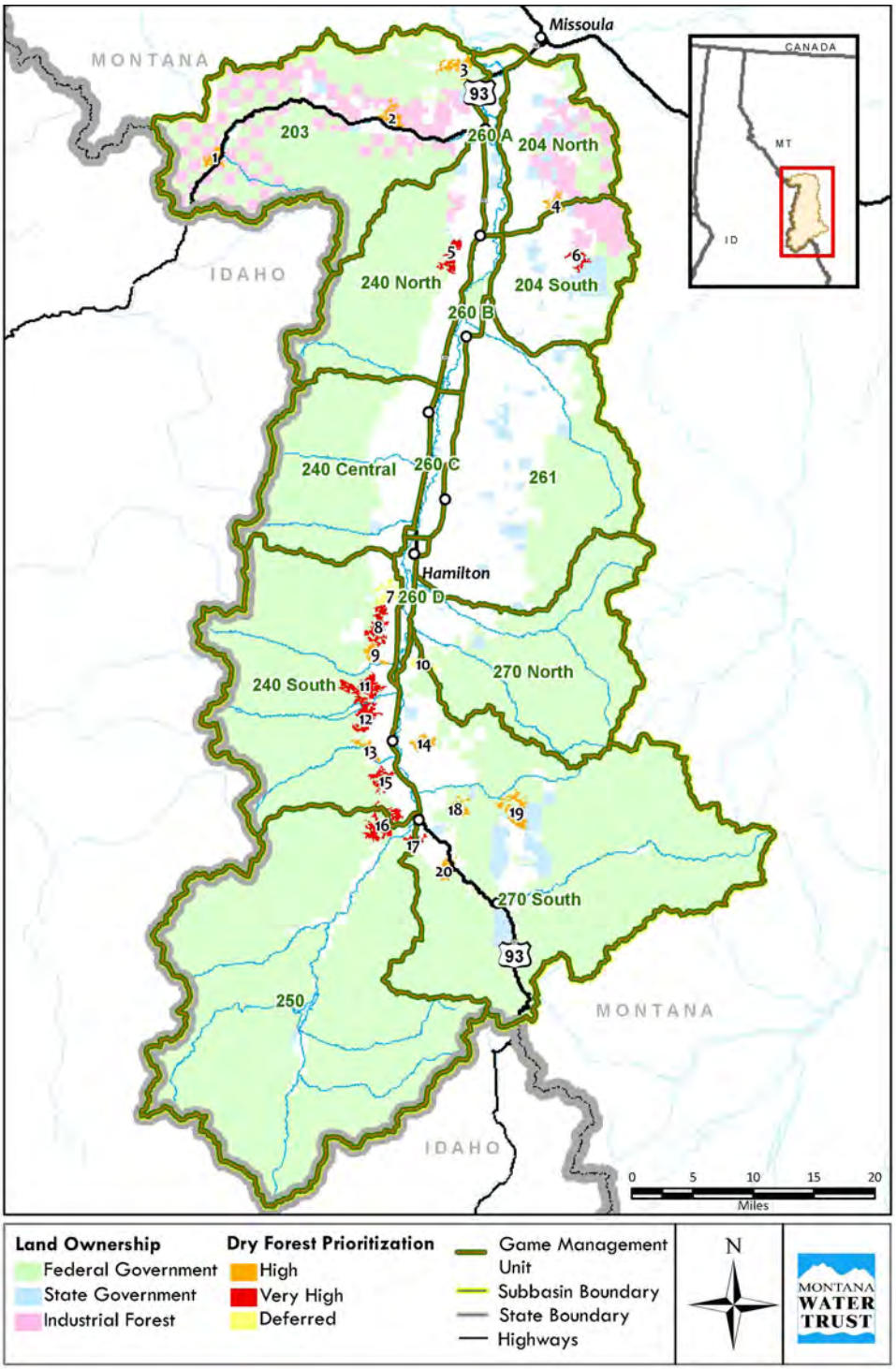

Figure 3.7. Priority dry forest habitats for the Bitterroot Subbasin (electronic versions of terrestrial habitat conservation priority maps at a large scale with detail allowing more precise location of each habitat patch are available from authors).

Table 3.32. Dry forest habitat conservation priority areas for the Bitterroot Subbasin.

New Parcel ID	Total Acres	Game Management Unit	Total Score	Class
1	804	203	9	Class 2
2	1165	203	8	Class 2
3	1632	203	10	Class 2
4	843	204 North	11	Class 2
5	1223	240 North	12	Class 2
6	643	204 South	12	Class 2
7	1404	240 South	6	Class 3
8	1693	240 South	14	Class 1
9	771	240 South	9	Class 2
10	734	270 North	6	Class 3
11	2152	240 South	14	**Class 1**
12	1195	240 South	13	**Class 1**
13	670	240 South	9	Class 2
14	735	270 South	9	Class 2
15	1169	240 South	15	**Class 1**
16	2618	250	13	**Class 1**
17	650	250	14	**Class 1**
18	657	270 South	10	Class 2
19	1817	270 South	9	Class 2
20	959	270 South	8	Class 2
Total Acres	23534			

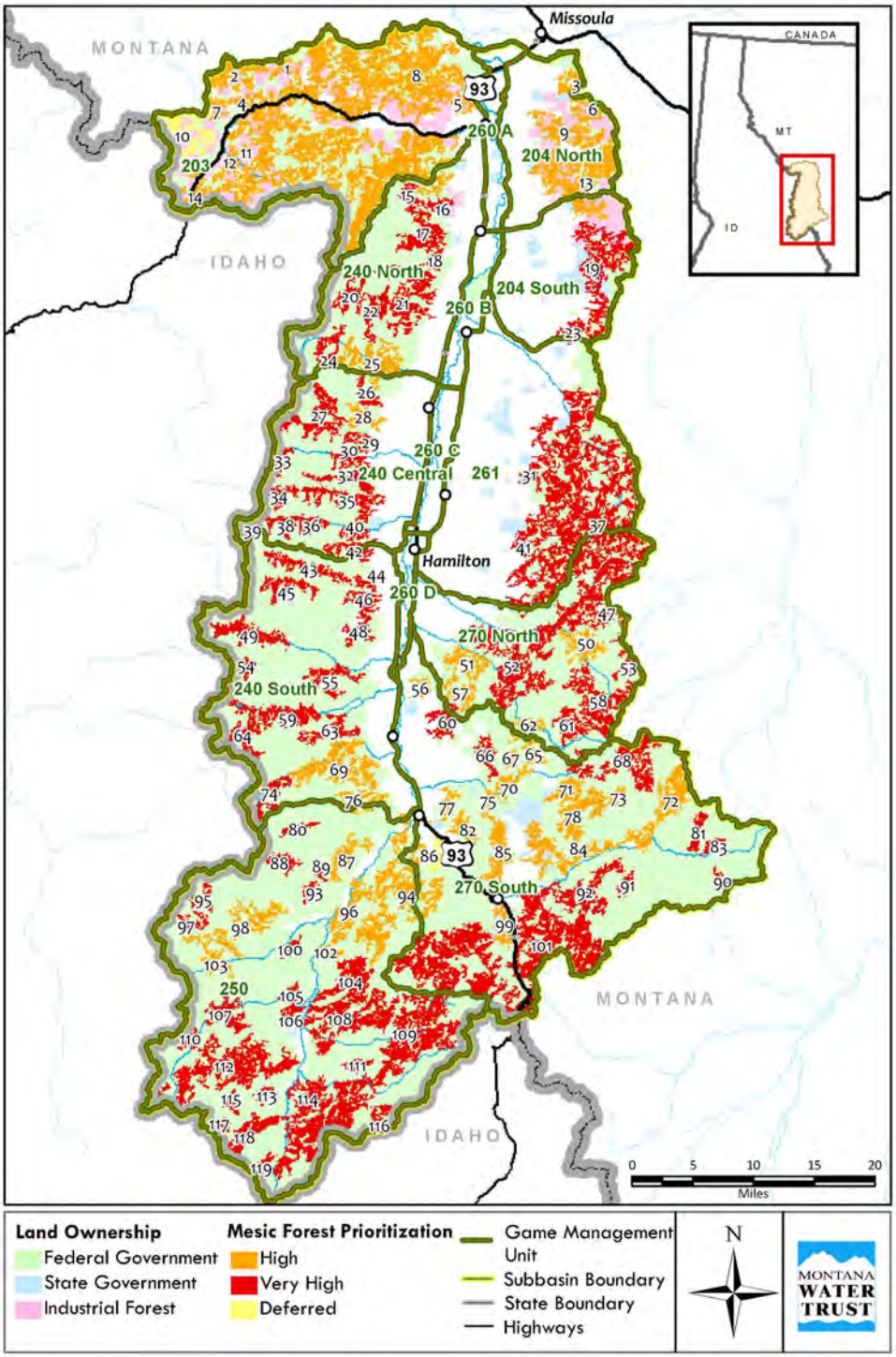

Figure 3.8. Priority mesic forest habitats for the Bitterroot Subbasin (electronic versions of terrestrial habitat conservation priority maps at a large scale with detail allowing more precise location of each habitat patch are available from authors).

Table 3.33. Dry forest habitat conservation priority areas for the Bitterroot Subbasin.

New Parcel ID	Total Acres	Game Management Unit	Total Score	Class
1	4634	203	10	Class 2
2	2099	203	10	Class 2
3	1033	204 North	8	Class 2
4	1346	203	9	Class 2
5	3907	203	9	Class 2
6	690	204 North	10	Class 2
7	859	203	8	Class 2
8	1162	203	8	Class 2
9	80087	204 North	11	Class 2
10	1325	203	7	Class 3
11	4358	203	10	Class 2
12	1700	203	8	Class 2
13	12944	204 North	12	Class 2
14	1161	203	9	Class 2
15	932	240 North	11	Class 2
16	1030	240 North	12	Class 2
17	4140	240 North	13	**Class 1**
18	745	240 North	12	Class 2
19	9322	204 South	12	Class 2
20	7759	240 North	13	**Class 1**
21	2149	240 North	12	Class 2
22	1363	240 North	12	Class 2
23	1822	204 South	12	Class 2
24	5700	240 North	12	Class 2
25	1372	240 North	9	Class 2
26	1084	240 Central	12	Class 2
27	4929	240 Central	14	**Class 1**
28	1527	240 Central	10	Class 2
29	1265	240 Central	12	Class 2
30	1454	240 Central	12	Class 2
31	1120	261	11	Class 2
32	2069	240 Central	12	Class 2
33	952	240 Central	12	Class 2
34	1303	240 Central	12	Class 2
35	3519	240 Central	14	**Class 1**
36	1454	240 Central	12	Class 2
37	55094	261	13	Class 2
38	1033	240 Central	12	Class 2

New Parcel ID	Total Acres	Game Management Unit	Total Score	Class
39	699	240 Central	12	Class 2
40	1155	240 Central	12	Class 2
41	729	261	10	Class 2
42	2082	240 Central	11	Class 2
43	2925	240 South	14	**Class 1**
44	694	240 South	13	Class 2
45	2221	240 South	12	Class 2
46	1663	240 South	11	Class 2
47	1998	270 North	12	Class 2
48	1480	240 South	12	Class 2
49	3946	240 South	12	Class 2
50	2640	270 North	11	Class 2
51	2502	270 North	9	Class 2
52	9333	270 North	12	Class 2
53	1426	270 North	14	**Class 1**
54	803	240 South	12	Class 2
55	3010	240 South	12	Class 2
56	793	270 South	10	Class 2
57	2167	270 North	9	Class 2
58	7023	270 North	12	Class 2
59	3277	240 South	12	Class 2
60	1899	270 South	11	Class 2
61	1554	270 North	12	Class 2
62	1294	270 North	10	Class 2
63	2507	240 South	11	Class 2
64	3725	240 South	13	**Class 1**
65	907	270 South	10	Class 2
66	1578	270 South	11	Class 2
67	718	270 South	9	Class 2
68	6682	270 South	12	Class 2
69	7000	240 South	11	Class 2
70	1526	270 South	9	Class 2
71	1380	270 South	10	Class 2
72	4818	270 South	11	Class 2
73	747	270 South	10	Class 2
74	2103	240 South	12	Class 2
75	816	270 South	9	Class 2
76	2375	240 South	9	Class 2
77	1132	270 South	10	Class 2

New Parcel ID	Total Acres	Game Management Unit	Total Score	Class
78	5108	270 South	10	Class 2
79	721	270 South	10	Class 2
80	928	250	12	Class 2
81	1276	270 South	14	**Class 1**
82	843	270 South	9	Class 2
83	874	270 South	11	Class 2
84	7244	270 South	10	Class 2
85	3939	270 South	11	Class 2
86	1624	270 South	7	Class 3
87	2619	250	11	Class 2
88	1466	250	12	Class 2
89	671	250	12	Class 2
90	655	270 South	12	Class 2
91	707	270 South	11	Class 2
92	5229	270 South	13	**Class 1**
93	850	250	12	Class 2
94	13451	250	11	Class 2
95	1157	250	13	Class 2
96	3736	250	11	Class 2
97	1023	250	12	Class 2
98	5332	250	11	Class 2
99	2111	270 South	10	Class 2
100	754	250	11	Class 2
101	18335	270 South	14	**Class 1**
102	734	250	9	Class 2
103	1469	250	10	Class 2
104	5230	250	12	Class 2
105	878	250	11	Class 2
106	810	250	11	Class 2
107	3126	250	13	**Class 1**
108	9098	250	13	**Class 1**
109	42045	250	14	**Class 1**

New Parcel ID	Total Acres	Game Management Unit	Total Score	Class
110	936	250	11	Class 2
111	829	250	12	Class 2
112	13521	250	14	**Class 1**
113	876	250	11	Class 2
114	3215	250	13	**Class 1**
115	731	250	12	Class 2
116	1840	250	13	**Class 1**
117	1206	250	11	Class 2
118	4123	250	13	**Class 1**
119	644	250	11	Class 2
Total acres	497733			

3.3.4 Near Term Opportunities

In riparian, wetland, grassland, sage-shrubland, and dry forest, many of the highest priority conservation opportunities are on private land. Several private conservation organizations, including Rocky Mountain Elk Foundation, Bitter Root Land Trust, Five Valleys Land Trust, and Montana Fish, Wildlife & Parks, among others, work closely with private landowners to conserve wildlife habitat on these lands. On some high priority lands, conservation easements have recently been purchased, others are under negotiation by these groups. Missoula County Open Space bond funds and Ravalli County Open Space bonds (approved in 2006) are an important asset to these land conservation programs. However, inadequate funding continues to be a limitation. Negotiations are confidential and so detailed description of land conservation opportunities are not available.

The Bitterroot and Lolo National Forests administer the vast majority of the land where priority mesic forest patches are located. These National Forests are in the process of updating their Forest Plans, and mesic forest wildlife habitat conservation opportunities will be a major concern of stakeholders.

Chapter 4 Consistency with ESA and CWA Requirements

Chapter 2 of the Bitterroot Subbasin Inventory identifies federal recovery plans for ESA-listed species, NWPCC Wildlife Protected Areas, State conservation and restoration management plans and strategies, and applicable County programs, plans, and policy documents.

Subbasin habitat and biological objectives are reflective of and integrated with recovery goals of ESA recovery plans, and they are supportive of and consistent with the federal Clean Water Act (CWA). The majority of habitat and biological objectives directly support goals and objectives in relevant ESA recovery plans and involve activities that help satisfy CWA objectives.

The bull trout is the only listed aquatic species found in the subbasin. Bull trout are listed as threatened under the ESA. The ESA is considered in all strategies and objectives related to bull trout recovery, and recovery efforts are coordinated with the FWS through MFWP or USFS to assure consistency with ESA management objectives (MBTRT 2002; UWFWS 2000) (See Appendix 9 for Bull Trout Recovery Plan restoration goals and strategies).

In the Bitterroot Subbasin there are two mammal species listed as threatened (Canada lynx and grizzly bear), one candidate bird species, and no threatened and endangered reptiles. The gray wolf (*Canis lupus*) was delisted in Montana in April 2009. The current Canada lynx critical habitat proposals for Montana do not include the Bitterroot Subbasin, and the grizzly bear is not known to be resident.

The MT DEQ is delegated (by the federal government) responsibility for implementing the CWA, which it does for the purposes of this subbasin plan through the TMDL process. **Water Quality Restoration Plans and Total Maximum Daily Loads** were completed for the Bitterroot River headwaters in 2005 and upper Lolo Creek in 2003; the plan for the mainstem Bitterroot River is in process. Objectives in these TMDL planning documents are considered in Bitterroot Subbasin management objectives and strategies, as is TMDL implementation coordination (Appendix 10 lists restoration strategies associated with final TMDLs in the subbasin).

Chapter 5 Research, Monitoring and Evaluation

This chapter describes the research, monitoring, and evaluation (RM&E) activities proposed to support conservation and restoration efforts in the Bitterroot Subbasin. RM&E needs are closely related to the subbasin vision, objectives and strategies described in sections 2 and 3.

The purpose of a research plan is to identify data gaps and how they might be addressed. Sections 5.1 and 5.2 present such a plan for aquatic and terrestrial resources.

A monitoring and evaluation program is needed to: (1) ensure that the strategies selected and implemented are addressing the limiting factors as anticipated; (2) verify that the limiting factors identified in the assessment are in fact the elements that are limiting the environmental expression and biological performance desired; and (3) evaluate progress towards meeting objectives. The monitoring and evaluation program is described in terms of an adaptive management framework set forth in Section 5.3.

The research plan included here is a first step that will be expanded over the course of the five-year iterative review process. Current or on-going RM&E programs (described in the Inventory) incorporate many of the RM&E needs identified in this section. Therefore, implementation of this plan will require close coordination with existing programs to prioritize needs, maximize effectiveness, and reduce redundancy.

5.1 Aquatic Research Plan

The research needs described here were developed in response to fish and wildlife limiting factors identified in the Assessment and the vision, hypotheses, objectives, and strategies sections of this plan. Table 5.1 presents the primary data gaps that form the basis for development of a research agenda. Data gaps and research needs are linked to specific management objectives, which in turn are tied to the working hypotheses and limiting factors identified in the Assessment. Table 5.1 is not comprehensive; rather it is meant to serve as an outline for development of a comprehensive research agenda in the future. A number of entities conduct research and monitoring in the subbasin. The list includes state and federal agencies, universities, local schools, and non-profit organizations. An effective research program will require a coordinated effort among these entities. Integrating research activities with regional efforts is also key.

Table 5.1. Data gaps and research needs identified to address uncertainties related to management and baseline status for aquatic focal species in the Bitterroot Subbasin.

Objective	Data Gap or Research Need	Outcome
BT1: Maintain or increase the number of fish in resident bull trout populations and increase the number of migratory fish.	• Determine tributary or sub-population specific baseline population status and population trends. • Identify, describe, and measure stream habitat and landscape-level characteristics and conditions at fish sampling sites to facilitate potential future use of habitat prediction tools (coordinate with current research by Rocky Mountain Research Station in Interior Columbia River Basin). • Improve extinction risk analysis relative to population size and population of isolated populations (West Fork Bitterroot River, East Fork Bitterroot River). • Determine genetic baseline of bull trout in additional populations for use in regional studies of genetic assignments. • Evaluate the use of genetic assessment to determine population status and trends. • Inventory and limiting factor analysis of migration barriers (has been completed for National Forest managed lands). • Quantify entrainment losses (Warm Springs Creek). • Determine migration pattern of bull trout upstream of Painted Rocks Reservoir.	Refined understanding of population status, genetic composition, and relation to other populations in the subbasin and region.
BT2: Where possible, reduce further expansion or suppress non-native species determined to be a significant threat to bull trout.	• Determine genetic baseline of bull trout in additional tributary populations (for use in determining genetic origin and extents of hybridization). • Conduct research to characterize species interactions specific to management in subbasin tributaries. • Determine tributary-specific upstream extents of nonnative species. • Determine tributary and reservoir-specific feasibility and predicted effectiveness of eradication efforts.	Refined understanding of subbasin-specific interactions between non-native species and bull trout to develop specific management strategies.
BT3: Achieve an overall bull trout population trend that is accepted to be stable or increasing based on at least 10 years of monitoring data.	Evaluate the need for focused restoration activities within core areas that will facilitate maintenance or increases in current population levels.	Refined understanding of population status and characterization. Information would be integrated into adaptive management framework and used to evaluating whether management objectives are achieved or changes in action course is needed.

Objective	Data Gap or Research Need	Outcome
BT4: Evaluate needs and opportunities to increase populations of bull trout throughout the subbasin by 2020.	• Data gaps and research needs identified for all other BT objectives apply. • Comprehensive limiting-factors analysis for use in refining prioritization criteria and priority locations for implementing strategies. • Correlation between priority restoration activities and anticipated population response, particularly within core areas where there is potential to facilitate maintenance or increases in current population levels.	Data to feed into adaptive management framework to refine strategies and restoration and conservation prioritization criteria.
WCT1: Maintain or increase the total number of genetically pure local populations and maintain the broad distribution of local populations.	• Correlate environmental conditions with genetic integrity (i.e. current research by Montana State University on genetically pure cutthroat temperature preference; study site Hughes Creek and research in progress by Rocky Mountain Research Station). • Genetic assessment research to establish genetic baseline. • Genetic assessment of populations for use in indicating population status and trends (research in progress by Rocky Mountain Research Station). • Quantify entrainment losses (Warm Springs Creek).	Refined understanding of population status, trends, and habitat preferences related to genetic assessment.
WCT2: Maintain or increase the number of fish in the migratory population.	• Implement telemetry study to track movement of fluvial fish in the lower Bitterroot (Lolo Creek population connectivity). • Implement telemetry study in other strongholds (East Fork Bitterroot River, Painted Rocks Reservoir).	Refined understanding of distribution of fluvial fish for use in prioritizing important spawning tributaries to focus restoration and conservation efforts.
WCT3: Where possible, reduce further expansion, suppress, or eradicate species that hybridize and directly compete with westslope cutthroat trout.	• Determine genetic baseline of westslope cutthroat trout in additional tributary populations (for use in determining genetic origin and extents of hybridization). • Determine tributary-specific upstream extents of nonnative species. • Collect tributary and reservoir-specific data to determine feasibility and predicted effectiveness of eradication efforts.	Refined understanding of hybridization extents and criteria for use in strategy prioritization.
WCT4: Evaluate needs and opportunities to increase populations of westslope cutthroat trout throughout the subbasin by 2020.	• Data gaps and research needs identified for all other WCT objectives apply. • Evaluate the need for focused restoration activities within core areas that will facilitate maintenance or increases in current population levels.	Data to feed into adaptive management framework to refine strategies and restoration and conservation prioritization criteria.
M1: Provide stream temperature connectivity in the form of cold-water refugia from tributaries to support movement of focal species.	• Develop realtime water temperature map for tributary streams downstream of National Forest Lands and mainstem river.	Integrated data set to determine temperature transition zones and prioritization.

Objective	Data Gap or Research Need	Outcome
T1: Reduce the delivery of human-caused fine sediments to lowest extent possible	• Correlate inventoried sediment sources with instream effects on focal species habitat.	Refined understanding of subbasin-specific effects of sediment to focal species populations for use in strategy refinement and prioritization.
T2: Maintain existing levels of prime, functioning tributary habitat.	• Comprehensive inventory of habitat conditions.	Data to feed into adaptive management framework to refine strategies, particularly related to specific habitat components.
TP1: Restore stream flows to levels that will support focal-species survival.	• Determine extents of dewatering on private-land portions of tributary streams. • Evaluate minimum flow requirements to support key conditions for focal species..	Refined locations of dewatering priority areas linked to specific points of diversion.
TP2: Restore aquatic and associated riparian habitat to levels that can support self-sustaining populations of focal species.	• Comprehensive inventory of habitat conditions.	Data to feed into adaptive management framework to refine strategies, particularly related to specific habitat components.

The data gaps identified in Table 5.1 are the foundation for the design of research projects. Each research project will require development of a number of elements, including: hypothesis development, sampling frequencies, sampling protocols, experimental design, and statistical analysis appropriate for the species of interest and the scope of research. These details will be included at the proper scale in project proposals. Objectives and strategies, hypotheses for testing, and the spatial and temporal scale at which research should be conducted provide a guide for research efforts.

The results of on-going and future research will provide the necessary data to assist planners in making management decisions, including prioritizing strategies and locations for implementing strategies within and between 'Active Restoration' subwatersheds. Section 5.3 discusses how on-going and future research will fit into future decision making in more detail.

5.2 Terrestrial Research Plan

5.2.1 Approach to Development of Research, Monitoring and Evaluation Plan

Substantial data gaps limit the value of a terrestrial wildlife conservation plan based on priority habitats. Data gaps exist at all levels, including basic target species population status and biology, description and understanding of target species relationship to habitats, and ecology of habitat management and restoration. This section outlines a general, preliminary research plan that will begin to address the most significant data gaps. It was developed by the partners as part of the Subbasin Plan's process of analyzing limiting factors and developing working hypotheses, objectives, and strategies.

Some components of the research and monitoring plan involve development of better baseline data on target species and habitats through regular monitoring. These monitoring functions will eventually be integrated into the overall adaptive management feedback process so that long-term progress towards the conservation objectives can be tracked. Evaluation of this monitoring data will be part of the adaptive management decision-making process.

A team of stakeholders will need to develop this preliminary plan into a full-scale research plan. The Lolo and Bitterroot National Forests, the USFS Regional biologists, the USDA-Rocky Mountain Research Station in Missoula, Montana Fish, Wildlife & Parks, and the University of Montana are key stakeholders. They have been collaborating on research in the Bitterroot for a number of years through the Bitterroot Ecosystem Management Research Program, which provides a strong basis for future conservation-oriented research work.

5.2.2. Ongoing RM&E for Terrestrial Wildlife in the Bitterroot

The University of Montana and the U.S. Forest Service Rocky Mountain Research Station frequently use the Bitterroot National Forest for wildlife-related research. The Bitterroot Ecosystem Management Research Program (BEMRP) started in 1993 and continues to support cooperative ecosystem research involving the Bitterroot National Forest, the USDA-Rocky Mountain Research Station, and University of Montana—over 200 peer-reviewed publications are listed on their website (http://www.fs.fed.us/rm/ecopartner/publications.shtml). Research focuses on four areas: fauna, landscape analysis, vegetation and fire, and human dimensions.

A variety of federal and state agencies have species monitoring programs in the subbasin that monitor target wildlife species. Tables 5.2 and 5.3 provide examples of ongoing monitoring programs for conservation target species.

Table 5.2. Monitoring programs for target mammal species in the Bitterroot Subbasin.

Species	Type of Monitoring/Method	Frequency/Location	Agency Lead
Elk	Population surveys/late winter aerial surveys	Annual/entire subbasin, by hunting district	MFWP
Pine Marten	Population surveys/track surveys	3 transects annually (winter) on Bitterroot NF	Bitterroot NF biologists
Fisher	Trapper surveys/reports by licensed trappers	Annual/entire subbasin; all of western Montana	MFWP
Gray wolf	Population surveys/aerial surveys and trapping: radio-telemetry collars	Annual/on-going/entire subbasin and nearby areas	MFWP

Table 5.3 Monitoring programs for conservation target bird species in the Bitterroot Subbasin.

Species	Type of Monitoring/Method	Frequency/Location	Agency Lead
Bald eagle	Nest surveys/aerial surveys	Annual/primarily Bitterroot river	MFWP
Flammulated Owls	Population/survey routes	Nearly annual in summer since 2005/Transects in Bitterroot & Lolo NF. Citizen efforts 2007.	UM Avian Science Center/USFS Region 1, BNF and LNF biologists
Northern Goshawk	Nest surveys/nest searches & monitoring	Annual/Bitterroot NF	Bitterroot NF biologists
Peregrine Falcon	Nest surveys/nest searches & monitoring	Annual/Bitterroot NF	MFWP, Inter-agency
Black-backed Woodpecker	Population/survey transects	Intermittent/Bitterroot NF	Bitterroot NF biologists

Species	Type of Monitoring/Method	Frequency/Location	Agency Lead
Pileated Woodpecker	Population/survey transects, USFS Region 1 method	3 transects annually/Bitterroot NF (also LBMP below)	Bitterroot NF biologists
Avian Productivity	Monitoring nesting productivity & survivorship/mist-netting & banding of songbirds	Annual at two long-term sites/ Bitterroot NF and Lee Metcalf NWR	Bitterroot NF biologists, USFWS
Breeding Bird Surveys	Breeding bird presence/driving transects	Annual on five routes/private land and USFS	USFWS, inter-agency, volunteers
Landbird Monitoring Program (LBMP)	Breeding bird presence and vegetation/transects and points	Every other year on 42 transects/Bitterroot & Lolo NF, through 2007	USFS Region 1, UM Avian Science Center
Winter raptor survey	Winter raptor (hawks, eagles, owl)/driving transect	Annual on one route /Eastside Hwy. private land	MFWP
Christmas Bird Counts	Winter bird populations/driving & walking within count circles	Annual at two 15-mile diameter count circles in Bitterroot Subbasin-Stevensville and Hamilton	Bitterroot Audubon Society Chapter and additional volunteers
International Shorebird Surveys	Standard Manomet shorebird monitoring protocol	Annual (spring-fall) on Lee Metcalf NWR	USFWS volunteers survey
Waterfowl Survey + Hunter survey	Population survey on transect by USFWS staff; plus compiled hunting harvest data	Monthly surveys on Lee Metcalf NWR; waterfowl hunters required to report	USFWS
Bitterroot Important Bird Area Monitoring	All riparian birds monitored via point counts and float survey	Beginning 2009 with plans for yearly monitoring	Bitterroot Audubon Society Chapter

Some of these programs will be useful in the implementation of the adaptive management monitoring program described in the next section. In other cases, new or modified monitoring programs will need to be designed. Table 5.5 includes some of these monitoring requirements.

5.2.3 General Research Needs

Terrestrial wildlife conservation-related research in western Montana is heavily weighted towards big-game species. Additional research requirements to support a habitat-based (including non-game) fish and wildlife conservation plan include a variety of diverse research topics. Table 5.4 includes some of the general areas of research required.

Table 5.4 General research needs and data gaps for terrestrial wildlife conservation-related research in the Bitterroot subbasin.

General Terrestrial Research Needs and Data Gaps
Provide quantitative ecological correlates for the priority habitat types.
Test the assumption that target habitats are functional if a target species group's recommended ecological correlates and management conditions are achieved.
Test of the assumption that selected target species or other obligate species/assemblages adequately represent the target habitats.
Provide current, high quality habitat data and maps to update the GAP analysis work, including field verification of spatial data interpretation.
Provide local population/distribution data for target species, especially in riparian, wetland, grassland, and sage habitats.
Evaluate the role of management treatments to maintain and improve habitat quality.

5.2.4 Research and Monitoring Needs to Address Specific Terrestrial Objectives

The terrestrial wildlife conservation objectives will require substantial investment in additional research, monitoring, and evaluation. The following table includes some guidance on data gaps and research and monitoring needs for specific objectives within the Subbasin Plan. These research and monitoring programs need to be developed and incorporated into the adaptive management strategy. Table 5.5 presents data gaps and research and monitoring needs for each terrestrial objective.

Table 5.5. Specific data gaps, research and monitoring needs by Terrestrial Objective for terrestrial wildlife conservation-related research in the Bitterroot subbasin.

Objective	Data Gap or Research Need	Outcome
Objective RW1: Protect all existing riparian habitat in all sections of Game Management Unit 260 (from Missoula to Darby) to maintain healthy populations of all riparian deciduous forest and shrub riparian target species in each section of the GMU, and maintain connectivity of habitat/ wildlife corridors throughout the river floodplain.	• Define key environmental correlates for target species in riparian subhabitats (deciduous riparian forest and riparian shrub). • Develop consolidated key environmental correlates for these riparian subhabitat types in Bitterroot. • Research the viability of environmental correlates for predicting riparian habitat quality and species presence using intensive field sampling/analysis. • Develop detailed maps of riparian habitat condition, relate existing conditions to key environmental correlates, i.e. desired condition (GMU 260 Bitterroot River). • Compile existing avian survey data, and design additional surveys to document and map avian target species presence for riparian habitats in Game Management Unit 260. • Analyze limiting factors for riparian avian productivity in target species (start with prior work of Tewksbury, et.al.). • Analyze viability of big game and furbearer movement corridors between river riparian and tributary riparian areas (remote cameras, telemetry, e.g. moose, fisher).	Improved understanding of quantifiable riparian habitat conditions that support viable populations of target species, and maps of habitat condition in GMU 260.
Objective RW2: Protect at least 50 percent of existing high-quality riparian habitat on private land in each tributary Game Management Unit, and conserve and manage all public-land riparian habitat to maintain healthy populations of appropriate deciduous riparian forest species, all shrub riparian, and all riparian coniferous forest target species in each GMU.	• Define key environmental correlates for target species in riparian subhabitats (upland riparian shrub and riparian coniferous forest) • Develop consolidated key environmental correlates for these riparian subhabitat types in Bitterroot • Expand existing inventories of riparian habitat condition vs. key environmental correlates in USFS lands (using a sampling plan) • Using groundtruthed aerial survey methods, develop maps of riparian habitat status on all major Bitterroot tributaries on private land.	Maps of riparian habitat condition in the Bitterroot Subbasin for both private and public lands.

Objective	Data Gap or Research Need	Outcome
Objective RW3: Protect and manage all existing wetlands in the Bitterroot River mainstem geologic floodplain area (GMU 260) and all high-quality tributary wetlands to maintain or improve subbasin populations of wetland target species by 2025.	• Define key environmental correlates for target species in wetlands subhabitats. • Develop consolidated key environmental correlates for each wetland subhabitat type. • Research the viability of environmental correlates for predicting wetland habitat quality and species presence using intensive field sampling/analysis • Develop detailed maps of wetland habitat condition, relate existing conditions to key environmental correlates, i.e. desired condition (start with GMU 260Bitterroot River—combine with riparian work). • Compile existing avian survey data and design additional surveys to document avian target species presence for wetland habitats in each Game Management Unit. • Analyze limiting factors for wetland avian productivity in target species.	Maps of wetland habitat condition in the Bitterroot Subbasin for both private and public lands.
Objective GSS1: Protect at least 30,000 new acres of Class 1 and Class 2 grassland and sagebrush/shrub habitat, including 20,000 acres in the lower and middle Bitterroot, and at least 10,000 acres in the upper Bitterroot (above Darby) by 2025.	• Define key environmental correlates for target species in grassland/sage habitats. • Develop consolidated key environmental correlates for these habitat types. • Research the viability of environmental correlates for predicting grassland and sage/shrub habitat quality and species presence using intensive field sampling/analysis. • Develop detailed maps of grassland/sage habitat condition, relate existing conditions to key environmental correlates, i.e. desired condition, by GMU (focus on 204, 261, 270). • Develop monitoring program for birds, small mammals, and reptiles and amphibians on Class 1 private land and DNRC grasslands/sage sites. • Analyze limiting factors for productivity of small populations of grassland/sage target species.	Improved understanding of key habitat conditions and target species populations on highest quality grassland/sage sites.
Objective GSS2: Improve, enhance and conserve the 30,000 new acres of grassland/ sagebrush/shrub habitat protected under Objective #1.	• Continue research on grassland plant diversity/ productivity relationships with noxious weed invaders. • Continue research on long-term management options for noxious weed invaders.	Improved grassland/ sage management recommendations that support conservation of desired plant diversity and target wildlife species.
Objective GSS3: Enhance the condition of Class 2 and other high quality grassland and sagebrush/bitterbrush habitat on public and private lands through federal, state and local programs.	• Continue research on grassland plant diversity/ productivity relationships with noxious weed invaders • Continue research on longterm management options for noxious weed invaders	Improved grassland/ sage management recommendations that support restoration of desired plant diversity and target wildlife species.

Objective	Data Gap or Research Need	Outcome
Objective DFMF1: Maintain, conserve and manage all Class 1 (high-priority) dry forest and mesic forest habitats in all game management units, including securing protection for at least 5,000 additional acres of private land in the dry forest type by 2025, and maintain the populations of all target species in each game management unit.	• Define key environmental correlates for target species in dry and mesic forest habitats. • Develop consolidated key environmental correlates for these coniferous forest subhabitat types. • Research the viability of environmental correlates for predicting dry and mesic forest habitat quality and species presence using intensive field sampling/analysis. • Expand sampling sites for forest habitat condition, relating existing conditions to key environmental correlates, and presence of target species, i.e. desired condition. • Map dry forest habitat condition throughout the Bitterroot publicprivate interface zone. • Expand monitoring of of dry forest target species, including private lands sites.	Improved understanding of quantifiable habitat requirements of dry forest target species, and mapping of sites where those conditions exist
Objective DFMF2: Restore and maintain Class 2 (priority) dry forest and mesic forest habitats in all units, including habitat restoration on 20,000 acres of dry forest and restoration of at least 20 percent of USFS mesic forests to appropriate fire regime condition classes, while maintaining or increasing populations of all target species.	• Evaluate management success in reestablishing key environmental correlates in dry forests and mesic forests. • Analyze target species response to long-term fire regime reestablishment process. • Expand monitoring of mesic forest target species through USFS monitoring programs to include sample sites in each GMU.	Improved understanding of how target wildlife species react to forest habitat restoration programs.
Objective DFMF3: Restore examples of locally uncommon Class 2 mesic forest subhabitats including ecologically–functional subalpine spruce-fir, western larch, burned forest, and white bark pine ecosystems and achieve measurable increases of aspen/mixed broadleaf inclusions where opportunities exist on the landscape by 2025.	• Expand USFS monitoring programs to specifically include all target species for mesic forest subtypes. • Continue whitebark pine disease resistance and general ecological research. • Analyze aspen regeneration management methods in different fire and grazing/browsing regimes. • Set up aspen, western larch, and whitebark pine monitoring plots for long-term habitat restoration experiments.	Improved understanding of methods for regenerating uncommon forest subhabitats.
Objective DFMF4: Rehabilitate Class 3 dry and mesic forest habitats where opportunities exist.	• Set up aspen, western larch, sprucefir and whitebark pine monitoring plots in degraded sites for long-term habitat restoration experiments.	Improved understanding of methods for regenerating uncommon forest subhabitats.

5.3 Monitoring & Evaluation

The adaptive management framework links the subbasin management plan with subsequent project planning, prioritization, and implementation. The management plan goes as far as applying coarse-scale prioritization criteria to subwatersheds based on what is currently known about focal species and habitats in subwatersheds and throughout the subbasin. In addition, objectives and strategies for focal species and habitats were developed (Section 3.2.1, 3.3.1). As described in Section 5.2, many data gaps still exist, particularly at the resolution of individual subwatersheds. Because adaptive management means that managers must be flexible and able to respond to new information as it becomes available, it is important to fill data gaps in a structured way, so information from research and project effectiveness monitoring can feed back into the overall program. This feedback system (Figure 5.1) is the adaptive management framework for the Bitterroot Subbasin Plan.

In general, adaptive management can be defined as incorporating the scientific method into a management framework to resolve a specific problem or problems. Adaptive management is based on the premise that informed, deliberate experimentation is the most reliable means of understanding and addressing complex problems in resource systems. Moreover, the adaptive management approach incorporates the development and comparison of alternative models based on multidisciplinary collaboration as the basis of management, experimental design, and monitoring of the resource system (Holling 1978; Walters 1986). This differentiates adaptive management from a more traditional trial-and-error or learn-as-you-go management approach (Hilborn 1992, Halbert 1993).

When applied to conservation and restoration planning at a large scale (as with the Bitterroot Subbasin), adaptive management provides a necessary framework for implementing the subbasin plan and linking it to related programs managed by other stakeholders. So, rather than just being one activity, adaptive management encompasses all phases of implementation, including project prioritization within subwatersheds, project implementation, research, and monitoring and evaluation.

Implementing the subbasin plan within an adaptive management framework will result in an interdisciplinary process focused on increasing knowledge about the ecosystem and its habitats and focal species and how projects affect focal species and habitats. This allows for projects developed in later phases of subbasin plan implementation to incorporate effectiveness monitoring data from previous projects, resulting in new projects being more effective than they would be without this feedback loop.

In addition to providing feedback that can continuously improve specific projects in an iterative manner, this type of structured data gathering and analysis can improve knowledge in general about the subbasin and potentially lead to refinement of subbasin objectives and strategies.

Other key ingredients of this adaptive management framework are existing monitoring and evaluation programs and the stakeholders themselves. Together, these pieces make up the current state of management and knowledge in the subbasin, so stakeholders and their existing management programs will be critical as the Bitterroot Subbasin Plan is implemented over the next 10 to 15 years. Figure 5.1 illustrates how these and other components combine to make up the adaptive management framework for the Bitterroot Subbasin Plan.

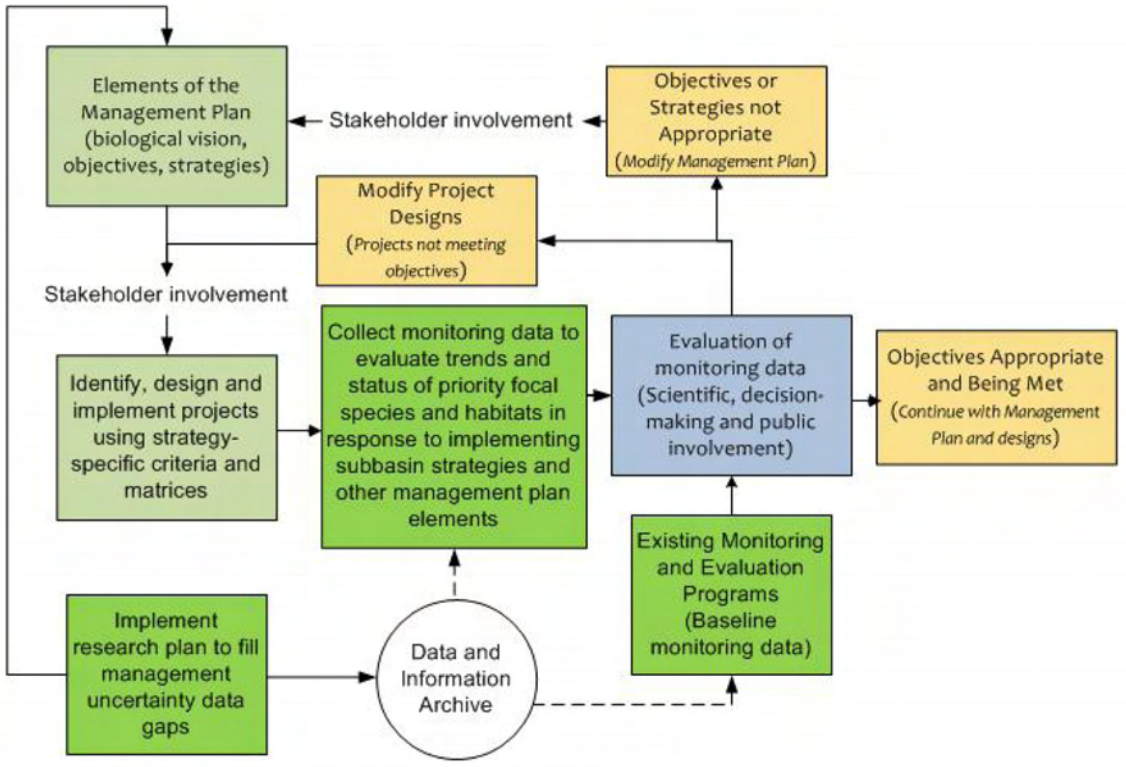

Figure 5.1. Bitterroot Subbasin Plan Adaptive Management Framework. Grey boxes indicate planning steps; green boxes indicate data inputs (research and monitoring), the blue box indicates the evaluation step, and brown boxes indicate decision-making steps.

The purpose of the Bitterroot Subbasin Plan adaptive management framework is to provide an ecological management framework to:

- Link together the vision, objectives and strategies identified in the management plan;
- Guide development (by stakeholders) of monitoring objectives and indicators (translated into metrics) that support management plan strategies and objectives and allow evaluation of progress toward meeting management plan objectives at the subbasin scale and at the scale of subwatersheds where appropriate and feasible;
- Using indicators and metrics developed by stakeholders, evaluate whether management plan objectives are being met and, at a larger scale, whether management plan objectives and strategies are appropriate or need to be modified;
- Collect and store monitoring data specifically aimed at evaluating effectiveness of specific projects implemented under the subbasin plan and where possible incorporate other data from related monitoring and evaluation programs into a data and information archive; and
- Provide a structure for incorporating new information from research and identify additional data gaps as they become apparent.
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While it is possible to describe a framework for implementing the Bitterroot Subbasin Plan in an adaptive manner, the details of the monitoring and evaluation program will be developed as part of

subsequent project planning, prioritization, and implementation. As a starting point for developing a detailed, stakeholder-driven monitoring and evaluation program, Tables 5.6 and 5.7 include potential indicators, which are structural and functional attributes of the subbasin that can be used to detect changes resulting from implementing strategies. These indicators are stated in terms of possible success criteria and linked to each management objective.

Table 5.6 Monitoring and evaluation indicators related to Bitterroot Subbasin aquatic management objectives and strategies.

Objective	Strategies	Indicators (Success Criteria)
Bull Trout Objectives		
BT1: Maintain or increase the number of fish in resident bull trout populations and increase the number of migratory fish.	• Remove barriers interfering with bull trout migration or restricting use of suitable habitat. • Eliminate entrainment in ditches. • Minimize unintentional bull trout mortality through regulations, guidelines, and education. • Conduct a genetic inventory to understand the genetic baseline and importance of tributary stream subpopulations. • Implement Habitat Related Objectives M1, T1, T2, TP1 and TP2.	Long-term population sampling shows that populations are stable or increasing; Movement and migration is documented throughout a greater range; A genetic baseline has been developed for subbasin populations.
BT2: Where possible, reduce further expansion of or suppress non-native species determined to be a significant threat to bull trout.	• Implement education and outreach programs on the effects of non-native fish and aquatic nuisance species to prevent further introductions. • Implement research to evaluate species interactions in terms of risks to bull trout populations. • Develop a decision pathway for determining appropriateness of non-native fish removal and prioritization of locations. • Continue to manage non-native fish species for increased harvest. • Evaluate biological, economical, and social effects of control or eradication of nonnative fish. Possible methods of control or eradication include: electrofishing, swamping of high elevation lakes or use of piscicides such as antimycin or rotenone.	Population sampling reveals a decrease in non-native species; Research and educational programs are in place to increase scientific and public awareness of non-native species threats and control measures.
BT3: Achieve an overall bull trout population trend that is accepted to be stable or increasing based on at least 10 years of monitoring data.	• Implement strategies for Objectives BT1, BT2, M1, T1, T2, TP1, and TP2.	Long-term population sampling shows bull trout populations are stable or increasing in the subbasin.

Objective	Strategies	Indicators (Success Criteria)
BT4: Evaluate needs and opportunities to increase populations of bull trout throughout the subbasin by 2015.	• Implement Research, Monitoring & Evaluation plan. • Implement subbasin-wide aquatic strategies. • Implement strategies for Objectives BT1, BT2 and BT3 that involve developing decision pathways for project selection and prioritization.	Research, monitoring , and evaluation plan is in place and is beginning to fill identified data gaps.
Westslope Cutthroat Objectives		
WCT1: Maintain or increase the total number of genetically pure local populations and maintain the broad distribution of local populations.	• Conduct sampling to establish the genetic baseline and monitor genetic changes. • Eliminate entrainment in ditches. • Evaluate potential differences in the effects of introduced fishes on westslope cutthroat trout between subwatersheds. • Continue to monitor effects of existing harvest regulations on westslope cutthroat trout populations. • Develop a decision pathway for selecting and prioritizing strategies that incorporates genetic integrity and risk level. • Place preference on strategies that will benefit populations with a documented fluvial component. Implement strategies related to Objective WCT2. • Implement strategies related to Objective WCT3.	Populations are stable or increasing and WCT range is as large or larger than present; Genetic purity of WCT exceeds a threshold (to be determined).
WCT2: Evaluate needs and opportunities to increase populations of westslope cutthroat trout throughout the subbasin by 2015.	• Continue to monitor fluvial fish movement to prioritize tributaries for restoration and conservation. • Remove barriers interfering with westslope cutthroat trout migration or restricting use of suitable habitat. • Implement strategies related to objectives M1, T1, T2, T3, TP1, TP2, and TP3. • Include the documented use by fluvial westslope cutthroat trout as priority criteria in decision pathways.	Research, monitoring, and evaluation plan is in place and is beginning to fill identified data gaps; Implemented strategies are resulting in increased populations and greater movement and migration of fluvial fish in the subbasin.

Objective	Strategies	Indicators (Success Criteria)
WCT3: Where possible, reduce further expansion, suppress or eradicate species that hybridize and directly compete with westslope cutthroat trout.	• Implement education and outreach programs on the effects of non-native fish and aquatic nuisance species to prevent further introductions. • Evaluate biological, economical, and social effects of control or eradication of nonnative fish. Possible methods of control or eradication include: electrofishing, swamping of high-elevation lakes with genetically pure stock or use of piscicides such as antimycin or rotenone. • Develop a decision pathway for determining appropriateness of non-native fish removal and prioritization of locations. • Continue to manage non-native fish species for increased harvest. • Implement research to evaluate species interactions in terms of risks to westslope cutthroat trout populations.	Population sampling reveals a decrease in non-native species and hybridized WCT; Research and educational programs are in place to increase scientific and public awareness of non-native species threats and control measures.
WCT4: Maintain or increase the number of fish in the migratory population.	• Implement strategies for Objectives WCT1, WCT2 and WCT3 that involve developing decision pathways for project selection and prioritization. • Implement RM&E plan. • Implement subbasin-wide aquatic strategies.	Research, monitoring , and evaluation of strategy success have led to adaptive management decisions that increase WCT migratory populations.
Mainstem Objectives		
M1: Provide stream temperature connectivity in the form of cold water refugia from tributaries to support movement of focal species.	• Implement strategies for objectives T3, TP1, and TP2. • Develop a temperature model and map for the mainstem Bitterroot River and major tributary streams to identify limiting areas. • Continue to manage releases from Painted Rocks reservoir for late season flows. • Pursue more efficient water uses from mainstem irrigation diversions. • Identify floodplain and riparian restoration and enhancement opportunities along the mainstem river.	Water use and management throughout the subbasin has resulted in greater thermal connectivity for movement and migration of focal aquatic species; Areas where water temperature is the primary limiting factor have been reduced.

Objective	Strategies	Indicators (Success Criteria)
Tributary Objectives		
T1 (public): Reduce the delivery of human-caused fine sediments to the maximum extent possible.	• Where a final TMDL is in place, implement associated restoration strategies. • Identify, prioritize and upgrade problem roads. • Identify, prioritize and address general sediment sources include eroding streambanks and fire-related sediment sources.	Sediment delivery to subbasin tributaries has been reduced; Problematic sediment sources have been identified and strategies for addressing them are being developed and/or implemented.
T2 (public): Maintain existing levels of prime, functioning tributary habitat.	• Ensure that Forest Plan revisions support focal species conservation and restoration. • Conduct habitat inventories to establish baseline conditions.	There has been no reduction to the amount of functioning tributary habitat within the subbasin; Focal species baseline data has been collected and conservation plans have been developed to maintain habiatat integrity.
TP1 (private): Restore stream flows to levels that will support focal species survival.	• Conduct assessments, both on the ground and aerial, to identify the extent of tributary dewatering. • Develop decision pathway for determining instream flow conservation prioritization. • Improve instream flows in all high priority streams based on criteria included in decision pathway.	Areas of tributary dewatering have been identified and prioritized; Coordination with private stakeholders is underway in order to address highest priority tributaries and restore appropriate stream flow levels.
TP2 (private): Restore habitat diversity to support sustainable population levels of focal species.	• Conduct assessments to determine locations of habitat limitations (riparian and instream habitat). • Develop decision pathways to assist in project selection and prioritization. Decision pathway should integrate a range of criteria including: focal species population status, feasibility, land owner cooperation, etc. • Assess and mitigate nonpoint thermal pollution. • Enforce water quality standards and implement total maximum daily load programs where in place. • Improve grazing practices. • Protect riparian habitats. • Develop riparian and stream education and outreach programs. • Promote local government policies to protect riparian areas and streams. • Protect and improve stream flows. • Remove roads. Where possible, remove, recontour or relocate roads impacting function of riparian and stream habitat. • Implement stream enhancement or restoration.	Assessments have been made in order to determine privately-owned lands that should be prioritized for restoration; Subbasin-wide limitations such as thermal pollution, grazing practices, transportation corridors, and degradation of riparian habitats have been addressed through education, outreach, and coordination with private landowners in order to restore as much focal species habitat as possible.

Table 5.7. Monitoring and evaluation indicators related to Bitterroot Subbasin terrestrial habitat management objectives and strategies.

Objective	Strategies	Indicators (Success Criteria)
Riparian and Wetland Habitats		
Objective RW1: Protect all existing riparian habitat in all sections of Game Management Unit 260 (from Missoula to Darby) to maintain healthy populations of all riparian deciduous forest and shrub riparian target species in each section of the GMU and maintain connectivity of habitat/wildlife corridors throughout the river floodplain.	Permanently protect riparian habitat on private lands in GMU 260 through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, and other land protection tools.	Riparian habitat is being protected or restored throughout GMU 260; projects which alter the natural banks, floodplains, and native riparian vegetation of the Bitterroot River mainstem are reduced in number (e.g. 310 permits along river). Amount of regenerating riparian deciduous forest is increased.
	Encourage and assist private and state landowners on the river mainstem to access appropriate riparian habitat restoration/management programs including weed management, grazing improvements, and revegetation with native species.	
	Collaborate with federal, state and county policymakers to encourage maintenance of natural channels and flood hydrology to improve floodplain function and riparian deciduous forest regeneration along the Bitterroot River.	
	Encourage state and county policymakers to preserve natural riparian vegetation in all flood-prone areas and minimize residential development and destruction of remaining native riparian vegetation in floodplain fringes.	
Objective RW2: Protect at least 50 percent of existing high-quality riparian habitat on private land in each tributary Game Management Unit, and conserve and manage all public-land riparian habitat, to maintain healthy populations of appropriate deciduous riparian forest species, all shrub riparian, and all riparian coniferous forest target species in each GMU.	Permanently protect riparian habitat on private lands through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, and other land protection tools.	Fifty percent of high-quality riparian habitat is actively being protected or restored or measures are being taken to achieve this goal.
	Encourage and assist private, state, and federal landowners to access appropriate riparian habitat restoration and management programs for tributaries, including natural channel stabilization, weed management, grazing improvements, revegetation with native species, and conservation planning.	
	Complete and implement forest travel management plans and road maintenance plans for USFS lands that improve riparian forest habitat quality and respond to specific riparian wildlife habitat and security needs.	

Objective	Strategies	Indicators (Success Criteria)
Objective RW3: Protect and manage all existing wetlands in the Bitterroot River mainstem geologic floodplain area (GMU 260) and all high-quality tributary wetlands to maintain or improve subbasin populations of wetland target species by 2025.	Collaborate with federal, state and county policymakers to encourage maintenance of natural channels and flood hydrology, to improve floodplain function and maintenance of natural wetlands in the Bitterroot River floodplain and floodplain fringe.	All significant wetlands in GMU 260 are being protected or restored; private land owners are being provided with education and outreach concerning habitat values and management program opportunities.
	Permanently protect high-quality wetland habitats on private lands through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, USDA-NRCS programs (e.g. Wetland Reserve), and other tools.	
	Increase public awareness and understanding of wetland and riparian habitat values and specific wetland/ riparian wildlife habitat security needs.	
	Encourage and assist private and state landowners to access appropriate wetland habitat restoration/management programs, including weed management, grazing improvements, and revegetation with native species.	
Grassland and Sagebrush/Shrub Habitats		
Objective GSS1: Protect at least 30,000 new acres of Class 1 and Class 2 grassland and sagebrush/ shrub habitat, including 20,000 acres in the lower and middle Bitterroot, and at least 10,000 acres in the upper Bitterroot (above Darby) by 2025.	Permanently protect Class 1 grasslands and sagebrush/shrub habitat on private lands through conservation easements, land exchanges, fee-title acquisition, cooperative agreements, and other land protection tools.	Protection measures have achieved or are trending toward acreage defined in Objective 1.
	Collaborate with landowners, NGOs, local, state and federal agencies to identify and accomplish the most efficient, effective, and scientifically-sound conservation outcomes for grassland/sagebrush/shrub areas.	

Objective	Strategies	Indicators (Success Criteria)
Objective GSS2: Improve, enhance and conserve the 30,000 new acres of grassland/sagebrush/shrub habitat protected under Objective #1.	Encourage and assist landowners to access appropriate grassland/sage management programs, including weed management, grazing improvements, and conservation planning.	Newly protected grasslands are actively being conserved or enhanced; stakeholders are being provided with educationand outreach in order to encourage conservation practices; programs for weed management and/or grazing management are being used at higher rates.
	Encourage use of land conservation programs that reduce wildlife damage and wildlife harassment problems.	
	Encourage re-establishment of native plant communities, where practical, on all degraded sites.	
	Increase public awareness and understanding of grassland and sagebrush/shrub habitat values.	
Objective GSS3: Enhance the condition of Class 2 and other high quality grassland and sagebrush/ bitterbrush habitat on public and private lands through federal, state and local programs.	Provide additional technical assistance and financial incentives to actively manage remaining grassland and sagebrush/shrub habitats.	New or existing programs are being used more frequently in order to promote the enhancement and conservation of existing Class 2 grasslands.
	Collaborate with federal, state and county policymakers to increase funding for programs that benefit grassland/ sagebrush/shrub conservation.	
Dry Forest and Mesic Forest Habitats		
Objective DFMF1: Maintain, conserve and manage all Class 1 (high-priority) dry forest and mesic forest habitats in all game management units, including securing protection for at least 5,000 additional acres of private land in the dry forest type by 2025 and maintaining the populations of all target species in each game management unit.	Seek private or state conservation easements and/or management agreements on Class 1 private forests.	Class 1 forests are being conserved and managed with respect to fire regime, weed management, and target species population at a higher rate (acres/year); Achievement or progress toward additional 5,000 acre private conservation of dry forests goal.
	Execute ponderosa pine habitat restoration projects (thinning, prescribed burn, etc.) for Class 1 dry forest habitats.	
	Encourage a natural fire regime in all Class 1 dry and mesic forests, where appropriate, to maintain habitat quality.	
	Encourage aggressive weed management in dry forests to maintain or improve native plant diversity.	

Objective	Strategies	Indicators (Success Criteria)
Objective DFMF2: Restore and maintain Class 2 (priority) dry forest and mesic forest habitats in all units, including habitat restoration on 20,000 acres of dry forest and restoration of at least 20 percent of USFS mesic forests to appropriate fire regime condition classes, while maintaining or increasing populations of all target species.	Actively manage forest vegetation to address insect-disease and fire regime issues and to restore forest habitat quality for all target species.	Restoration and maintenance of Class 2 forests with respect to habitat diversity, fire regime, and insect/disease is ongoing; Achievement or progress toward 20,000 acre dry forest restoration goal and 100,000 acre (20 percent) mesic forest restoration goal by USFS.
	Manage vegetation to improve forest habitat diversity for all target species.	
	Complete and implement forest travel management plans that respond to wildlife habitat security needs.	
Objective DFMF3: Restore examples of locally uncommon Class 2 mesic forest subhabitats including ecologically–functional subalpine spruce-fir, western larch, burned forest, and white bark pine ecosystems and achieve measurable increases of aspen/mixed broadleaf inclusions where opportunities exist on the landscape by 2025.	Promote and develop specific management projects to restore examples of uncommon mesic forest types.	Examples of uncommon mesic forest types have been restored in areas as available.
	Explore opportunities for restoring uncommon mesic forest types that coincide with the maintenance and restoration of Class 1 and 2 habitats.	
Objective 4: Rehabilitate Class 3 dry and mesic forest habitats where opportunities exist.	Explore opportunities for restoring Class 3 forests that coincide with the maintenance and restoration of Class 1 and 2 habitats.	Class 3 rehabilitation is ongoing or being pursued

Tables 5.2 and 5.3 describe monitoring indicators and success criteria at a conceptual level. As one of the first steps in implementing the Bitterroot Subbasin Plan, it will be necessary to identify a core group of stakeholders who can refine these indicators and success criteria. The refined indicators and success criteria will then form the foundation of a monitoring program that will provide a system of accountability when projects are implemented under the Subbasin Plan's overall framework. In order to refine the monitoring program and the larger, related adaptive management framework, the subbasin planning team will need to identify funding sources to complete the following steps that will result in a comprehensive, final adaptive management framework:

- Convene a technical oversight group that represents a subset of stakeholders who will focus on integrating Subbasin Plan implementation and related monitoring with existing, ongoing monitoring programs within particular agencies. This group will likely include representatives of land management agencies, universities, and research-focused conservation groups;
- Organize a larger, umbrella stakeholder group that includes other affected parties such as irrigators, agricultural operators, local government, conservation groups, and other interested parties who may be potential project partners or collaborators;
- Refine the Subbasin Inventory to include details about restoration and conservation projects so that the information can serve as a baseline for comparison with changes in focal species populations and habitat over time and can contribute to project prioritization within subwatersheds where past projects might influence the selection or design of future projects;
- Refine monitoring indicators, taking into consideration existing monitoring programs and continuing to link to subbasin objectives and strategies;
- Continue to identify data gaps and modify the research plan accordingly; and
- Develop a central data archive where information from monitoring and research can be integrated to support adaptive decision-making.

Once this framework is in place, and possibly concurrent with its development, subbasin planners will develop decision-making pathways to assist with the identification (and ranking in priority order) of projects within each subwatershed or habitat unit. Example decision pathways for aquatic habitat projects related to bull trout and westslope cutthroat trout are shown in Figures 5.2 and 5.3.

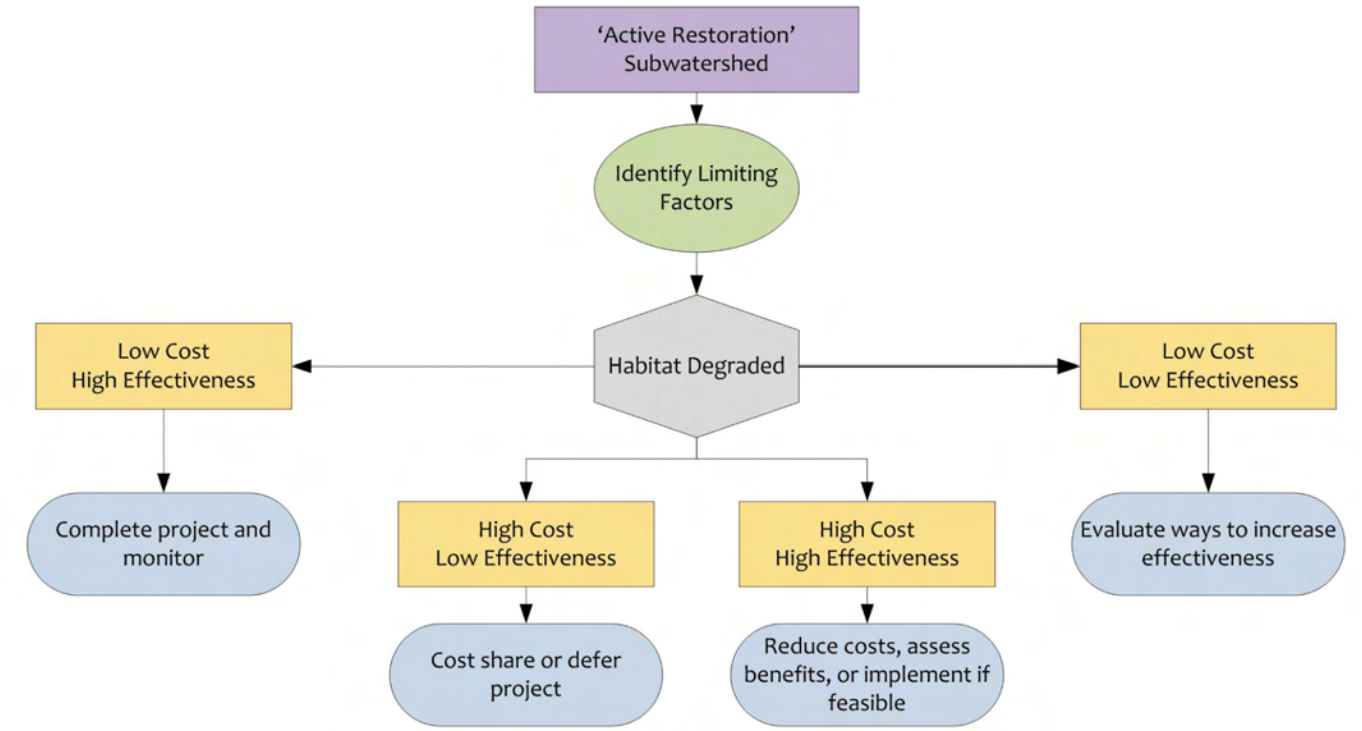

Figure 5.2. Example decision-making pathway for implementing habitat restoration work in Active Restoration subwatersheds.

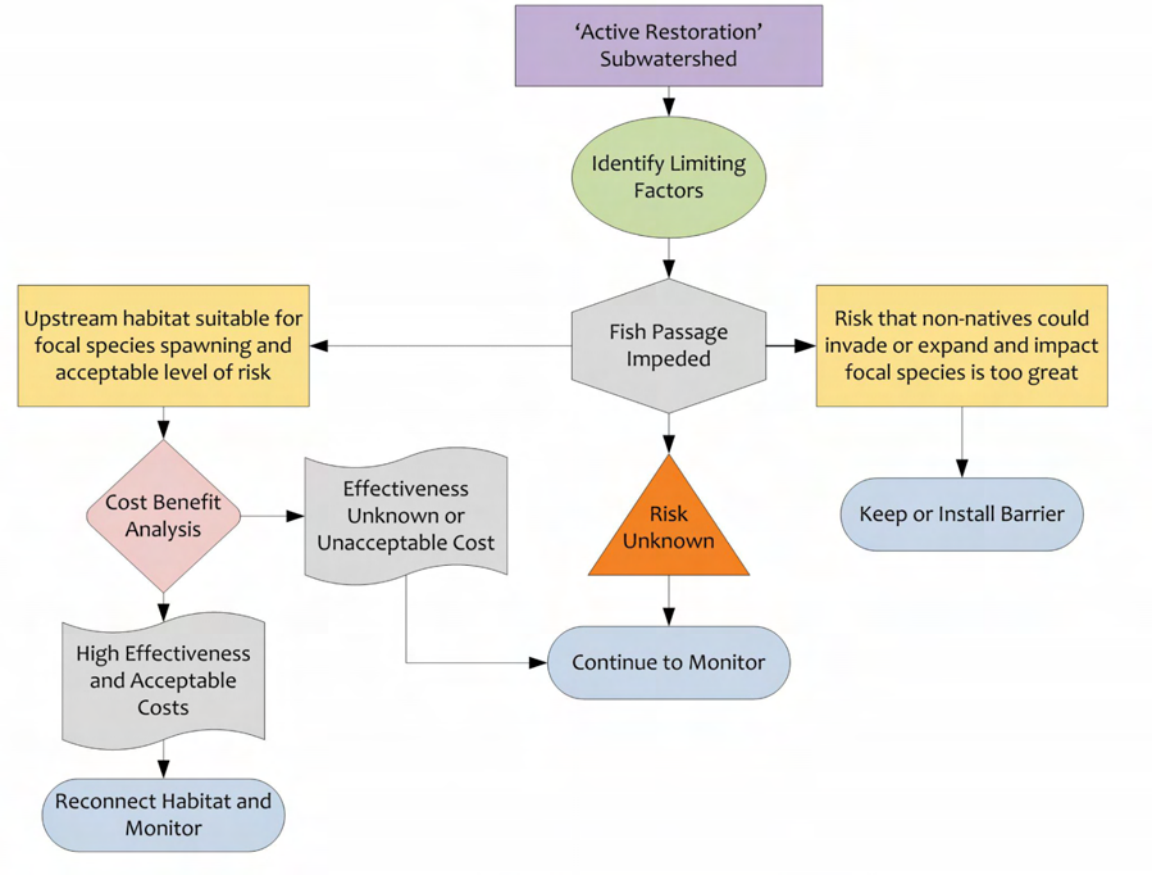

Figure 5.3. Example decision-making pathway for implementing habitat restoration work in Active Restoration subwatersheds.

Chapter 6 References

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