Middle Snake Subbasins Management Plan

May 2004

Written by
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Contracted by
Shoshone-Paiute Tribes

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1 Introduction

The *Middle Snake Subbasins Plan* was produced as part of the Northwest Power and Conservation Council's (NPCC) Columbia River Basin Fish and Wildlife Program. Subbasin plans are intended to direct Bonneville Power Administration's (BPA) funding of projects that mitigate for damage to fish and wildlife caused by the development and operations of the Columbia River's hydropower system. The *Middle Snake Subbasins Plan* was developed in an open public process that included the participation of a wide range of state, federal, local, and tribal governments local managers; landowners and other stakeholders—a process that the NPCC hoped would ensure support of the final plan and provide a means to better direct funding to fish and wildlife projects that will do the most good.

An adopted subbasin plan is intended to be a living document that increases analytical, predictive, and prescriptive ability to restore fish and wildlife. This *Middle Snake Subbasins Plan* will be updated every three to five years to include new information that will guide revision of the biological objectives, strategies, and the implementation plan. The NPCC views plan development as an ongoing process of evaluation and refinement of the region's efforts through adaptive management, research, and evaluation. More information about subbasin planning can be found at http://www.nwcouncil.org.

The Middle Snake subbasins were originally two of 62 subbasins in the region. Discrepancies between maps, textual descriptions, and work plans for the subbasins on the NPCC's website (NPCC 2003) resulted in confusion and eventually changes in the boundaries of the subbasins. The boundaries used here—from Shoshone Falls to Hells Canyon Dam, including the Wood River drainage—are consistent with those used in the subbasin summaries. They also provide for ecological continuity to the historic upstream distribution (Shoshone Falls) of anadromous fish stocks. The tributaries to the Lower Middle Snake subbasin on the Oregon side from Succor Creek to Hells Canyon Dam are not covered in this plan. The decision was made early in the process to cover these tributaries in the *Burnt, Powder, Brownlee Subbasin Plan* and no further efforts were made to incorporate these areas into Middle Snake subbasins planning process.(L. Youngbar, NPCC, personal communication, January 9, 2004).

The *Middle Snake Subbasins Plan* includes three interrelated volumes that describe the characteristics, management, and vision for the future of the Middle Snake subbasins: the assessment, inventory and plan.

Assessment (Volume 1)—The assessment analyzes the biological potential of the Middle Snake subbasins to support key habitats and species and the factors limiting this potential. These potential limiting factors provide opportunity for restoration. The assessment describes existing and historic resources and conditions within the subbasins, focal species and their habitats, environmental conditions, impacts outside the subbasins, ecological relationships, potential limiting factors, and a final synthesis and interpretation. Aquatic and Terrestrial Technical Teams were formed to guide the development of the assessment and technical portions of the management plan. They were composed of scientific experts with the biological, physical, and management expertise to refine, validate, and analyze data used to inform the planning process (see section 1.1.6).

Inventory (Volume 2)—The inventory summarizes fish and wildlife protection, restoration, and artificial production activities and programs within the Middle Snake subbasins that have occurred over the last five years or are about to be implemented. The information includes programs and projects, as well as locally developed regulations and ordinances that provide fish, wildlife, and habitat protections.

Management Plan (Volume 3)—The management plan defines a vision for the future of the subbasin, including biological goals and strategies for the next 10 to 15 years. The management plan includes a research, monitoring, and evaluation plan to ensure that implemented strategies succeed in addressing potential limiting factors and to reduce uncertainties and data gaps. The management plan also includes information about the relationship between proposed activities and the Endangered Species Act (ESA) and Clean Water Act (CWA). The plan prioritizes objectives and strategies and then concludes with management recommendations.

The completed plan was submitted to the NPCC by the Shoshone-Paiute Tribes on May 28, 2004. The following sections detail the entities contractually involved in developing the subbasin plan for the Middle Snake subbasins and describes the planning process.

1.1 Contract Entities and Planning Participants

Multiple agencies and entities are involved in managing and protecting fish and wildlife populations and their habitats in the Middle Snake subbasins. Federal, state, and local regulations, plans, policies, initiatives, and guidelines are part of this effort and share co-management authority over the fisheries resource. Federal involvement in this arena stems from ESA responsibilities and management responsibilities for federal lands. Numerous federal, state, and local land managers are responsible for multipurpose land- and water-use management, including protecting and restoring fish and wildlife habitat. The contract entities and plan participants involved in development of the Middle Snake subbasin plan are outlined below.

1.1.1 Shoshone-Paiute Tribes of Duck Valley Indian Reservation

The Shoshone-Paiute Tribes (SPT) served as lead entity for subbasin planning for the Middle Snake subbasins. The tribes contracted with the NPCC to deliver the *Middle Snake Subbasins Plan*. They provided an opportunity for participation in the process to fish and wildlife managers, local interests, and other key stakeholders, including tribal and local governments.

The Shoshone-Paiute Tribes are responsible for managing, protecting, and enhancing fish and wildlife resources and habitats on the Duck Valley Indian Reservation (which encompasses portions of the Owyhee and Bruneau subbasins) as well as surrounding areas in the Lower Middle Snake Province where the tribes held aboriginal title. They are a self-governance tribe, as prescribed under Public Law 103-414. A seven-member Tribal Business Council is charged with making decisions on behalf of 1,818 tribal members.

The Wildlife and Parks Department, with direction from the Tribal Business Council, is responsible for fish and wildlife species monitoring and management, recovery efforts, mitigation, research, management of the tribal fisheries, and enforcement of fishing and hunting regulations. The department implements fish and wildlife restoration and mitigation activities

toward the goal of restoring properly functioning ecosystems and species assemblages for present and future generations to enjoy.

1.1.2 Northwest Power Conservation Council

The NPCC has the responsibility to develop and periodically revise the Fish and Wildlife Program for the Columbia Basin. In the 2000 revision, the NPCC proposed that 62 locally developed subbasin plans, as well as plans for the mainstem Columbia and Snake rivers, be adopted into its Fish and Wildlife Program. The NPCC will administer subbasin planning contracts pursuant to requirements in its master contract with the BPA (NPCC 2000). The NPCC will be responsible for reviewing and adopting each subbasin plan, ensuring that it is consistent with the vision, biological objectives, and strategies adopted at the Columbia Basin and province levels.

1.1.3 Bonneville Power Administration

The BPA is a federal agency established to market power produced by the federal dams in the Columbia River basin. As a result of the Northwest Power Act of 1980, BPA is required to allocate a portion of power revenues to mitigate the damages caused to fish and wildlife populations and habitat from federal hydropower construction and operation. These funds are provided and administered through the Lower Snake River Compensation Plan (LSRCP).

1.1.4 Project Team

In addition to its own staff, the Shoshone-Paiute Tribes hired two contractors to help with the planning process and help write plan documents: Ecovista to work on the assessment, inventory, and plan and the Idaho Council on Industry and the Environment (ICIE) to organize and carry out the public involvement and public relations tasks for the Middle Snake subbasins. Under a separate contract, the Idaho Department of Fish and Game (IDFG) helped develop the assessment and inventory for the subbasins. Staff from these contractors served on the Project Team (see Table 1).

Table 1. The Project Team for the Middle Snake subbasins.

Name	Affiliation	Position
Darin Saul	Ecovista	Project coordinator, technical writer and editor
Tom Cichosz	Ecovista	Fisheries biologist, technical writer
Anne Davidson	Ecovista	Wildlife biologist, GIS analyst, technical writer
Lisa Audin	Ecovista	Aquatic ecologist, technical writer
Lance Hebdon	IDFG	Fisheries biologist, technical writer
Jon Beals	IDFG	Wildlife biologist, technical writer
Tim Dykstra	Shoshone-Paiute Tribes	Wildlife biologist
Pat Barclay	ICIE	Public involvement coordinator

1.1.5 Planning Team

The Planning Team for the Middle Snake subbasins is composed of representatives from government agencies with jurisdictional authority in the subbasin, the Shoshone-Paiute Tribes,

fish and wildlife managers, county and industry representatives, and private landowners (see Table 2). The Planning Team guided the public involvement process, developed the vision statement, reviewed the biological objectives, and participated in prioritizing subbasin strategies. Regular communication and input among team members occurred throughout the planning process. The Planning Team met monthly.

Table 2. Members of the Planning Team for the Middle Snake subbasins

Name	Affiliation
Guy Dodson, Sr.	Shoshone-Paiute Tribes
Lisa Jim	Shoshone-Paiute Tribes
Peggy Browne[a]	North Powder, OR
Marilyn Hemker	U.S. Fish and Wildlife Service
Scott Koberg	Idaho Association of Soil Conservation Districts
Thomas Grant	Idaho Department of Water Resources
Steven Lysne	U.S. Fish and Wildlife Service
Scott Short	Idaho Department of Water Resources
Gayle Batt	Idaho Water Users Association
Dick Bass	Rancher, Homedale, Idaho
Dennis Myhrum[a]	Oregon Farm Bureau
Dennis Tanikuni	Idaho Farm Bureau
David Ward/Tom Rein	Oregon Department of Fish and Wildlife
Bill Moore	Southwest Idaho RC&D
Jerry Hoagland	Rancher, Wilson, Idaho
Lyle Umpleby[a]	Powder Valley Water Control District, North Powder, Oregon
Scott Grunder	Idaho Department of Fish and Game
Robert Lipskoch	Bell Rapids Irrigation, Hagerman, Idaho
Lesa Stark	U.S. Bureau of Reclamation

[a] In February 2004, the decision was made by the Oregon Level II coordinators not to participate in the Middle Snake subbasins process. Oregon participants on the Planning Team left to participate in the Oregon process.

1.1.6 Technical Teams

The Aquatic and Terrestrial Technical Teams for the Middle Snake subbasins included scientific experts who participated in developing the subbasin assessment, inventory and plan (see Table 3 for a list of Technical Team members). The Technical Teams developed the assessment, and the biological objectives, strategies, research, monitoring, and evaluation sections of the management plan. The Technical Teams met monthly throughout the process, participated in workshops that were one or more days long, and focused on inputting professional judgment to fill data gaps.

Table 3. Technical Team members for the Middle Snake subbasins.

Name	Affiliation
Steven Lysne	U.S. Fish and Wildlife Service

Name	Affiliation
Marilyn Hemker	U.S. Fish and Wildlife Service
Gina Glenne	U.S. Fish and Wildlife Service
Cary Myler	U.S. Fish and Wildlife Service
Jeff Dillon	Idaho Department of Fish and Game
Mike McDonald	Idaho Department of Fish and Game
Chuck Warren	Idaho Department of Fish and Game
Kevin Meyer	Idaho Department of Fish and Game
Tim Dykstra	Shoshone-Paiute Tribes
Guy Dodson, Sr.	Shoshone-Paiute Tribes
Tom Rein	Oregon Department of Fish and Wildlife
Ray Perkins	Oregon Department of Fish and Wildlife
Jeff Zakal	Oregon Department of Fish and Wildlife
Walt Van Dyke	Oregon Department of Fish and Wildlife
Eric Tinus	Oregon Department of Fish and Wildlife
Jill Holderman	Bureau of Land Management

1.2 Public Outreach and Government Involvement

As the *Middle Snake Subbasins Plan* was developed, four methods of outreach and public and governmental participation were used in the Middle Snake subbasins: Technical Team meetings, Planning Team meetings, public meetings, and a website.

1.2.1 Technical Team Participation

The Technical Teams were composed of members with technical expertise in fish, wildlife, and habitat resources in the Middle Snake subbasins. The meetings were held mornings of the third Wednesday of every month in Boise at the IDFG state office and were open to the public. Meeting agendas and minutes were posted on the Ecovista website (2003) and provided at public meetings. The Technical Teams reviewed and gave input on the technical aspects of the subbasin plan; this input is documented in the subbasin assessment.

1.2.2 Planning Team Participation

The Planning Team met during the afternoon of the third Wednesday of every month in Boise at the IDFG state office. The meetings were open to the public. Meeting agendas and minutes were posted on the Ecovista website (2003) and provided at public meetings. The Planning Team reviewed and gave input on the subbasin plan; this input is documented in the subbasin management plan.

1.2.3 Public Meeting Outreach

Three public meetings were held to introduce the subbasin planning process to local people and resource managers and provide them an opportunity for input. Pat Barclay of the ICIE coordinated public meeting announcements and logistics for the Middle Snake subbasins. Public meeting outreach is summarized in Appendix A.

On December 17, 2003, the first public meeting for the Middle Snake subbasins was held at IDFG headquarters in Boise. Attendance was poor, although the one attendee was interested and motivated. A number of people who attended the Boise, Payette, and Weiser subbasins public meeting the previous evening indicated an interest in the Middle Snake subbasins; however, they chose not to attend the Middle Snake meeting the next evening because the content was the same. The end result was that a slightly larger group of people were informed about the Middle Snake subbasins than actual meeting attendance might indicate.

1.2.4 Ecovista Website Information

As the *Middle Snake Subbasins Plan* was developed, draft documents and information on meetings, the subbasin, and subbasin planning were posted on Ecovista's website (2003) at www.ecovista.ws.

1.3 Review Process

The *Middle Snake Subbasins Assessment* and *Middle Snake Subbasins Management Plan* were available for review through e-mail notification lists compiled by the Project Team and during Technical and Planning Team meetings. The drafts were posted on the Ecovista website. The focal species, focal habitats, and limiting factors from the assessment were presented at the second and third public meetings in March and April 2004. (The first meeting was an introduction to subbasin planning). The vision for the subbasins, problem statements, and objectives from the management plan were also presented in March. Prioritizations for the subbasins were presented and discussed during the April public involvement meeting. Through this review process, comments, suggestions, and clarifications were received from local, state, tribal, and federal representatives having relevant professional expertise, as well as from landowners and other stakeholders in the subbasin.

Time was not available to obtain letters of endorsement of the plan by the Planning Team. (Once available, they will be included in Appendix B.) Pat Barclay of ICIE is currently working to obtain letters of endorsement to be sent to the NPCC during the public review process after May 28. On behalf of the Shoshone-Paiute Tribes and IDFG, Ecovista forwarded the Middle Snake Subbasins Plan to the NPCC for adoption on May 28, 2004.

The summer schedule for the independent scientific review of subbasin plans has been developed. For a majority of the subbasin plans, the Independent Scientific Review Panel (ISRP)/Independent Scientific Advisory Board (ISAB) review process will begin immediately following the May 28 deadline and conclude with submittal of final reports to the NPCC by August 12, 2004. The *Middle Snake Subbasins Plan* will be reviewed during Week 4: June 29 through July 2 (NPCC 2004).

To complete the review, about ten review teams and one basinwide umbrella committee have been established. The review teams are organized to review sets of subbasin plans grouped by province. Each team consists of six or more reviewers and includes a mix of ISRP, ISAB, and Peer Review Group members. The umbrella group will help ensure a consistent level of review scrutiny and comment quality (NPCC 2004).

A review checklist and comment template is being developed for the ISRP/ISAB review of subbasin plans based on the NPCC's *Technical Guide for Subbasin Planners* and will include the NPCC's review questions. Reviewers must evaluate whether the subbasins plans are 1) complete, scientifically sound, and internally consistent following a transparent and defensible logic path and 2) externally consistent with the vision, principles, objectives, and strategies contained in the NPCC's 2000 Fish and Wildlife Program. The checklist also asks reviewers to evaluate whether the plan satisfactorily provides the assessment, inventory, and management elements requested by the NPCC and to recommend the level of need to further treat a specific element of the subbasin plan before the plan meets the criteria of completeness, scientific soundness, and transparency. A sample of the checklist and template was available in March (NPCC 2004).

Regarding plan adoptability, the NPCC's Legal Division is organizing a framework that NPCC members may use to make the determinations required by the Power Act relative to subbasin plan amendment recommendations. The framework is essentially a way of organizing the review around the act's standards that apply to program amendments for the Fish and Wildlife Program measures found in section 4(h) and the standards set in the 2000 Fish and Wildlife Program in the unique context of subbasin plans. The framework will be discussed with NPCC members in the near future.

2 Vision for Middle Snake Subbasins

This vision and guiding principles for the *Middle Snake Subbasins Management Plan* were developed by the Planning Team. The vision was developed to present a common goal and desirable future for the subbasin. The guiding principles are components of the vision representing actions to be followed for obtaining the vision. These principles are not listed in order of their ranking; they are all meant to be understood as important and interconnected.

2.1 Vision Statement

The vision for the Middle Snake subbasins is a healthy ecosystem with productive and diverse aquatic and terrestrial species, with emphasis on native species, which will support sustainable resource-based activities for a growing human population.

2.2 Guiding Principles

- Respect, recognize, and honor private property rights and efforts made by individuals that have protected, enhanced, or restored ecosystems.

- Respect, recognize, and honor the legal authority, jurisdiction, tribal rights, and legal rights of all parties, as well as the current local conditions, values, and priorities of the subbasin.

- Identify and prioritize existing and potential project opportunities and coordinate program resources to implement the *Middle Snake Subbasins Management Plan* and the Pacific Northwest Electric Power Planning and Conservation Act, including the ESA and other local, state, federal, and tribal programs, obligations, and authorities.

- Foster ecosystem sustainability and stewardship of natural resources, recognizing all components of the ecosystem, including altered ecosystems and the human component.

- Provide information and opportunities to residents of the Middle Snake subbasins to promote understanding and appreciation of the need to protect and enhance a healthy and properly functioning ecosystem.

- Recognize the importance of protection and/or restoration of native ecosystems.

- Provide opportunities for natural resource-based economies to be successful in concert with aquatic and terrestrial species, through the implementation of this plan.

- Promote local participation in, and contribution to, natural resource problem solving and subbasinwide conservation efforts.

- Develop a scientific foundation for diagnosing ecosystem problems, designing and prioritizing projects, and implementing monitoring and evaluation to improve results of future efforts.

2.3 Definitions and Qualifications

Definitions were developed and adopted by the Planning Team for the purpose of ensuring that the meaning of the vision and guiding principles were clear to the many parties reading and applying them. Words and phrases within the vision and guiding principles statements that are important and may have more than one interpretation are defined here.

Ecosystem—A biological community of plants, animals and other organisms interacting with each other and their physical environment. This system is subject to natural disturbance processes.

Restoration—The return of an ecosystem to a close approximation of its natural condition. The restored ecosystem should simulate the natural condition before it was damaged or some other native ecosystem appropriate for the new conditions of the local landscape.

Scientific foundation—Relies on the best available scientific knowledge. Describes the best understanding of biological realities that will govern how the vision is accomplished. Provides the basis for the working hypotheses that underlie the NPCC's program. Applies the following eight principles from established scientific literature to form the foundation of the NPCC's program:

Principle 1. The abundance, productivity, and diversity of organisms are integrally linked to the characteristics of their ecosystems.

Principle 2. Ecosystems are dynamic, resilient, and develop over time.

Principle 3. Biological systems operate on various spatial and time scales that can be organized hierarchically (e.g., ecosystems, landscapes, communities, populations).

Principle 4. Habitats develop, and are maintained, by physical and biological processes.

Principle 5. Species play key roles in developing and maintaining ecological conditions.

Principle 6. Biological diversity allows ecosystems to persist in the face of environmental variation.

Principle 7. Ecological management is adaptive and experimental.

Principle 8. Ecosystem function, habitat structure, and biological performance are affected by human actions.

3 Problems, Objectives, and Strategies

The various components (problem statements, biological objectives, and strategies) of the *Middle Snake Subbasins Management Plan* described in this section have been developed collaboratively by the Technical and Planning Teams from information presented in the *Middle Snake Subbasins Assessment* and *Middle Snake Subbasins Inventory,* and best professional judgment. References to information contained in other volumes of the *Middle Snake Subbasins Management Plan* or sections in this management plan are provided to aid finding more detailed information regarding particular problem statements, objectives, and strategies.

Although the problems, objectives, and strategies are commonly related to individual species or communities, none of these ecosystem components functions independently. Any actions that benefit or harm one species within the subbasin also impact other species (aquatic or terrestrial, including humans) that rely on that species. In addition, every action has social, political, and economic implications.

Social, economic, and political factors in the Middle Snake subbasins are important to determining the success of the implementation phase of this management plan. These factors are referenced in the vision and guiding principles for the Middle Snake subbasins and must be considered at all levels of the planning process, including development of appropriate problem statements, objectives, and strategies. Accounting for the human component of the subbasins increases the probability that this plan will be successfully implemented and viewed as a necessary, socially acceptable, and reasonable step in the protection and recovery of aquatic and terrestrial species in the subbasins.

3.1 Problem Statements, Objectives, and Strategies

Problem statements were developed from the factors limiting focal species and habitats in the subbasin and conditions that inhibit natural ecological processes, as described in the subbasin assessment (assessment sections 3.4.2: Aquatic Resources Limiting Factors and 3.5.3: Terrestrial Limiting Factors). Objectives describe the changes needed to achieve the vision, consistent with the scientific principles. Strategies provide specific steps necessary to accomplish the objectives.

For organizational purposes, problem statements, objectives, and strategies are grouped by three categories: biological, environmental, and socioeconomic components, although they are intrinsically linked. The biological components are generally directed toward fish and wildlife populations, when sufficient data exist. Problems, objectives, and strategies meant to address habitat for fish and wildlife populations are listed under environmental components. Biological and environmental objectives were developed by the Project and Technical Teams and were reviewed by Planning Team members. The Planning Team developed objectives and strategies that address social, economic or cultural aspects of protecting and restoring aquatic and terrestrial populations and their habitats are listed under socioeconomic components.

The Planning Team considers these biological, environmental and socioeconomic objectives and strategies critical to successfully implementing the *Middle Snake Subbasins Management Plan*. Recommendations for further data collection or prioritization were noted where data gaps limit

the development of sound objectives and strategies. These information needs were further detailed in section 4 on research, monitoring, and evaluation in this volume.

The formatting of the problem statements, objectives, and strategies follows the recommendations made by the ISRP (2003b) in its review of the *Clearwater Subbasin Plan*. The ISRP's suggested format was consistent with guidance in the technical guide (NPCC 2001) and used in this document with minor modifications.

3.2 Biological Components

The problem statements and biological objectives developed to address potential limiting factors in the Middle Snake subbasins are summarized in Table 4. The associated strategies are detailed in the test. These problems, objectives, and strategies are generally directed toward fish and wildlife populations, when sufficient data exist. This section is divided into two parts: the objectives and strategies to address problems associated with aquatic species, followed by those for terrestrial species.

Table 4. Problems statements and biological objectives in the Middle Snake subbasins. These must be taken in context with associated strategies and discussion comments in plan section 3.2: Biological Components.

Problem Statements		Biological Objectives	
Aquatic Species			
1	Anadromous fish have been extirpated from the subbasin, with wide spread impacts on aquatic ecosystems and user groups.	1A	Restore aquatic ecosystems and user opportunities impacted by the loss of anadromous fish components.
2	White sturgeon populations have been reduced primarily from the resultant reductions in water quantity and quality following dam construction. Harassment due to catch and release fishing may also impact populations.	2A	Achieve white sturgeon population recovery to levels identified in Table 5.
		2B	By 2019, identify areas where harassment due to catch and release fishing is a viable concern and minimize potential population impacts.
3	Redband trout populations are reduced throughout much of the subbasins due to environmental and biological factors.	3A	Ensure continued existence of high density (core) redband trout populations.
		3B	Ensure continued existence of moderate or low density redband trout (satellite) populations.
		3C	Evaluate and reduce hybridization between hatchery rainbow trout and redband trout, where it occurs within 10 years.
		3D	Investigate status of unknown redband trout populations.
4	Bull trout populations are at risk of extinction because of low abundance, isolation, and limited suitable habitat.	4A	Maintain and increase bull trout distribution and abundance (greater than or equal to 500 adults) within Indian and Wildhorse Creeks.

Problem Statements		Biological Objectives	
		4B	Reduce and prevent impacts of brook trout on bull trout where they exist, especially within the Indian Creek drainage
5	Mountain whitefish have been reduced in abundance throughout the Middle Snake subbasins primarily due to reduced water quality and quantity	5A	Increase mountain whitefish productivity and production to desirable levels within 15 years through habitat improvements
6	The Wood River sculpin has diminished in range and abundance due to upland and riparian degradation, flow reductions, thermal alteration, and interactions with introduced species.	6A	Increase productivity and production of Wood River sculpin to desirable levels within 15 years through habitat improvements
7	Predation negatively impacts native species in some areas of the subbasin, primarily in areas where habitats have been significantly altered.	7A	Evaluate and establish the impact of predation on productivity of native fish populations throughout mainstem and tributary habitats by 2019.
8	Loss of prey base due to lost anadromous fish runs (salmon, steelhead and lamprey) may be negatively impacting white sturgeon and bull trout which historically preyed on those species.	8A	Evaluate and quantify impacts to white sturgeon and bull trout related to loss of the prey base from anadromous fish runs
9	Fresh water mollusks are declining in distribution and abundance throughout the Snake River system due to habitat alteration.	9A	Support freshwater mollusk conservation and recovery through habitat restoration, ground and surface water conservation, and continued research of environmental factors limiting mollusk growth, survival, and reproduction.
Terrestrial Species			
10	Limited understanding of the wildlife and plant (terrestrial) communities limits the ability to effectively manage or conserve these species.	10A	Increase understanding of the composition, population trends, and habitat requirements of terrestrial communities.

3.2.1 Aquatic Species

Problem 1: Anadromous fish have been extirpated from the subbasin, with wide spread impacts on aquatic ecosystems and user groups (see Appendix C).

Biological Objective 1A: Restore aquatic ecosystems and user opportunities impacted by the loss of anadromous fish components.

Strategies:

1A1. Participate in province and basinwide coordinated studies and water management forums.

1A2. Evaluate effects of lost anadromous components on the aquatic ecosystems in the subbasin (plan section 4.2: Research Needs).

1A3. Continue to investigate the feasibility of restoring anadromous fish runs above Hells Canyon Dam (plan section 4.2: Research Needs).

1A4. Compensate for lost opportunities to user groups related to diminished fish runs and ecological function.

Discussion: Prior to construction of hydropower dams, the Snake River from Shoshone Falls downstream, supported a diverse and rich aquatic community that included anadromous species. Steelhead trout, chinook salmon, white sturgeon, redband or rainbow trout, Pacific lamprey, bull trout, and a host of other aquatic species inhabited the river and could freely range throughout the Snake and Columbia river systems (assessment section 3.4: Aquatic Resources).

Construction of hydroelectric projects on the Snake River eliminated anadromous species such as chinook salmon, steelhead trout, and Pacific lamprey above the Hells Canyon Complex and contributed significantly to the reduction of native redband trout, bull trout, and white sturgeon (assessment section 3.4: Aquatic Resources). Resident fish populations, including bull trout, sturgeon, and redband trout populations, have been segmented into isolated habitat areas and can no longer interact with other populations.

The loss of anadromous fish impacted the basic biomass in the system, reducing overall nutrients, the prey base, and wildlife resources throughout the subbasins (assessment section 3.4: Aquatic Resources). Potential negative impacts to aquatic ecosystems in headwater streams result from the loss of anadromous fish, a source of nutrients and primary production in such systems.

Negative impacts to user groups from the loss of anadromous fish include lost Indian and non-Indian cultural uses of natural resources, including fishing opportunities, in the Middle Snake subbasins (plan section 3.4: Socioeconomic Objectives). For a more detailed description of the impacts of the loss of anadromous species on the Shoshone-Paiute Tribes see Appendix C.

The *Burnt, Powder, Brownlee Subbasin Plan* has been simultaneously developed with this plan, and covers the tributaries to the Lower Middle Snake subbasin on the Oregon side from Succor Creek to Hells Canyon Dam (L. Youngbar, NPCC, personal communication, January 9, 2004). Consult that document regarding recommendations for possible reintroduction of steelhead to the Pine Creek drainage.

Problem 2: White sturgeon populations have been reduced within the subbasins relative to historic conditions, primarily resulting from dam construction and resultant

reductions in water quantity and quality. Harassment due to catch and release fishing may impact populations in some areas where angling pressure is greatest.

Biological Objective 2A: Achieve white sturgeon population recovery to levels identified in Table 5.

Strategies:

2A1. Determine usable habitat for adjustments in population goals listed in Table 5 (plan section 4.1: Data Gap).

2A2. Continue to monitor success of white sturgeon spawning and early life history survival (plan section 4.1: Data Gap).

2A3 Evaluate the limiting factors to recruitment of white sturgeon (plan section 4.2: Research Needs) (see Discussion regarding contaminants, loss of connectivity between reaches, and habitat).

2A4. Evaluate impacts of entrainment on population abundance and distribution (plan section 4.2: Research Needs) (see Discussion).

2A5 Determine and seek adequate flows via the State of Idaho instream flow statute (I.C. Title 42 Chapter 15) to meet spawning, incubation and early life history stages (plan section 4.3: M&E).

2A6. Conduct periodic population assessment (plan section 4.1: Data Gap).

2A7. Develop genetics plan to address current status and implications of potential translocation or hatchery introductions (plan section 4.1: Data Gap).

2A8. Cooperate with Idaho Power Company to mitigate adverse effects of load following operations on spawning, incubation, and fry/juvenile life history stages.

2A9. Implement translocation plan to improve productivity and genetic diversity, if necessary (plan section 4.3: M&E).

2A10. Implement hatchery introduction program, if necessary (plan section 4.3: M&E). IDFG believe conservation aquaculture should be pursued only after attempts to restore recruitment through habitat restoration efforts have been attempted. ODFW supports hatchery use for recruitment limitations only and with caution. Consider artificial spawning channels or other engineered habitat (see discussion).

2A11. Implement measures to improve water quality throughout the mainstem Snake River (plan section 4.3: M&E).

2A12. Monitor and evaluate the physical and biological response to habitat projects. Revise program as required.

Table 5. Summary of white sturgeon objectives for individual river reaches in the Middle Snake subbasins (from IDFG 2003c).

Reach	Abundance Goal[1]	Estimated Current Abundance
Shoshone Falls downstream to Upper Salmon Falls Dam	1,400	772 (Lepla et al. 2002)
Upper Salmon Falls Dam downstream to Lower Salmon Falls Dam	340	Unknown—Very Low[2]
Lower Salmon Falls Dam downstream to Bliss Dam	630	Unknown—Very Low[3]
Bliss Dam downstream to C.J. Strike Dam	2,900	2,192 (Cochnauer 1983) 2,662 (Lepla and Chandler 1995a)
C.J. Strike Dam downstream to Swan Falls Dam	1,340	726 (Lepla and Chandler 1997)
Swan Falls Dam downstream to Brownlee Dam	7,100	155[4] (Lepla et al. 2001)
Brownlee Dam downstream to Oxbow Dam	630	Unknown—Very Low[5]
Oxbow Dam downstream to Hells Canyon Dam	1,300	Unknown—Very Low

1 Abundance goals are for fish greater than 60 cm total length of which 60% are between 60 cm and 92 cm total length, 30% between 92 cm and 183 cm total length, and 10% greater than 183 cm total length.

2 1979–1981 survey by IDFG found no white sturgeon in this reach. IDFG (2003c) states utilization of reservoir by white sturgeon is unknown; however, it is expected some of the reservoir can provide necessary habitat requirements for survival.

3 No population estimates could be made during past (1993) studies due to low numbers of recaptured white sturgeon.

4 Estimate is for fish >90 cm (TL) located between Swan Falls Dam and Walters Ferry at Rkm 710.4.

5 IDFG (2003c) states "…few if any white sturgeon inhabit this river section. Whether or not any fish can survive or be retained in this river section is questionable."

Discussion: The goals in Table 5 are from IDFG and have not been thoroughly reviewed or agreed to by other management entities; they are included as interim goals. The IDFG Plan assumes both the free-flowing and reservoir sections can fully support rearing for juveniles and adults, resulting in abundance goals in Table 5. This may result in an overestimation of appropriate goals in most areas. IDFG and other parties anticipate alteration of these goals as white sturgeon management efforts move forward and additional information becomes available.

Of the eight fragmented reaches between dams in the Middle Snake subbasins in Idaho, only one supports a viable population of white sturgeon. The Bliss to C.J. Strike section has adequate flows in most years and varied habitat to support all life history stages of white sturgeon. In the other six sections, not all habitat requirements are available or accessible to white sturgeon that would allow population maintenance and growth (assessment section 3.4.1, white sturgeon).

The Technical Team believes the development of eggs, maturation of females, and how they are affected by contaminants are important research topics. Many

wild fish populations, including white sturgeon, are in decline due to loss of habitat and the presence of contaminants. Contaminants can influence population numbers by lethal effects on individuals or by non-lethal effects (i.e. gene function, cell integrity and metabolism, immune function, behavior) which ultimately can have deleterious effects on growth and reproduction (Heath, 1995). The types of contaminants present in the Columbia River Basin are numerous. Polychlorinated biphenyls (PCBs) are persistent, lipophilic contaminants that had a wide range of uses including capacitors and transformers. PCB-containing electrical equipment from dam operations have been disposed of throughout the Columbia River Basin, and several recent studies have revealed the presence of PCBs in sediments and organisms in the river (Foster et al., 2001a and 2001b; DEQ, 2002; EPA, 2002; URS, 2002). Organochlorine pesticides have been used extensively in agricultural practices on lands surrounding the Columbia River Basin and are present in run-off. Dioxins and furans originate from a wide variety of domestic and industrial processes, including incineration of plastics, combustion of fossil fuels, and pulp mills (Kime, 1998). Heavy metal pollution is the result of mining and smelting practices as well as natural weathering processes. All of these contaminants are persistent, lipophilic-compounds that bind to organic substrates and remain in sediments for decades potentially building up behind dams and biomagnifying through the food chain. These contaminants have been detected in white sturgeon in the Columbia River Basin (e.g., Kruse, 2000; Foster et al., 2001a and 2001b; EPA, 2002).

Recent studies have revealed elevated levels of environmental toxicants in white sturgeon tissues (mercury and organochlorines) and suggest that contaminants are negatively affecting sturgeon growth and reproduction. Sturgeon are particularly susceptible to bioaccumulation of environmental pollutants because of their life history characteristics (long-lived, late-maturing, benthic association), and the damming of the Columbia River has resulted in increased exposure of sturgeon to contaminants trapped in sediments behind the dams. Tissue samples (liver, gonad, and cheek muscle) from immature white sturgeon in the estuary, Bonneville Reservoir, The Dalles Reservoir, and John Day Reservoir have been collected and analyzed for chlorinated pesticides, PCBs, mercury and physiological, molecular, and biochemical measures of growth and reproductive physiology. The results suggest a link between contaminants, growth, and reproduction (Foster et al., 2001a and b; Webb et al., in prep, Feist et al., in prep). Specifically, sturgeon captured in Bonneville Reservoir were found to have the highest contaminant loads and the lowest plasma triglycerides, condition factor, relative weight, gonadosomatic index, and plasma androgens (testosterone and 11-ketotestosterone in males) compared to the sturgeon in the estuary, The Dalles Reservoir , and John Day Reservoir (Feist et al., in prep; Webb et al., in prep).

Future research is critical to understand the poor growth and reproductive success of sturgeon and the potential role environmental contaminants play. Determination of the effects of multiple stressors (including potential synergistic effects of contaminants) on the growth and reproductive physiology of white sturgeon by measuring nutritional status, food quality, toxic chemical

concentrations, maternal transfer of contaminants, and effects from toxic chemical exposure is essential. Environmental contaminants appear to be an important limiting factor in the successful recruitment of white sturgeon in the Columbia River.

In systems that have little opportunity or likelihood to restore fully functioning natural habitat, engineered habitat may allow spawning and rearing without employing a more traditional hatchery approach (P. Anders, S. P. Cramer and Associates, personal communication, April 11, 2004). Recently an engineered-habitat approach has been proposed to investigate factors limiting spawning and rearing success in Kootenai River white sturgeon (Anders et al. 2003). A precedent has been set for using artificial streams and engineered habitat to restore stream fishes (Katopodis et al. 2001). Natural channels have been built around dams as an alternative fish passage technique (Jungwirth 1996). In Canada, artificial streams have been successfully used to increase the productivity of spawning and rearing habitat for salmon (Lister and Finnigan 1997; Cooper 1977). Finally, in Europe, which has a longer history of development and river regulation, restoration strategies include engineered habitat to create habitat for lowland river fishes (Simons et al. 2001). Although the use of engineered habitat is relatively new, substantial potential and limited alternatives may exist to make population level contributions to fish production from relatively small areas of habitat. These options should be considered for recovery of white sturgeon where natural habitat is limited with little opportunity for restoration.

The loss of connectivity between reaches and entrainment losses were determined to be a factor limiting white sturgeon as dams act as an impediment to migration and spawning (assessment section 3.4.1, white sturgeon). Population simulations based on characteristics of Columbia and Snake rivers white sturgeon demonstrated that increasing river fragmentation by building 1 to 20 “virtual dams” along a 160-mile long river segment produced an exponential decline in population persistence and decreased genetic diversity within the segmented fish groups. Simulations further demonstrated that unbalanced migration [passage] patterns similar to those observed in white sturgeon (low upstream and high downstream) outweigh isolation as an extinction risk. The simulations did not allow the investigators to identify a minimum river length needed to ensure population persistence (Jager et al. 2001).

Biological Objective 2B: By 2019, identify areas where catch and release fishing is a viable concern and minimize potential population impacts.

Strategies:

2B1. Determine areas where catch and release angling may be impacting populations giving consideration to population size, angler effort, and catch rates (plan section 4.2: Research Needs).

2B2. Evaluate sport catch release angling impact. Maintain and adjust angling regulations to control impacts as needed to improve populations (plan section 4.2: Research Needs).

2B3. Conduct angler education about white sturgeon and ways to minimize potential catch and release related mortality.

2B4. Evaluate potential angling regulations which might contribute to reduced catch and release related mortality (e.g. use of circle hooks, limited leader strength, etc.) (plan section 4.2: Research Needs).

Discussion: While the construction of dams and isolation of populations have contributed significantly to the present depressed state of white sturgeon in the Snake River, sport fishing has also played a role in reducing numbers and creating unbalanced populations. Although the present sport fishing regulation for white sturgeon in the Snake River is catch and release, the populations have responded slowly to this management change due to the relatively old age of maturation and slow growth of individual fish. In many instances, the number of available females and their infrequent spawning have caused extremely slow increases in numbers of fish in the middle- to old-age groups. Even with the present catch-and-release regulations, a high demand for white sturgeon fishing, particularly in two reaches of the middle Snake River: below Bliss Dam, where population numbers are the highest, and immediately below C.J. Strike Dam, where fish are concentrated. The popularity of white sturgeon sport fishing is undoubtedly based on the likelihood of catching large, old-aged fish (assessment section 3.4.1). This is most likely a substantial issue in areas where angling pressure is most intense, particularly below CJ Strike and Bliss and Lower Salmon dams. However, in areas with small and/or non-reproducing populations, impacts may be significant even if overall angling pressure is low.

Problem 3: Redband trout populations are reduced throughout much of the subbasin due to high temperatures, habitat alteration, flow limitations, drought, limited connectivity, and competitive or other interactions with hatchery or other introduced species. Many relevant actions are addressed through environmental objectives 11A through 11F defined in plan section 3.3.1: Aquatic Ecosystem. Relevant biological considerations include the continued existence of core populations, satellite populations, and hatchery rainbow trout influence.

Biological Objective 3A: Ensure continued existence of high density (core) redband trout populations at or near current levels for each of the areas identified in assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, redband.

Strategies:

3A1. Continue activities aimed at identification of stocks endemic to Middle Snake subbasins and introgressed populations (plan section 4.1: Data

Gap), including investigating status of unknown redband trout populations.

3A2. Continue the genetic evaluation using data collected during NSA including activities aimed at identification of stocks endemic to Middle Snake subbasins and introgressed populations (plan section 4.2: Research Needs).

3A3. Expedite analysis of archived and/or additional necessary genetic samples to facilitate achievement of strategy 1 (plan section 4.3: M&E).

3A4. Evaluate the need for focused restoration activities within core areas that will facilitate maintenance or increases in current population levels.

Biological Objective 3B: Ensure continued existence of moderate or low density (satellite) population areas identified in assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, redband trout, and move forward with restoration in prioritized areas and establishment of priorities for undefined areas.

Strategies:

3B1. Continue ongoing evaluation of redband trout population structure and limiting factors (plan section 4.1: Data Gaps).

3B2. Evaluate restoration feasibility in priority areas identified in assessment section 3.4.1 and move forward with habitat restoration where feasible.

3B3. Build from information in assessment section 3.4.1 to define population areas and establish restoration priority and feasibility (plan section 4.1: Data Gap).

3B4. Reprioritize actions as necessary based on development of new information (genetic analyses, population status, etc.).

Discussion: In the late 1990s, IDFG began to assess the status of redband trout populations in southern Idaho. Data from that effort was used to identify population status and strongholds for redband trout in much of the Middle Snake subbasins (all areas upstream of the mouth of the Weiser River). IDFG states that this information represents the best scientific information available for redband trout in the Middle Snake subbasins, and that the represented sampling locations may be viewed as surrogates for populations within the context of broad scale evaluations (assessment section 3.4.1, redband trout). This represents the first analysis of this data under the time constraints given, and the information will be subject to complete analysis by IDFG in the future, thus results are subject to revision (assessment section 3.4.1, redband trout). Available results from this effort supplied by IDFG are displayed in Figure 26 presented in assessment section 3.4.1, redband trout and, due to the level of detail contained in this map,

the figure has been provided separately in electronic format for those who wish to view/print the map at larger scales.

Biological Objective 3C: Evaluate and reduce hybridization between hatchery rainbow trout and redband trout, where it occurs, within 10 years.

Strategies:

3C1. Limit expansion of problem - Based on current state of knowledge, limit further introduction and expansion of hatchery rainbow trout into redband trout habitats without compromising connectivity for redband trout (plan section 4.3: M&E).

3C2. Limit expansion of problem - Protect quality habitat and restore degraded habitat to promote natural distribution of native resident fish (in accordance with environmental objectives 11A through 11F) (plan section 4.3: M&E).

3C3. Where stocking of hatchery fish is a viable management alternative, evaluate the management option of stocking only sterile fish. Evaluate the management option of using local native broodstock for fisheries mitigation and genetic conservation (plan section 4.2: Research Needs).

3C4. Continue to evaluate and improve fish sterilization techniques relevant to stocking in this subbasin (plan section 4.3: M&E).

3C5. Determine extent of hybridization problems--develop a genetics monitoring plan that integrates past genetics work and includes documentation and interpretation of natural or hatchery influenced genetic interaction between hatchery rainbow and redband trout (plan section 4.1: Data Gap).

3C6. Prioritize problems and projects (plan section 6.1: Prioritization).

3C7. Monitor and evaluate efforts in strategies 3C1-3C5. Integrate new information into next reiteration of this plan. Revise strategies as necessary to reflect new information and repeat strategies for subsequent iterations.

Discussion: Information regarding genetic makeup of redband trout within the Middle Snake subbasins is limited. Pure redband trout populations are known to reside in the Malad River and one of the spring tributaries of the Malad River (assessment section 3.4.1, redband). The native redband in the Wood River drainage are unique as a result of being isolated from anadromous populations by the falls on the Malad River at Interstate 84. There has been extensive introgression of hatchery rainbow trout with the native redband trout in the Big Wood River (assessment section 3.4.1, redband). Genetic analysis has been performed on redband trout populations in Castle Creek, Reynolds Creek, and Sinker Creek

(assessment section 3.4.1, redband). These studies show a relatively high degree of genetic heterozygosity in each population, suggesting that, even though population levels are generally low, genetic "bottlenecks" have not occurred in these populations. In addition, little to no evidence of hatchery introgression was thought to have occurred in these three drainages based on results of genetic analyses (assessment section 3.4.1, redband). The Technical Team described "hatchery influence" as potentially limiting in various drainages in the Middle Snake subbasins (assessment section 3.4.2, Table 33).

Problem 4: Bull trout populations within the Middle Snake subbasins are at risk of extinction because of low abundance, isolation, and limited suitable habitat. Bull trout within the Indian Creek drainage are impacted by high rates of hybridization with brook trout (Pratt 2001).

Biological Objective 4A: Maintain and increase bull trout distribution and abundance (greater than or equal to 500 adults) within each of the defined local population watersheds (Indian and Wildhorse Creek) (USFWS 2002).

Strategies:

4A1. Determine current population abundance for the three existing population areas within Indian Creek (one population unit) and Wildhorse Creeks (Bear Creek and Crooked Creek populations) (plan section 4.3: Data Gaps).

4A2. Maintain existing local population levels by protecting existing water temperature, stream flows, habitat quality, connectivity, and invasion from non-native species (plan section 4.3: M&E).

4A3. If local population abundance is determined to be less than 500 adults within either the Indian Creek or Wildhorse Creek watershed, increase populations to at least 500 adults within each watershed by achieving environmental objectives 11A through 11F (plan section 4.3: M&E).

4A4. By 2015, define and complete all activities which will expand the potential range of bull trout within these population areas where it is believed to have been reduced due to anthropogenic impacts (e.g. culvert modification or removal) (plan section 4.3: M&E).

4A5. Monitor and evaluate biological response by sampling populations every 3-5 years. Integrate new data and information into strategies 4A1 and 4A3 to reclassify population status as indicated by monitoring results. Adapt protection and restoration measures as necessary.

4A6. Coordinate efforts with those established for Pine Creek in Oregon which represents another metapopulation component tied to those in Indian and Wildhorse Creeks.

4A7. Participate in and contribute to ongoing USFWS development of bull trout recovery plan and efforts.

Discussion: The bull trout in the conterminous United States was listed as threatened by the USFWS on November 1, 1999 (64 FR 58910). In 2002, the USFWS released a draft bull trout recovery plan (plan section 5.1.2.1: Bull trout). Major goals of this and State agency plans include summarizing the best available scientific information, identifying and maintaining critical bull trout habitats, implementing recovery strategies aimed at both abundance and habitat, and establishing key watersheds to achieve stable or increasing populations, and maximize potential species recovery (assessment section 3.4.1: bull trout).

Biological Objective 4B: Reduce and prevent impacts of brook trout on bull trout where they exist, prioritizing existing impacts within the Indian Creek drainage (assessment section 3.4.1: bull trout).

Strategies:

4A1. Based on current state of knowledge, prevent introduction and expansion of brook trout into bull trout habitats without compromising connectivity for bull trout. Evaluate brook trout threat prior to barrier removal or installation (plan section 4.3: M&E).

4A2. Identify and eradicate isolated populations of brook trout where feasible (plan section 4.3: M&E).

4A3. Continue and expand ongoing surveys of both brook and bull trout, including standardized genetic sampling to determine levels of hybridization (plan section 4.3: Data Gaps).

4A4. Prioritize problems and projects (plan section 6.1: Prioritization).

4A5. Develop and test methods to prevent the spread of brook trout, thereby reducing the spread of impacts of hybridization on bull trout (plan section 4.1: Research Needs).

4A6. Monitor and evaluate eradication efforts following strategy 4A2. Integrate data into next reiteration along with other new data developed for objectives. Revise strategies as necessary to reflect new information and repeat strategies for subsequent iterations.

Discussion: Strategies need to be consistent with recovery goals (USFWS 2002). Pine Creek, Indian Creek, and Wildhorse River currently provide spawning and rearing habitat for bull trout. All three watersheds also support brook trout and bull trout-brook trout hybrids. To date, all hybrids that have been captured in the Pine Creek core area and genetically tested have been first generation (F1) hybrids, with the exception of two hybrids sampled in the upper portion of Indian Creek that indicated an F1-bull trout cross (assessment section 3.4.1: bull trout). Non

native, hatchery stocked salmonids prey on bull trout and may compete with bull trout for food or space (USFWS 2002).

Within the scope of this plan, bull trout exist only in Indian and Wildhorse Creeks (as Pine Creek is being covered in the *Burnt, Powder, Brownlee Subbasin Plan*), with the exception of the mainstem Snake River which is in close proximity to these streams. The mainstem was likely used by these populations for migration and overwintering, no other areas within the subbasins are thought to have been historically used by bull trout.

Problem 5: Mountain whitefish have been reduced in abundance throughout the Middle Snake subbasins primarily due to reduced water quality (mainstem habitats) or limitations in either or both water quantity and water quality (larger tributaries).

Biological Objective 5A: Increase mountain whitefish productivity and production to desirable levels within 15 years through habitat improvements outlined below (see environmental problems, objectives, and strategies).

Strategies:

5A1. Define appropriate population productivity and production goals through technical discussion and working groups (plan section 4.1: Data Gaps).

5A2. Evaluate alternative habitat treatments and expected biological outcomes to address water quantity and/or quality issues in various mountain whitefish habitat areas (mainstem and tributaries) (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, Mountain whitefish) throughout the subbasins (plan section 4.2: Research Needs).

5A3. Identify and develop indices to evaluate biological response(s) to habitat improvement projects, using appropriate fish production models or empirical data to link the developed index to fish production potential (plan section 4.1: Data Gaps).

5A4. Implement projects using information developed under strategy steps 1 and 2. Coordinate with implementation of strategies and actions delineated under environmental problems, objectives and strategies below (plan section 4.3: M&E).

5A5. Monitor and evaluate the ability of habitat improvement projects to provide biological benefit using indices developed in strategy step 3.

Discussion: The preferred habitat of the mountain whitefish, a salmonid, is cold mountain streams where the species is found predominantly in riffle areas during summer and deep pools during winter. They are fall spawners, typically spawning in riffle areas during late October or early November when water temperatures range between 40 and 45 °F; in some instances, spawning is known to occur along gravel shores in lakes or reservoirs. The mountain whitefish is abundant in all

major river drainages in Idaho and considered the most abundant game fish in the state. However, their abundance has been reduced from historical values (assessment section 3.4.1, mountain whitefish). Temperature, base flow, flow variation, habitat disturbance, sediment, habitat degradation, connectivity, and introduced species, loss of prey base, and water quality have all been defined by the Technical Team as potentially limiting to mountain whitefish in tributary (Table 30) and mainstem (Table 31) habitats (assessment section 3.4.2). Environmental objectives in plan section 3.3 address the habitat concerns of mountain whitefish.

Problem 6: The Wood River sculpin (endemic to the Big and Little Wood River drainages) has diminished in range and abundance due to upland and riparian degradation, flow reductions due to withdrawl and drought, thermal alteration, and interactions with introduced species.

Biological Objective 6A: Increase productivity and production of Wood River sculpin to desirable levels within 15 years through habitat improvements outlined below (see environmental problems, objectives, and strategies).

Strategies:

6A1. Evaluate population limiting factors for Wood River and Shoshone scuplin (plan section 4.2: Research Needs).

6A2. Define appropriate population productivity and production goals through technical discussion and working groups (plan section 4.1: Data Gaps).

6A3. Continue implementation of beneficial activities detailed in the Wood River Sculpin Habitat Conservation Assessment and Strategy (USDA USFS et al. 2001) (plan section 4.3: M&E).

6A4. Identify and develop indices to evaluate biological response(s) to habitat improvement projects (plan section 4.1: Data Gaps).

6A5. Coordinate ongoing activities aimed at Wood River sculpin with implementation of strategies and actions delineated for various species below under environmental problems, objectives and strategies.

6A6. Monitor and evaluate the ability of habitat improvement projects to provide biological benefit using indices developed in strategy step 3.

Discussion: The Wood River sculpin (*Cottus leiopomus*) is considered a sensitive species by the USFS in Region 4 and is similarly protected by all federal agencies. The Idaho Department of Fish and Game (IDFG) classify the fish as a species of special concern (assessment section 3.4.1, Wood River sculpin). Little is known about the life history of the Wood River sculpin. They appear to require low to moderate gradient areas with coarse substrate, instream cover, and good pool-to-riffle ratios. Sculpins in general are sensitive to habitat alteration and pollution

and have been used as indicators of good water quality (assessment section 3.4.1, Wood River sculpin). In the winter, Wood River sculpin were found only in large pools. Deep complex pools are critical to their overwinter survival (assessment section 3.4.1, Wood River sculpin).

Limited information provided the following habitat relationships relative to Wood River sculpin (assessment section 3.4.1: Wood River Sculpin):

- Sculpin density appears to decline with increased embeddedness.
- Substrate size may be related to the size of the sculpin using it, i.e., the smaller the substrate, the smaller the sculpin.
- Water velocity between 1.5 and 3.0 feet per second may be optimal for adult sculpin.
- Water depth (> 4 inches) is a positive habitat attribute regardless of substrate size or flow velocity.
- Adult sculpin are most abundant in relatively deep water along the channel thalweg.
- The largest sculpin are generally associated with streambank structures (large woody debris, boulders).

Environmental objectives in plan section 3.3 support protection or restoration of habitat favorable for Wood River sculpin.

Problem 7: Predation negatively impacts native species in some areas of the subbasin, primarily in areas where habitats have been significantly altered.

Biological Objective 7A: Evaluate and establish the impact of predation on productivity of native fish populations throughout mainstem and tributary habitats by 2019.

Strategies:

7A1. Evaluate the impact of predation where it is currently known or suspected to be a problem for native species. Give priority to relationships defined in Table 6 (plan section 4.2: Research Needs).

7A2. By 2009, define and prioritize for study, additional areas (as necessary) within the subbasin where native species populations may be negatively impacted by predation (plan section 4.1: Data Gaps).

7A3. Based on findings of strategies 7A1 and 7A2, adjust management strategies to lessen impacts of predation on native species (plan section 4.3: M&E).

7A4. Monitor and evaluate effectiveness of activities implemented under strategy 7A3.

Table 6. Overview of known or suspected predatory relationships which may negatively impact native species within the Middle Snake subbasins.

Area of Concern	Predatory Species	Native Species Impacted
Silver Creek area - Big Wood River drainage	Brown trout	Mountain whitefish Wood River sculpin
Silver Creek area - Big Wood River drainage	Native rainbow trout[1]	Wood River sculpin
Salmon Falls Creek	Smallmouth bass	Native salmonids
Mainstem Habitats	All introduced species	White sturgeon, native salmonids
Mainstem Habitats	Northern Pikeminnow	White sturgeon, native salmonids

1. USDA USFS (2001) states that management for trophy size rainbow trout in this area may potentially result in increased predation on Wood River sculpin.

Discussion: The Technical Team described predation as being a less influential factor limiting populations in the Salmon Falls drainage and the mainstem Snake River between CJ Strike Dam and Shoshone Falls (assessment section 3.4.2: Limiting Factors). Predation by brown trout in Silver Creek area impacts mountain whitefish and possibly Wood River sculpin. Mainstem reservoir habitats are no longer suitable for most native species; non-native introduced species prey on existing native species in and near mainstem habitats. Native predatory species (northern pikeminnow) are also favored by habitat alteration and contribute to predation issues. Alteration of habitats allows spread of non-natives from mainstem to tributary habitats (e.g. smallmouth into Salmon Falls Ck).

Problem 8: Loss of prey base due to lost anadromous fish runs (salmon, steelhead and lamprey) may be negatively impacting white sturgeon and bull trout which historically preyed on those species.

Biological Objective 8A: Evaluate and quantify impacts to white sturgeon and bull trout related to loss of anadromous fish runs to the Middle Snake subbasins.

Strategies:

8A1. Assess impacts to white sturgeon and bull trout from loss of anadromous stocks. Quantify the ecological process and population impacts associated with the loss of anadromous fish species (plan section 4.2: Research Needs).

8A2. Evaluate potential for offsetting negative impacts to bull trout and white sturgeon due to use of alternative food sources. Assess diet, growth, condition, etc. by life stage as it relates to similar stocks in areas where

substantial anadromous fish runs still exist (plan section 4.2: Research Needs).

Discussion: The loss of prey base resulting from anadromous fish extirpation has been identified as a factor of intermediate influence on bull trout populations in the lower tributaries (below mouth of Weiser River) and on white sturgeon, bull trout, and mountain whitefish populations in the mainstem (assessment section 3.4.2: Aquatic Resources Limiting Factors, Table 33 and Table 34). Reduced abundance of most of the fish species in the subbasins contributes to the loss of prey base.

Problem 9: Fresh water mollusks are declining in distribution and abundance throughout the Snake River system due to habitat alteration.

Biological Objective 9A: Support freshwater mollusk conservation and recovery through habitat restoration, ground and surface water conservation, and continued research of environmental factors limiting mollusk growth, survival, and reproduction.

Strategies:

9A1. Pursue the establishment of conservation areas on springs and spring-fed tributaries and groundwater of the Snake River in conjunction with local, state, and federal habitat improvement programs for the benefit of trust aquatic and wildlife resources and the people of Idaho (plan section 4.3: M&E).

9A2. Pursue the opportunities for water conservation through water rental programs, water banks, and the acquisition of permanent non-use water rights for the benefit of trust aquatic and wildlife resources and the people of Idaho (plan section 4.3: M&E).

9A3. Support the research of environmental factors limiting the growth, survival, and reproduction of freshwater mollusks in the Snake River and its tributaries to promote the adaptive versus static management of the Snake River basin and its resident fish and wildlife (plan section 4.2: Research Needs).

9A4. Support the attainment of recovery criteria for threatened and endangered mollusks through cooperative agreements with private, state, and federal resource managers (plan section 4.3: M&E).

Discussion: Five species aquatic snails found in the Middle Snake subbasins upstream of C.J. Strike Dam are listed for protection under the ESA (plan section 5.1). Four are listed as endangered: the Idaho springsnail (*Pyrgulopsis* [=*Fontelicella*] *idahoensis*), Utah valvata snail (*Valvata utahensis*), Snake River physa snail (*Physa natricina*), and Banbury Springs lanx (*Lanx* sp.). One aquatic snail is listed as threatened: the Bliss Rapids snail (*Taylorconcha serpenticola*) (December 14, 1992 [57 FR 59244]) (assessment section 3.4.1, Aquatic snail

species). As molluscs are a food source for opportunistic white sturgeon, mollusc conservation efforts benefit white sturgeon.

The Technical Team defined baseflow, flow variation, watershed disturbance, sediments, hatchery influence, and introduced species as potentially limiting to mollusk species in the mainstem Snake River (assessment section 3.4.2: Aquatic Resources Limiting Factors, Table 33 and Table 34). The New Zealand mudsnail (*Potamopyrgus antipodarum*) is a threat to listed snail species. It is widely distributed and adaptable, experiencing explosive growth in the Snake River and shows a wide range of tolerance for water fluctuations, velocite, temperature, and turbidity (USFWS 1995). Ground water conservation may likely be the most important conservation effort for snails, and the most pragmatic in terms of implementation (S. Lysne, USFWS, personal communication, April 21, 2004).

3.2.2 Terrestrial Species

Problem 10: Limited understanding of the composition, population trends, and habitat requirements of the wildlife and plant (terrestrial) communities of the Middle Snake subbasins, limits the ability to effectively manage or conserve these species (see assessment section 3.5: Terrestrial Resources for available data related to terrestrial communities).

Biological Objective 10A: Increase understanding of the composition, population trends, and habitat requirements of the terrestrial communities of the Middle Snake subbasins.

Strategies:

10A1. Develop a subbasinwide survey program and database for terrestrial focal, ESA listed, and culturally important species (plan section 4.1: Data Gaps).

10A2. Increase documentation by supporting the efforts of the Idaho Conservation Data Center (IDCDC) and other agencies to document the occurrence of rare species and work toward increased reporting of sightings (see assessment section 3.3: Special Status Species for a summary of rare species documentation) (plan section 4.1: Data Gaps).

10A3. Research life history requirements continue to research the habitat requirements of the terrestrial species of the Middle Snake subbasin, focus efforts on focal, ESA listed, and culturally important species and their interrelationships (plan section 4.2: Research Needs).

10A4. Continue existing and expand research on processes such as fire regimes, stream/spring hydrology, plant community dynamics etc. that influence the terrestrial communities of the subbasin (plan section 4.2: Research Needs).

Discussion: Increasing the amount of data collection focused on terrestrial species will improve our understanding and ability to manage these species. Establishing a baseline understanding of current habitat conditions and population numbers will allow managers to evaluate the affects of management activities and adapt them as necessary. The option for other agencies to collect data and report sightings or rare species should be available. IDCDC should be the central repository.

3.3 Environmental Components

The problem statements and environmental objectives developed to address limiting factors in the Middle Snake subbasins are summarized in Table 7. The associated strategies are detailed in the test. These problems, objectives and strategies are generally meant to address habitat for fish and wildlife populations. This section is divided into two parts: the objectives and strategies to address problems in aquatic ecosystems, followed by those addressing terrestrial ecosystems.

Table 7. Problems statements and environmental objectives in the Middle Snake subbasins. These must be taken in context with associated strategies and discussion comments in plan section 3.3: Environmental Components.

Problem Statements		Environmental Objectives	
Aquatic Ecosystems			
11	Water quantity, quality, connectivity, and habitat complexity are key environmental factors limiting aquatic species	11A	Restore flows in limited reaches
		11B	Reduce water temperature to meet needs of aquatic focal species
		11C	Reduce instream sedimentation to meet water quality standards
		11D	Coordinate with TMDL process to support nutrient reduction efforts in 303 (d) listed stream segments affecting ESA listed or focal species.
		11E	Reduce number of artificially blocked stream miles by 2019 to increase fish access to habitat, while screening diversions that negatively affect listed or focal species
		11F	Improve aquatic habitat diversity and complexity in tributary systems where focal species populations are limited
Terrestrial Ecosystems			
12	The introductions of noxious weeds have negatively impacted focal habitats and species.	12A	Protect existing quality, quantity, and diversity of native habitats.
		12B	Reduce extent and density of established noxious weeds and invasive exotics.
13	Alteration of the natural fire regime has negatively impacted native terrestrial focal habitats and species.	13A	Manage fire on the landscape in a manner that would allow for natural ecosystem processes and succession.

Problem Statements		Environmental Objectives	
14	Historic and current livestock grazing has adversely impacted fish and wildlife habitats and populations in some areas.	14A	Manage grazing to reduce impacts on the aquatic and terrestrial communities in the subbasin. Protect and restore riparian, wet meadow, and native upland habitats.
		14B	Reduce conflicts between livestock and native wildlife, fish, and plant populations.
15	The conversion of native habitats by urban and rural human development and has negatively impacted native terrestrial species.	15A	Minimize the negative impact of current and future development, including roads, on the native terrestrial species of the subbasins.
16	Reductions in the extent of dry, mature pine/fir forest habitats have negatively impacted the numerous wildlife species that utilize these habitats.	16A	Protect mature pine/fir forest habitats.
		16B	Manage for a minimum of 20-40% mature old growth stands of ponderosa pine and Douglas-fir in warm/dry-ponderosa pine, Douglas Fir, and grand fir habitat groups
17	The excessive loss and degradation of shrub-steppe habitat has negatively impacted numerous native plant and animal species.	17A	Protect existing shrub-steppe habitats from additional fragmentation and degradation. Prevent the additional loss of shrub-steppe habitats. Restore areas important for focal species
18	The extensive loss and degradation of native grassland habitats has negatively impacted numerous native plant and animal species.	18A	Protect remaining native grassland remnants.
		18B	Restore historic native grassland habitat to natural conditions.
19	The loss or degradation of wetland and riparian habitats has negatively impacted the numerous wildlife species that utilize these habitats	19A	Protect, enhance or restore wetlands or create new wetland habitats to mitigate for permanently lost wetlands
		19B	Protect, enhance or restore riparian habitats.
		19C	Achieve hydrologic processes that protect water quality, base flows, peak flows, and timing to ensure that riparian, wetland, and aquatic resources are in proper functioning condition.

3.3.1 Aquatic Ecosystem

Problem 11: Water quantity and quality, connectivity, and habitat complexity are key environmental factors that limit the production of resident fish species and aquatic wildlife (assessment sections 3.4.2: Aquatic Limiting Factors).

Environmental Objective 11A: Restore flows in limited stream and spring reaches to support resident fish needs (including spawning, rearing, and migration) and the needs of other aquatic species, resulting in an increased trend in the number of stream miles with adequate flows.

Strategies:

11A1. Research adequate flows for specific life history and species composition needs. Identify problems and opportunities for improvement at a finer scale than is presented in the assessment (plan section 4.2: Research Needs).

11A2. Prioritize problems and activities for protection and restoration at a finer scale than presented in plan section 6: Prioritization to improve fish spawning, rearing, and migration. These problems have a long history and a complex legal and social context that must be taken into account while planning and implementing activities. Prioritize activities based on cost-effectiveness and expected biological response, taking account of and working with the social economic complexity and its restraints in the subbasin (plan section 4.1: Data Gaps).

11A3. Complete designation of minimum flow requirements where appropriate (plan section 4.3: M&E). Conduct appropriate consultation amongst local, state, tribal, federal, water user, and other relevant agencies/entities to designate adequate flow requirements. An overview of any existing minimum flow requirements in the subbasins is presented in assessment section 2.6: Hydrology.

11A4. Continue and expand efforts aimed at increasing base flows and restoring natural flow timing through riparian, floodplain, and wetland enhancements (plan section 4.3: M&E). Implement forest and agricultural BMPs, where hydrographs have been altered (assessment section 2.6: Hydrology).

11A5. Where hydrographs have been altered by high surface water withdrawals, work with water users to develop cooperative efforts to improve water conservation and decrease water withdrawals.

11A6. Coordinate efforts with the Idaho Department of Water Resources to secure water rights designated to meet flows where necessary and possible (plan section 4.3: M&E).

11A7. Monitor and evaluate outcomes of strategies 11A4, 11A5, and 11A6. Integrate new data with information from strategy 1. Revise strategies 11A1 through 11A3 as necessary to reflect new information. Continue or repeat strategies until all flows are adequate.

Discussion: Low base flows, or dewatering, has been identified as highly limiting to redband trout, mountain whitefish, and Wood River sculpin in areas of the Wood River, Camas Creek, and Canyon Springs drainages, as well as in select tributaries (upper/central tributaries) of the mainstem Middle Snake River between its confluence with the Weiser and Malad rivers (assessment section 3.4.2: Aquatic Resources Limiting Factors, Table 33 and Table 34). In addition, low base flows in mainstem habitat have been identified as highly limiting to focal mollusk

species between Shoshone Falls and C.J. Strike Dam. Other areas with low flows have been selected as moderately or slightly limiting (assessment section 3.4.2: Aquatic Resources Limiting Factors, Table 33 and Table 34).

Minimum stream flow requirements have been filed for Silver Creek, Bancroft Springs, Big and Little Wood River, and the Malad River in the subbasins (assessment section 2.6: Hydrology). Minimum flows in the mainstem Snake River, from C.J. Strike Dam to Brownlee Dam, have been identified for protecting aquatic, wildlife, and vegetation resources (assessment section 2.6: Hydrology, Table 2 and Table 3). These minimum flows are often not met during the irrigation season. In addition to concerns about low flows, episodic high flows are necessary to maintain riparian and wetland vegetation dependant on periodic flooding (assessment section 2.6: Hydrology).

The Technical Team believes the degree of which hydrograph alteration in the Middle Snake subbasins is problematic to resident and aquatic focal species is well established. Flow cues are required by white sturgeon and redband trout for spawning. Invertebrate species are negatively impacted by impoundments. Clearly, further degradation of instream flows will not reverse the declining trend of certain resident fish and native mollusk populations. This condition makes it necessary to address the current recommendations for evaluation of additional minimum flow designations. Research should be initiated to focus on areas where natural hydrographs have been altered so that the extent to which reduced flows have impaired various life history stages for focal aquatic species can be established (plan section 4.2: Research Needs). Prioritization of problem areas should differentiate between systems that are naturally limited by flow and those impacted by anthropogenic activities. Flow problems and restoration are highly controversial in these subbasins.

Environmental Objective 11B: Reduce water temperatures to levels meeting applicable water quality standards for life stage-specific needs of aquatic focal species, with an established upward trend in the number of stream miles meeting standards by 2019.

Strategies:

11B1. Inventory and prioritize areas where temperature amelioration would most benefit various target species at a finer scale than presented in plan section 6: Prioritization and assessment section 3.4.2: Aquatic Limiting Factors (plan section 4.1: Data Gaps). Begin in spawning and rearing areas, then migratory corridors and support TMDL processes (plan section 5.2.2: TMDLs in the Middle Snake subbasins).

11B2. Conduct habitat inventories in priority areas of the Middle Snake subbasins (plan section 4.1: Data Gaps), placing emphasis on data collection for canopy closure and stream shading in coordination with existing programs (see inventory).

11B3. Develop a water temperature database for the subbasin (plan section 4.1: Data Gaps). Prioritize problems, opportunities, and areas for restoration based on strategy 11B1. Prioritization needs should include cost-effectiveness and potential biological responses. This prioritization will determine sequencing of activities in strategies 11B4 and 11B5 (plan section 4.1: Data Gaps).

11B4. Identify and rehabilitate wetland and floodplain areas to restore hydrologic function (plan section 4.3: M&E).

11B5. Continue efforts aimed at increasing streamside shading where streamside shading where riparian habitats have been reduced by anthropogenic activities. This strategy includes implementing forest and agricultural BMPs. Restore watershed functions where impairment has impacted temperatures (plan section 4.3: M&E).

11B6. Continue TMDLs, Ecosystem Analysis at the Watershed Scale (EAWS), and other watershed-scale assessments to define localized factors negatively influencing temperature regimes and differentiate between natural and anthropogenic influences. Add existing information to database (inventory section) (plan section 4.1: Data Gaps).

11B7. Monitor and evaluate the results of all implementation strategies—Integrate data with other new information and revise assessment and priority strategies. Repeat implementation and monitoring and evaluation strategies until water temperature is no longer a problem in the subbasin.

Discussion: Excessive stream temperatures in various tributary and mainstem habitats of the Middle Snake subbasins are considered to be factors limiting the production of focal aquatic species (assessment section 3.4.2: Aquatic Resources Limiting Factors, Table 33 and Table 34). Over 1,400 stream miles—including 10 reservoirs, 12 Snake River segments, 2 springs, and 95 tributary segments—have been classified as water quality limited in the subbasins under § 303(d) of the Clean Water Act (assessment section 2.9: Water Quality). Assessment Appendix A, Table 43 summarizes the 303 (d) listed streams and their listed parameters in the Middle Snake subbasins. The Snake Hells Canyon subbasin TMDL and Middle Snake/Succor Creek Subbasin TMDL addressed impairment of beneficial uses due to temperature exceedances (plan section 5.2.2: TMDLs in the Middle Snake subbasins).

The Technical Team listed temperature as a priority to address for focal species in most segments of the mainstem Snake River (plan section 6.1: Aquatic Prioritization). Stream reaches need to be prioritized for temperature amelioration at a finer scale. Reaches that are 303(d) listed and that are inhabited by multiple focal species or influence habitats containing key species should direct prioritization of restoration efforts. On-the-ground restoration efforts should focus on rehabilitating a naturally functioning thermal regime and address

hydrologic function in riparian areas, wetland areas, and floodplains. Monitoring and evaluation of restoration efforts, including agricultural and forestry BMPs, will ensure quality assurance/quality control and efficient use of resources. Continued effort should be dedicated to the investigation and/or establishment of localized temperature standards to account for local variability in the biological response to temperature conditions.

Environmental Objective 11C: Reduce instream sedimentation to levels that meet applicable water quality standards and measures and establish an upward trend in the number of stream miles meeting such criteria by 2019.

Strategies:

11C1. Continue development of TMDLs, EAWSs, and other watershed-scale assessments designed to define both localized sediment sources and opportunities to ameliorate impacts (plan section 5.2.2: TMDLs in the Middle Snake subbasins) (plan section 4.1: Data Gaps).

11C2. Develop a coordinated monitoring program for sediment production, transport, and fate through existing monitoring entities, where possible (plan section 4.1: Data Gaps).

11C3. Inventory and prioritize areas where sediment reductions would be most beneficial to various target species at a finer scale than presented in plan Section 6: Prioritization (plan section 4.1: Data Gaps). Begin spawning and rearing areas, then migratory corridors and support TMDL processes.

11C4. Reduce sediment inputs by cooperatively implementing practices that address problems from logging, mining, agriculture, and other historic and current sediment-producing activities (plan section 4.3: M&E).

11C5. Monitor and evaluate results of all implementation activities—Integrate new data and information into strategies 11C1 through 11C3. Revise and repeat implementation strategies until the problem is adequately addressed.

Discussion: The Technical Team described sediment as a factor potentially limiting all focal fish species to a varying degrees, especially in tributary habitats. Instream sedimentation concerns are most widespread in the Camas Creek and Salmon Falls drainages where redband trout, mountain whitefish, and Wood River sculpin are limited (assessment section 3.4.2: Aquatic Resources Limiting Factors, Table 30 and Table 31).

TMDLs have been developed for sediment in the Brownlee (Weiser flat), Snake-Hells Canyon, Middle Snake/Succor Subbasin, Big Wood Subbasin, and Billingsley Creek Subbasin (plan section 5.2.2: TMDLs in the Middle Snake subbasin). These finer-scale assessments and plans are helpful in defining localized source areas, and they use reach-specific data to address problems and

provide treatments. Also helpful are studies specifically designed to identify sediment production areas, track sediment movement, and estimate where sediment deposition will occur. By using a combination of these and other approaches and by establishing where sedimentation will cause the greatest ecologic impact, managers will be able to prioritize sediment abatement actions that will be most beneficial to subbasin resources.

Environmental Objective 11D: Coordinate with TMDL process to support nutrient reduction efforts in areas affecting ESA listed or focal species.

Strategies:

11D1. Prioritize stream reaches for nutrient reduction where excess nutrients (or related water quality concerns) are negatively affecting listed and focal species (plan section 4.1: Data Gaps) at a finer scale than available in this plan (plan section 6: Prioritization).

11D2. Coordinate with and utilize TMDLs (plan section 5.2.2: TMDLs in the Middle Snake subbasins) and other efforts to evaluate nutrient sources negatively affecting listed and focal species in prioritized reaches (plan section 4.1: Data Gaps).

11D3. Target nutrient reduction efforts accordingly to benefit aquatic and terrestrial species (plan section 4.3: M&E) in a cooperative manner.

11D4. Monitor and evaluate nutrient reduction efforts. Integrate data and new information into strategies 11D1 and 11D2 and continue.

Discussion: Water quality concerns related to excess nutrients are decreased dissolved oxygen concentrations, increased bacterial counts, and decreased turbidity. Recovery of the listed snail species will entail restoration of the water quality of the Middle Snake River to a level that supports and maintains diverse and sustainable aquatic ecosystems. The reduction of nutrients and sediment are particularly needed. Because of their stringent oxygen requirements, any factor that reduces dissolved oxygen concentrations for even a few days would likely prove fatal to most or all of the listed snails (USFWS 1995).

The Middle Snake River is affected by runoff from feedlots and dairies, hatchery and municipal sewage effluent, and other point and non-point discharges (USFWS 1995). During the irrigation season, 13 perennial streams and more than 50 agricultural surface drains contribute irrigation tailwater to the Snake River (USFWS 1995). In addition, state and federal fish culture facilities discharge wastewater into the Snake River and its tributaries (USFWS 1995). Coordination of this plan with the Snake River Aquatic Species Recovery Plan (1995) is described in plan section 5.1.2: Consistency with existing recovery plans.

It is important to coordinate actions to achieve objectives in this plan with the TMDL process (plan section 5.2.2: TMDLs in the Middle Snake subbasins).

However, it may be important to evaluate the TMDL timeframe as some may not reach attainment of goals for 50 or 60 years. TMDLs need to be reviewed and updated accordingly (M. Hemker, USFWS, personal communication, March 16, 2004).

Nutrients are not always in excess in the Middle Snake subbasins. The loss of anadromous fish impacted the basic biomass in the system, reducing overall nutrients and the potential productivity of some headwater streams (assessment section 3.4: Aquatic Resources).

Environmental Objective 11E: Reduce the number of artificially blocked stream miles by 2019 to increase fish access to habitat, while screening diversions that negatively affect listed or focal species.

Strategies:

11E1. Remove or modify known barriers limiting aquatic listed and focal species (assessment section 3.4.2; plan section 6: Prioritization) added update numbers. Screen known diversions negatively impacting listed or focal species (plan section 4.3: M&E).

11E2. Compile a database of existing and potential barriers to fish migration (culverts, bridges, stream crossings, etc.) and unscreened diversions in tributary habitats of the Middle Snake subbasins by 2010 (plan section 4.1: Data Gaps).

11E3. Prioritize additional barriers for removal or modification and diversions for screening at a finer scale than presented in plan section 6: Prioritization based on connection of habitats that are in a condition useable by listed or focal species (plan section 4.1: Data Gaps).

11E4. Remove or modify additional barriers or screen additional diversions. Emphasize alteration/removal of unnatural barriers over natural barriers (plan section 4.3: M&E).

11E5. Where elimination of barriers may pose a high risk to the genetic make-up of upstream fish stocks, de-emphasize barrier removal or elimination until the risk of introgression is minimized or eliminated.

11E6. Monitor and evaluate biological response resulting from strategies 11E3 and 11E4 to determine whether passage has been established—Integrate new data into strategies 11E1 and 11E2. Modify strategies based on new information and repeat until artificial barriers have been removed.

Discussion: Anadromous fish have been extirpated from the subbasins as a result of the Hells Canyon Complex of impassable dams. Road culverts can also prevent fish passage and seriously impact fish populations (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization). Lack of connectivity or passage in

areas of the Canyon Springs and upper/central tributaries of the Snake River has been designated as highly limiting to redband trout. Other areas where lack of connectivity is a moderate or slight impairment have been selected for redband trout, mountain whitefish, and Wood River sculpin (assessment section 3.4.2: Aquatic Limiting Factors, Table 33 and Table 34).

Isolation of local populations and habitat fragmentation due to passage barriers posed by culverts, irrigation diversions, and dams are the primary threats to bull trout in the Pine-Indian-Wildhorse core area. As brook trout are also a significant threat to bull trout in this area, the potential for introgression needs to be considered during barrier removal or modification projects (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization).

A 2003 culvert inventory exists for National Forest lands in the subbasin (B.Moore, RC&D, personal communication, March 2, 2004); however, this covers little of the subbasin. Upon development of a subbasinwide fish passage database, known barriers and unscreened diversions should be prioritized for removal or alteration and decisions made to either replace structures with fish/aquatic species-friendly crossings or remove the crossings that are no longer needed. Barrier modification should only occur on the validation that it will not negatively impact upstream populations. The effects of barrier removal/alteration will be evaluated to determine whether adequate passage has been achieved.

Environmental Objective 11F: Improve aquatic habitat diversity and complexity in tributary and spring systems where focal species populations are limited.

Strategies:

11F1. Identify habitats at a finer scale than presented in plan section 6: Prioritization, that have been simplified to a degree detrimental to focal species populations (plan section 4.1: Data Gaps).

11F2. Continue aquatic habitat improvement efforts consistent with existing federal, tribal, state, and local habitat improvement plans and guidelines (see subbasin inventory for overview of relevant existing plans and guidelines) (plan section 4.3: M&E).

11F3. Prioritize problems and protection and restoration using the information generated by strategy 11F1 and plan section 6: Prioritization, in coordination with entities implementing strategy 11F2.

11F4. Address priority problems with protection and restoration activities designed to promote development of more complex and diverse habitats through improved watershed condition and function. This will involve coordination of activities aimed at individual components (*e.g.,* temperature and sediment) (plan section 4.3: M&E).

11F5. Restore ecosystem functions by identifying and rehabilitating upland, wetland and floodplain areas (plan section 4.3: M&E).

11F6. Develop a method to monitor biological response to habitat improvements (plan section 4.2: Research Needs).

11F7. Monitor long-term effectiveness of habitat improvement efforts. Modify strategies based on new information as necessary.

Discussion: Channel form and stability, the presence of large woody debris, pool: riffle sequence, and interaction with riparian and floodplain areas influence the complexity and diversity of habitat available for aquatic species. Channel incision, advancement of headcuts, loss of floodplain interaction and riparian zone vegetation are among the primary symptoms of degraded habitat.

Habitat degradation including riparian or instream habitat loss was the most influential factor limiting production of redband trout and mollusk in Canyon Springs drainage as well as redband trout and bull trout populations in the tributaries of the Snake River below the mouth of the Weiser River (referred to as lower tributaries). Habitat degradation has an intermediate influence on redband trout and mountain whitefish in the Salmon Falls Creek drainage. Habitat degradation was the most influential factor limiting mountain whitefish and molluscs in mainstem habitats of the Snake River (assessment section 3.4.2: Aquatic Limiting Factors, Table 33 and Table 34).

Alterations in channel form and reductions in channel stability result in habitat degradation and reduced survival of bull trout eggs and juveniles. Channel alterations may reduce the abundance and quality of side channels, stream margins, and pools, which are areas bull trout frequently inhabit. Habitat degradation, loss of prey resources, and loss of connectivity between populations has white sturgeon populations in the subbasin to a fraction of historic estimates (assessment section 3.4.1: Focal Species Selection and Characterization).

3.3.2 Terrestrial Ecosystem

Problem 12: The introductions of noxious weeds and invasive nonnative species into the Middle Snake subbasins have negatively impacted native terrestrial focal habitats and species (assessment section 3.5.3: Terrestrial Limiting Factors).

Environmental Objective 12A: Protect the existing quality, quantity, and diversity of native plant communities providing habitat to native wildlife species by preventing the introduction of noxious weeds and invasive exotic plants into native habitats.

Strategies:

12A1. Identify and prioritize native plant communities for protection from exotic weeds using plan section 6: Prioritization and other plans (Cooperative Weed Management Area (CWMA) plans, county weed boards, or other

sources) as part of a finer scale prioritization effort (plan section 4.1: Data Gaps). Prioritize by cost-effectiveness and expected biological response.

12A2. Prevent new infestations (plan section 4.3: M&E) by minimizing ground disturbing activities in habitats highly susceptible to weed invasion (assessment section 3.5.3: Terrestrial Limiting Factors) through local cooperation and revegetate following disturbance.

12A3. Prevent seed dispersal (plan section 4.3: M&E) by encouraging the use of weed free seeds and feeds. Limit the transportation of weed seeds from vehicles and livestock.

12A4. Increase public participation by promoting and participating in existing programs, supporting the Idaho Weed Management Strategy in developing education and awareness programs in noxious weed identification, spread, prevention, and treatment.

12A5. Minimize establishment of new invaders by supporting early detection and eradication programs (plan section 4.3: M&E).

12A6. Monitor and evaluate the effort to protect native plant communities from exotic plants. Integrate new information into strategy 12A1 and modify implementation strategies as necessary.

Discussion: Invasive plant and animal species–also referred to, as exotics, non-natives, introduced, or nonindigenous species–are organisms that have expanded beyond their native range or have been introduced from other parts of the world. Species are considered invasive if their presence in an ecosystem will cause environmental harm, economic harm, or harm to human health (assessment section 3.5.3: Terrestrial Limiting Factors). Populations of noxious weeds, which make up only a small portion of all alien taxa, are doubling on BLM land within the interior Columbia River basin every 5 to 6 years (assessment section 3.5.3: Terrestrial Limiting Factors). Noxious weeds destroy wildlife habitat, reduce plant and animal diversity, displace threatened and endangered species, and cost millions of dollars in treatment and loss of productivity on the land. Noxious weeds and other invasive plants have been identified as a significant factor limiting every focal habitat, except aspen forests, in areas of every 4th HUC in the subbasin (assessment section 3.5.3: Terrestrial Limiting Factors, Table 45).

Invasive exotics have various impacts on native habitats. The invasion of cheatgrass in shrub-steppe habitat is fueling larger and more frequent fires that outcompete sagebrush as well as the associated forb and grass species that are native components of that ecosystem. An estimated 25% of the original sagebrush ecosystem is now annual cheatgrass/medusa-head rye grassland, and an additional 25% of the sagebrush ecosystem has only cheatgrass as an understory constituent (assessment section 3.5.3: Terrestrial Limiting Factors). European purple loosestrife (*Lythrum salicaria*) has been spreading at a rate of 115,000

ha/yr and is changing the basic structure of most of the wetlands it has invaded (assessment section 3.5.3: Terrestrial Limiting Factors). Spotted knapweed infests a variety of natural and semi-natural habitats including barrens, fields, forests, prairies, meadows, pastures, and rangelands. It outcompetes native plant species, reduces native plant and animal biodiversity, and decreases forage production for livestock and wildlife. It has increased at an estimated rate of 27% per year since 1920 (assessment section 3.5.3: Terrestrial Limiting Factors). Spotted knapweed is capable of establishing itself into undisturbed sites; however, disturbance allows for rapid establishment and spread.

Livestock act as vectors for seeds, disturb the soil, and reduce the competitive and reproductive capacities of native species. Exotic weeds have been able to displace native species, in part, because native grasses of the Intermountain West and Great Basin are not adapted to frequent and close grazing (assessment section 3.5.3: Terrestrial Limiting Factors). Consequently, populations of native species have been severely depleted by livestock, allowing more grazing-tolerant weedy species to invade.

Control of infestations has been difficult and the ecological consequences have been serious. Negative impacts include reduction in biodiversity, forage, habitat and aesthetic quality, and soil productivity. Increased surface runoff and sediment yield may occur in areas infested by noxious weeds, which would also negatively impact aquatic systems. Preventing the spread and establishment of invasive exotic species in other areas of the subbasins is a priority. Future planning efforts should consider the recommendations of the Idaho Invasive Species Council (IISC) plan when it becomes available.

An assessment of invasive species management in Idaho was completed by the Idaho IISC in July 2003 (NNRG 2003). The IISC recommends the assessment become the basis for a more comprehensive plan designed to address the threats posed by invasive species in Idaho. Other recommendations include the establishment of an equitable and stable source of funds as insufficient funding and staff was noted as a major barrier by a great majority of Idaho's invasive species managers. It was also recommended that educational programs are conducted with focus on: (1) property owners, and (2) those having some relationship with invasive species pathways. The latter category ranges from nursery operators who import exotic species to recreationists. It is also important to set priorities for species to be addressed. There is a wide variety of species requiring control efforts and little consensus among managers on priorities for them. Efforts to prioritize species, and then work to prevent or manage outbreaks of them, must be accompanied by an assessment of the risk that each poses, including the risk of introduction if they are not already established. Coordination of invasive species work within state government is important to ensure that a comprehensive invasive species program in Idaho is not diluted by competing efforts among various agencies. Enactment of changes in state law should be considered to provide the Idaho Invasive Species Council with a clear statutory basis for developing and implementing a comprehensive invasive species

program. The identification of research needs is recommended as there is much to be learned about invasive species, ranging from how some microbials might spread to finding acceptable biological controls for noxious weeds. Finally, it is recommended that the Idaho Invasive Species Summit reconvene to review the current situation and discuss what future steps will be needed (NNRG 2003).

Environmental Objective 12B: Reduce the extent and density of established noxious weeds and invasive exotics and restore to a naturally functioning system using effective perennial species.

Strategies:

12B1. Identify and prioritize, at a finer scale than presented in plan section 6: Prioritization, noxious weed infestations for treatment in the subbasins in cooperation with existing Cooperative Weed Management Areas (CWMA). Prioritize according to cost-effectiveness and expected biological response (plan section 4.1: Data Gaps). Integrate new information with existing inventories and management efforts from each CWMA in the subbasin (Camas Creek CWMA, Adams County CWMA, Northside Tri-County CWMA, and the Shoshone Basin CWMA, Jordan Valley CWMA).

12B2. Treat weed infestations (plan section 4.3: M&E) to reduce or eliminate invasive exotic populations by implementing the most effective treatment methods, without adversely effecting sensitive native species (such as listed MacFarlane's four o'clock). Use the areas and species specific Weed Management objectives and priorities developed by the Cooperative Weed Management Area Committees in the subbasin in addition to plan section 6.1: Prioritization.

12B3. Control or mitigate for the adverse impact of invasive vegetation in reservoir drawdown zones (plan section 4.3: M&E).

12B4. Upon successful treatment, restore to naturally functioning system (plan section 4.2: M&E).

12B5. Encourage best management practices and land use that will decrease the likelihood of invasion. Use the most effective and environmentally appropriate biological, mechanical, or chemical treatments for control (plan section 4.3: M&E).

12B6. Regulate and enforce off-road vehicle restrictions (OHV) and educate to minimize impacts of recreation.

12B7. Monitor and evaluate efforts to reduce invasive exotics. Integrate new information and modify implementation strategies as necessary.

Discussion: As discussed in the preceding objective, noxious weeds and invasive plants degrade habitat and reduce its suitability for native plants and animals, and are expensive in terms of control measures and reductions in yield for agriculture and ranching. Working to develop effective methods for reducing noxious weeds and invasive plants in the subbasin will be an important step in preserving native biodiversity.

Problem 13: Alteration of the natural fire regime in the Middle Snake subbasins has negatively impacted native terrestrial focal habitats and species.

Environmental Objective 13A: Manage a natural historic fire regime on the landscape in a manner that would allow for ecosystem processes and succession.

Strategies:

13A1. Identify and prioritize areas for fire management needs at a finer scale than presented in plan section 6.1: Prioritization. Coordinate with existing management agencies (USFS, BLM, Idaho Department of Lands (IDL), and rural fire districts, Air Force, and other entities) with an emphasis on Middle Snake subbasins focal species and habitats (plan section 4.1: Data Gaps).

13A2. Shrub-steppe needs reduced fire frequency (plan section 4.3: M&E). Increase fire suppression efforts in shrub-steppe to limit the size and frequency of wildfires to mimic the historic fire regime. Follow objectives 7A and 7B (invasive exotics) to support fire management strategy.

13A3. Rehabilitate burned areas (plan section 4.3: M&E) in conjunction with objective 12B (Reduced extent and density of invasive exotics). Follow methods to increase seed germination success (BLM Fire Rehabilitation Protocols, NRCS Emergency Conservation Program). Emphasize use of native shrub, grass, and forb species in rehabilitation seed mixture.

13A4. Maintain, and improve existing native species in the long-term during rehabilitation efforts (short-term impacts may not be avoidable) (plan section 4.3: M&E).

13A5. Alter fire frequency in pine and juniper habitats in the subbasins to mimic the historic fire regime (plan section 4.3: M&E). Assess for each site for the combination of methods (thinning, prescribed fire, etc.) necessary to achieve appropriate distribution of seral stages (plan section 4.2: Research Needs).

13A6. Enhance public awareness of the fundamental importance of fire through educational programs about the role of fire in the ecosystem.

13A7. Monitor and evaluate management efforts. Integrate new information and modify implementation strategies as necessary.

Discussion: Altered fire regime has been ranked as a severe to moderately limiting factor in nearly all habitats in the subbasin (assessment section 3.5.3: Terrestrial Limiting Factors, Table 45 and Table 46). Fire suppression, vegetation management and other activities have altered vegetative composition and structure in many areas of the subbasins. Fire is an important disturbance regime that shapes habitats and impacts species. Moving fire management towards natural regimes will address many terrestrial species and habitat issues. Fire suppression has allowed conifers to invade once suitable meadow habitats required by the Northern Idaho ground squirrel, an ESA listed species (plan section 5.1.2: Coordination with existing recovery plans) as pine/fir habitats in the subbasin historically had a more frequent fire regime. The introduction of exotic grasses particularly cheatgrass (*Bromus tectorum*), has resulted in dramatically shortened fire return intervals. Both of these types of fire regime alterations have resulted in changes in the vegetative communities and ecosystem processes in the subbasins. These changes have had numerous far reaching impacts on the wildlife populations that depend on these communities.

Problem 14: Historic and current livestock grazing adversely impacted fish and wildlife habitats and populations in some portions of the subbasin.

Environmental Objective 14A: Manage grazing to reduce impacts on the aquatic and terrestrial communities in the subbasin. Protect and restore riparian, wet meadow, and native upland habitats.

Strategies:

14A1. Identify and prioritize areas impacted by grazing for protection and restoration at a finer scale than presented in plan section 6.1: Prioritization. Use the Coordinated Resource Management Planning process (NRCS) for development of Grazing Plans to improve and protect focal habitats (plan section 4.1: Data Gaps).

14A2. Manage grazing to reduce impacts by encouraging establishment of riparian pasture systems, exclusion fences (passable to wildlife), off-site watering areas, riparian conservation easements, or consider retirement of grazing permits in priority areas. Adjust seasonal timing of livestock grazing to minimize soil compaction, erosion, noxious weed propagation and conflicts with wildlife (plan section 4.3: M&E).

14A3. Identify confined animal feeding operations negatively impacting water quality, coordinate with and augment existing programs (State Department of Agriculture, TMDLs, Soil and Water Conservation Districts, and CWA) to design management actions minimizing sediment and nutrient inputs to streams and protect groundwater quality/quantity (plan section 4.3: M&E).

14A4. Monitor and evaluate the effort to protect and restore habitats from grazing impacts. Integrate new information into strategy 14A1 and modify implementation strategies as necessary.

Discussion: One of the most significant human-induced changes affecting the western landscape has been the widespread introduction of domestic livestock, as 91% of the public land in the western United States is grazed (assessment section 3.5.3: Terrestrial Limiting Factors). The abundance of food, water, and shade attracts livestock to riparian wetland areas. The direct effects of livestock grazing on the wetland riparian habitats have been summarized as follows (assessment section 3.5.3: Terrestrial Limiting Factors):

- Higher stream temperatures from lack of sufficient woody streamside cover.
- Excessive sediment in the channel from bank and upland erosion.
- A high coliform bacterium counts.
- Channel widening from hoof-caused bank sloughing and later erosion by water.
- Change in the form of the water column and the channel it flows in.
- Change, reduction, or elimination of vegetation.
- Elimination of riparian areas by channel degradation and lowering of the water table.
- Gradual stream channel trenching or braiding depending on soils and substrate composition with concurrent replacement of riparian vegetation with more xeric plant species.

Livestock grazing in shrub-steppe habitats alters species community composition and disrupts ecosystem function, often leading to invasion of non native plants, and a higher frequency of fire. The direct impacts from cattle are the grazing of plants and trampling of vegetation and soil (assessment section 3.5.3: Terrestrial Limiting Factors).

It is important to recognize the positive values in regard to ranching such as reduced fuel loads, preservation of rural values and lifestyle, and land use aside from development. In general, efforts should focus on cooperative improvement in riparian and wet meadow habitats, while acknowledging that some priority projects in other areas exist (especially in shrub-steppe habitats). Consider implications for wildlife during fencing projects that restrict access to riparian habitats.

Environmental Objective 14B: Reduce conflicts between livestock and native wildlife, fish, and plant populations

Strategies:

14B1. Encourage the reduction or elimination of domestic sheep and goat grazing within bighorn sheep habitat (plan section 4.3: M&E).

14B2. Protect important plant populations (plan section 4.3: M&E) developing grazing management plans to limit adverse impacts to rare or culturally important plant populations as described in assessment section 3.3: Special Status Species)

14B3. Prevent seed dispersal (plan section 4.3: M&E) by minimizing the potential for livestock to facilitate the spread of noxious weeds through weed-free hay programs, quarantine requirements, and other actions (strategy 12A3: Weeds).

14B4. Alter grazing management, where possible, to minimize livestock/big game conflicts (plan section 4.3: M&E, especially on winter range areas as illustrated in assessment section 3.5.2: Focal Species Associated with Focal Habitats, Figure 39 (mule deer habitat classes).

14B5. Monitor and evaluate efforts to reduce impacts of livestock on plant and wildlife species. Modify implementation strategies as necessary.

Discussion: Livestock can compete with native wildlife populations for forage and/or space. Heavy browsing by big game animals may inhibit shrub and grass cover, alter plant composition, alter vegetative structure, prevent adequate plant reproduction, or cause direct mortality (assessment section 3.5.3: Terrestrial Limiting Factors). Generally, big game impacts to the habitat become significant when the animals exceed the carrying capacity of the habitat.

Dietary overlap between elk and cattle likely occurs on fall cattle range used by elk later in the year as winter range (assessment section 3.5.3: Terrestrial Limiting Factors). Dietary overlap between elk and domestic sheep occurs during the summer when both species rely heavily on forbs (assessment section 3.5.3: Terrestrial Limiting Factors). The degree of diet overlap between cattle and mule deer is relatively small. The diets of domestic sheep and mule deer overlap during the spring and fall when both ungulates are using browse and forbs (assessment section 3.5.3: Terrestrial Limiting Factors). Winter bighorn sheep diets and summer-fall cattle diets have the greatest potential for overlap of any seasonal diet combination between these two ungulates. Under this combination, the diets of both cattle and bighorn sheep are dominated by graminoids. However, as with elk and cattle, the differences in seasonal habitat use displayed by cattle and bighorn sheep minimizes the potential for dietary competition between these species. Dietary overlap between domestic sheep and bighorn

sheep is not understood as well (assessment section 3.5.3: Terrestrial Limiting Factors).

Problem 15: The conversion of native habitats by urban and rural human development has negatively impacted native terrestrial species.

Environmental Objective 15A: Minimize the negative impact of current and future development, including roads, on the native terrestrial species of the subbasins.

Strategies:

15A1. Identify, map, and prioritize protection of focal habitats and travel corridors important to aquatic and terrestrial species at a finer scale than presented in plan section 6.1: Prioritization. Coordinate with effort to map big game habitat (Strategy 14B1).

15A2. Work with city and county governments and natural resource managers to include consideration of these important habitats in the planning process. Provide information on the impacts of development and roads on wildlife species and habitats (particularly big game winter range and rare plant habitat).

15A3. Support and fund predator information and education efforts of the wildlife agencies of the subbasin including Living with Carnivores, and Project Wild.

15A4. Encourage compliance with ordinances and covenants addressing weed and pet control.

15A5. Protect existing good quality focal habitats under threat of development through land purchase, fee title acquisitions, conservation easements, land exchanges and other actions (plan section 4.3: M&E).

15A6. Monitor and evaluate the effort to protect wildlife and their habitats from the effects of development and roads. Integrate new information into strategy 15A1 and modify implementation strategies as necessary.

Discussion: Land conversion on the urban fringe has a number of impacts on the natural environment and human activity. Farm and ranch lands, forests, and other open space are transformed into subdivisions, ranchettes, shopping areas with expansive parking lots, and roads. This reduces wildlife habitat and diminishes wetland/ riparian areas (assessment section 3.5.3: Terrestrial Limiting Factors).

The fastest growing area in the Columbia River Basin is the State of Idaho with a population growth rate of 28.5%. Recreation, tourism and quality of life issues play a significant role in population increases across the region. The population growth trend and its related development directly challenge community and environmental quality in many ways. Communities throughout the basin are

struggling to deal with the impacts of this population growth to agricultural lands, water quality, forests, wildlife and habitat (assessment section 3.5.3: Terrestrial Limiting Factors). Increasing development results in habitat fragmentation, higher road densities, and loss of wildlife security. Humans living in previously wild areas also result in significant predation on native fauna by pets. Habitat fragmentation negatively affects many of the terrestrial focal species within the subbasins such species as Spalding's silene, white-headed woodpecker, sharp-tailed grouse, and mountain quail (assessment section 3.5.2: Focal Species Associated with Focal Habitats). Efforts to reduce the negative impacts of development on native species and habitats should continue.

Problem 16: Reductions in the extent of dry, mature pine/fir forest habitats in the subbasin have negatively impacted the numerous wildlife species that utilize these habitats.

Environmental Objective 16A: Protect mature pine/fir forest habitats.

Strategies:

16A1. Inventory and map existing mature pine/fir forest habitats (plan section 4.1: Data Gaps) at a finer scale than presented in assessment section 2.5: Vegetation, Figure 7.

16A2. Integrate information presented in plan section 6: Prioritization into a finer scale prioritization process to protect pine/fir forest communities.

16A3 Protect existing mature ponderosa pine communities through land purchase, fee title acquisitions, conservation easements, land exchanges or other strategies (plan section 4.3: M&E). Encourage the planting of ponderosa pine in existing state, federal and tribal reforestation efforts.

16A4. Where appropriate to the habitat type, use prescribed burning and/or understory removal to protect mature stands from stand-replacing fire events (plan section 4.3: M&E) in coordination with strategy 13A2 to mimic the natural fire regime.

16A5. Continue existing programs that work to acquire and restore low elevation pine/fir forests (plan section 4.3: M&E). Develop new programs to acquire and restore mature ponderosa pine forests.

16A6. Monitor and evaluate effectiveness of pine/fir protection activities to reduce negative impacts to wildlife species. Integrate new information into strategies 16A1 and 16A2. Modify implementation strategies as necessary.

Discussion: The loss of pine/fir forest is primarily a result of timber harvest, grazing pressure, conversion to agriculture, invasive exotic species, and encroachment by other species following fire suppression. Under historic fire regimes, stands were

usually maintained in a late seral single layer structure (assessment section 3.5.3: Terrestrial Limiting Factors).

Needles, cones, buds, pollen, twigs, bark, seeds, and associated fungi and insects provide food for many species of birds and mammals. Pine/fir forests provide numerous species of birds and mammals with shelter at each stage of growth but is particularly valuable in mature stands and as snags, where it provides spacious housing for numerous cavity dwelling species and valuable perch trees such as lynx and bald eagle (plan section 5.1.2: Consistency with existing recovery plans). Reductions in pine/fir habitats has negatively impacted native focal wildlife species including the flammulated owl and the white-headed woodpecker (assessment section 3.5.2: Focal Species Associated with Focal Habitats). Protection of stands of pine/fir forests in areas where the habitats were historically dominant will help to preserve wildlife dependent on the various pine/fir forest habitat types.

Environmental Objective 16B: Manage for a minimum of 20-40% mature old growth stands of ponderosa pine and Douglas-fir in warm/dry-ponderosa pine, Douglas Fir, and grand fir habitat groups.

Strategies:

16B1. Identify and prioritize areas to develop into pine/fir forest communities (plan section 4.1: Data Gaps) at a finer scale than presented in plan section 6.1: Prioritization or assessment section 3.5.2. Use vegetation layer or BLM or USFS plans to aid prioritization. Integrate information developed in objective 16A to protect pine/fir forests.

16B2. Where appropriate to the habitat type, use prescribed burning and selective thinning (in coordination with strategy 13A2 to mimic natural fire regime) to encourage succession and the establishment of mature pine/fir forest communities (plan section 4.3: M&E).

16B3. Where historic pine/fir forest communities have been deforested, actively restore (plan section 4.3: M&E) following objective 12A (Noxious weeds), objective 13A (fire suppression), and objective 16A (timber harvest).

16B5. Monitor and evaluate the effectiveness of strategies 16B2 and 16B3 at achieving objective 16B. Integrate new information to modify strategies 16B1 through 16B3 as necessary.

Discussion: As described above, timber harvest, land-use conversion, invasive exotics, and fire suppression have resulted in a decline in the abundance of pine/fir forests in the subbasin. Management for the restoration of pine/fir forests to areas of historic dominance and encouragement of natural succession processes will increase the amount of pine/fir habitats available to dependent wildlife. The 20-40% goal was selected because the terrestrial subcommittee felt it was small

enough to be feasible within the current political, social, and ecological context of the subbasin, but was substantial enough to be biologically significant. The historical range of variability for mature ponderosa pine/Douglas-fir in forested ecosystems is approximately 30% (USFWS 2003).

Problem 17: The excessive loss and degradation of both dwarf shrub-steppe and shrub-steppe habitats in the Middle Snake subbasins has negatively impacted numerous native plant and animal species dependent on these habitats.

Environmental Objective 17A: Protect existing shrub-steppe habitats from additional fragmentation and degradation. Prevent the additional loss of shrub-steppe habitats. Restore areas important for focal species.

Strategies:

17A1. Identify and prioritize areas of existing good and excellent shrub-steppe habitats for protection and degraded areas for restoration at a finer scale than presented in plan section 6.1: Prioritization. Use areas identified in plan Section 6.2: Terrestrial Prioritization, Figure 2: Terrestrial Protection and Restoration Priorities. Additional sources for use in prioritization are Figure 37 (sage grouse habitats and potential restoration areas) in assessment section 3.5.2: Focal Species Associated with Focal Habitats, the Lepidium Conservation Strategy, the BLM Management Plans when updated, and Idaho Army National Guard Integrated Natural Management Plan as a starting point.

17A2. Protect existing good and excellent shrub-steppe habitats (plan section 4.3: M&E) based on specific areas defined following strategy 1. Prioritize protection efforts to support habitat for focal species and to protect other important habitats (particularly big game winter range and rare plant habitat) under threat of development through land purchase, fee title acquisitions, conservation easements, land exchanges, candidate conservation agreements, and other actions. Protect and restore important big game winter range through the planting of high quality browse shrub species.

17A3. Follow objective 14A (Protection and restoration from grazing impacts) to develop Coordinated Resource Management Plans (NRCS) to support protection efforts of existing good and excellent shrub-steppe habitats.

17A4. Research shrub-steppe restoration methods and explore techniques for effectively restoring habitats in coordination with interested landowners, agencies and organizations (plan section 4.2: Research Needs).

17A5. Increase fire suppression efforts in shrub-steppe habitats to limit the size and intensity of wildfires, following objective 13A (Natural fire regime) (plan section 4.3: M&E).

17A6. Follow objectives 12A (Protect native habitats from invasive exotics) and 12B (Reduce the extent and density of established noxious weeds) to protect shrub-steppe habitats.

17A7. Restore fragmented and degraded sagebrush habitats (plan section 4.3: M&E). Use NRCS Soil survey data (SSURGO 2004) (in terms of potential vegetation) to determine high priority areas suitable for restoration. Maintain the structure and composition of shrub-steppe habitat to maintain dependant species (assessment section 3.5.2: Focal species associated with focal habitats).

17A8. On private lands, when possible, assist private landowners in maintaining and/or restoring native vegetation (plan section 4.3: M&E).

17A9. Monitor and evaluate the effectiveness of efforts to protect and restore shrub-steppe habitats. Integrate new information and modify strategies as necessary.

Discussion: Shrub-steppe (big sagebrush) habitats dominate the Middle Snake subbasins, covering over 56% (4,709,594 acres) of the land area (assessment section 3.5.1: Selection of focal habitats and focal species, Figure 29). Alteration of fire regimes, fragmentation, livestock grazing, and the addition of exotic plant species have changed the character of shrub-steppe habitat (assessment section 3.5.3: Terrestrial Limiting Factors, Table 29).

A change in the natural fire regime is decreasing the extent of sagebrush ecosystems, which resulted in steep declines in the populations of wildlife species that depend on sagebrush. Invasion of cheatgrass is fueling larger and more frequent fires that create the conditions that allow invasive exotics to outcompete sagebrush as well as the associated native forb and grass species (assessment section 3.5.3: Terrestrial Limiting Factors).

The U.S. Fish and Wildlife Service determined substantial biological information exists to warrant a more in-depth examination of greater sage-grouse status. Petitions include information detailing loss, fragmentation, and degradation of sage-grouse habitat due to wildfire, invasion of non-native plants, livestock management, agricultural conversion, herbicide treatment, mining and energy development, among other causes. Once review is complete, the Service will determine whether to propose listing the species as threatened or endangered (assessment section 3.5.2: Focal species associated with focal habitats). Sage-grouse are shrub-steppe dependant species. More than half of the Pacific Northwest shrub-steppe habitat community types listed in the National Vegetation Classification are considered imperiled or critically imperiled (assessment section 3.5.3: Terrestrial Limiting Factors).

Problem 18: The extensive loss and degradation of native grassland habitats of the Middle Snake subbasins has negatively impacted numerous native plant and animal species dependent on these habitats.

Environmental Objective 18A: Protect remaining native grassland remnants.

Strategies:

18A1. Inventory and map existing native grassland remnants (plan section 4.1: Data Gaps), building on existing data presented in assessment section 2.5: Vegetation, Figure 7.

18A2. Prioritize areas for protection with larger remnants or those that contain rare species. Integrate information presented in plan section 6.1: Prioritization to provided detail at a finer scale.

18A3. Protect remaining native grassland remnants through land acquisition, fee title acquisitions, conservation easements, or land exchanges (plan section 4.3: M&E).

18A4. Monitor and evaluate the effectiveness of protecting native grassland remnants as a strategy for providing native grassland habitats and protecting native grassland dependent wildlife species. Integrate new information into strategies 18A1 and 18A2 as part of next iteration of program.

Discussion: Both grazing and fire suppression favor shrub species over grasses and accelerate soil erosion. Extensive amounts of grasslands have been, or are being, converted to agricultural production. Once these ecosystems are converted, only limited potential for restoration to native grasslands exists (assessment section 3.5: Terrestrial Resources). Preservation of relatively intact prairie grasslands will provide habitat for the many species, such as listed Spalding's silene (plan section 5.1.2: Coordination with existing recovery plans), as well as preserving reference to guide restoration efforts aimed at expanding these habitats (environmental objective 18B: Restore grasslands).

Environmental Objective 18B: Restore historic native grassland habitat to natural conditions.

Strategies:

18B1. Research grassland restoration methods and explore techniques for effectively restoring grassland habitats in coordination with interested landowners, agencies and organizations (plan section 4.2: Research Needs).

18B2. Identify prioritize and map areas for native grassland restoration (plan section 4.1: Data Gaps) at a finer scale than presented in plan section 6: Prioritization. Integrate information from objective 15A to minimize the

negative impact of development into the process, helping to connect fragmented habitats and prevent further fragmentation (see discussion regarding prioritization).

18B3. Restore native grassland habitats by actively improving or creating native grassland habitats through noxious weed control, cultural practices and seeding. Encourage the use of native species in existing state, federal, and tribal habitat programs (plan section 4.3: M&E).

18B4. Acquire and restore grasslands by continuing existing programs that work to acquire and restore prairie and canyon grasslands (plan section 4.3: M&E). Develop new programs to acquire and restore prairie and canyon grasslands.

18B5. Monitor and evaluate the effectiveness of strategies 18B3 and 18B4. Integrate new information into strategies 18B1 and 18B2. Modify strategies as necessary based on new information.

Discussion: Even native grassland habitats not converted to cultivated or urban lands have been degraded through the introduction of exotic species, grazing practices, and fragmentation. Restoring these habitats to a more natural state and building connections between habitat fragments will benefit the many terrestrial species that depend on this habitat type.

With current technologies, the restoration of degraded grassland systems is expensive and time consuming. However, new techniques for grassland restoration are being developed and may be available for use following future iterations of the plan.

Preventing species from being listed is of lower priority than preventing species from going extinct. For example, projects for listed species such as Spalding's silene (*Silene spaldingii*) would have higher priority than doing projects to benefit sage grouse, although both are focal species in this subbasin. Fish and Wildlife Service conducted extensive public input before preparing the Spalding's silene recovery plan including contact with private landowners. The recovery plan for this species will be available as an internal USFWS document by the end of April 2004, while the recovery plan draft should be available for public review in October 2004 (M. Hemker, USFWS, personal communication, April 16, 2004). The State of Idaho prepared a conservation strategy for use in the interim (Hill and Gray 2004).

Problem 19: The loss or degradation of wetland, spring and riparian habitats has negatively impacted numerous species that utilize these habitats.

Environmental Objective 19A: Protect, enhance or restore wetlands and spring habitats or create new wetlands to mitigate for permanently lost wetlands.

Strategies:

19A1. Conduct surveys of important wetland areas to refine protection and restoration priorities given in plan section 6: Prioritization. Complete National Wetlands Inventory maps across the subbasin (plan section 4.1: Data Gaps). Use methodology consistent with and build on the work conducted in the subbasin by Jankovsky-Jones in 1997 and 2001 (assessment section 3.5.1: Selection of focal habitats and focal species, Figure 36). Assessment Appendix F displays wetland areas already surveyed and associated management needs.

19A2. Protect wetland and springs habitats through land acquisition, fee title acquisitions, conservation easements, land exchanges, public education, promotion of BMPs, promotion of alternative grazing strategies and the installation of alternative forms of water for livestock (plan section 4.3: M&E).

19A3. Restore wetland habitats by improving wetland function and quality (plan section 4.3: M&E). Work to address the issues identified in Assessment Appendix F (Wetland survey and identified needs) by implementing appropriate strategies to achieve objectives 11A (restore flows), 12A (protect native habitats), 12B (reduce established invasive exotics), 14A (reduce negative impacts of grazing on wetlands), and 15A (minimize negative impacts of development).

19A4. Create and/or reestablish wetlands where it will help mitigate the impacts of nonpoint and point sources of pollution to achieve compliance with TMDL (plan section 4.3: M&E). Integrate with objective 11D (nutrient allocation plan). Build on the success of work done by TNC at Thousand Springs.

19A5. Work with responsible parties within the FERC relicensing process to protect and restore existing wetland and spring habitats to mitigate for the impacts of the hydropower system.

19A6. Where priority wetlands and springs exist on private land collaborate with private landowners, communicate and cooperate with landowners to protect or improve wetland and spring habitat (plan section 4.3: M&E).

19A7. Monitor and evaluate effort to protect wetlands. Integrate information into strategy 19A1 and modifying activities under strategies 19A2, 19A3, and 19A4 as necessary based on new information.

Discussion: Wetlands and springs cover only a small portion of the subbasins, but offer some of the most diverse and unique habitats available. Wetlands occur as small ponds filled by spring runoff, wet meadows, springs and seeps, bogs, small lakes, and riverine and streamside riparian areas. Many wetland communities in the subbasin have been degraded by livestock grazing, road development, land use conversion, urban expansion, and altered hydrologic regimes. Given the

weakness of current data on wetlands in these subbasins, it is not currently possible to determine exact acreage needing protection and restoration.

Two wetland and riparian habitat characterizations have been conducted for the subbasin: in 1997, wetland habitats in the Big Wood River, Little Wood River, and Camas Creek drainages (Big Wood drainage) and in 2001, wetland habitats along the mainstem Snake River from Milner Dam to the confluence with the Payette River (assessment section 3.5.1: Selection of focal habitats and focal species).

The spring systems associated with the Thousand Springs Ecosystem in the area surrounding Hagerman support a rich mixture of herbaceous species. Box Canyon, on the northeast shore of the Snake River between Hagerman and Buhl, is the only Class 1 wetland area identified in the subbasins. Box Canyon is possibly the best remaining example of Thousand Springs formation habitats and reported to be the eleventh largest spring in the United States. The springs contain populations of listed snail species (plan section 5.1.2: Coordination with existing recovery plans) and provides habitat for other species of concern (California floater, Shoshone sculpin, giant helleborine) (assessment section 3.5.1: Selection of focal habitats and focal species). Banbury Springs are currently unprotected and also provide habitat for sensitive species (assessment section 3.5.1: Selection of focal habitats and focal species). A characterization of other important wetland and spring areas are in assessment section 3.5.1: Selection of focal habitats and focal species. Collection of baseline data for additional prioritization is an important first step. The Technical Team chose not to speculate on quantitative goals at this time, while emphasizing the importance of continuing with wetland protection and restoration while data collection proceeds. The Technical Team thought that any further loss of this habitat from the current situation is unacceptable.

Environmental Objective 19B: Protect, enhance or restore riparian habitats.

Strategies:

19B1. Identify and prioritize riparian habitats for protection and restoration (plan section 4.1: Data Gaps) at a finer scale than presented in plan section 6.1: Prioritization.

19B2. Restore degraded riparian areas prioritized under strategy 19B1. Coordinate with existing plans and programs addressing riparian habitats when possible (plan section 4.3: M&E).

19B3. Protect riparian communities through land purchase, the acquisition of water rights, fee title acquisitions, conservation easements, land exchanges, promotion of BMPs and land stewardship, promotion of alternative grazing strategies and the installation of alternative forms of water for livestock (plan section 4.3: M&E).

19B4. Minimize road and other land-use impacts in riparian areas (plan section 4.3: M&E).

19B5. Protect and restore riparian communities in agricultural lands through increased enrollment by landowners in the Continuous Conservation Reserve Program (CCRP), conservation easements and other agricultural land programs (plan section 4.3: M&E).

19B6. Increase stewardship and public knowledge by increasing understanding of the importance of riparian habitat through education programs for the general public, irrigation districts, water users, land owners and land managers (plan section 4.3: M&E).

19B7. Monitor and evaluate efforts to protect and restore riparian habitats to address objective 15B. Integrate new information into strategy 19B1 and modify implementation strategies as necessary.

Discussion: Adjacent to many streams, rivers, and wetlands, riparian habitats are water-dependent systems strongly associated with stream dynamics and hydrology. Riparian habitats may reduce stream temperatures by providing shade, reduce sediments through channel stabilization and filtration, increase channel habitat diversity, and improve floodwater retention and groundwater recharge. These habitats consistently support greater diversity and abundance of wildlife species than other habitat types and are often important breeding habitats, seasonal ranges, or migration corridors for a variety of fish and wildlife species (assessment section 3.5.1: Selection of focal habitats and focal species). Grazing/browsing, altered hydrologic regime, invasive exotics, and land-use conversion were defined as limiting factors by the Technical Team (assessment section 3.5.3: Terrestrial Limiting Factors). The Technical Team believes any further loss of this habitat is unacceptable.

Environmental Objective 19C: Restore hydrologic processes that protect water quality, base flows, peak flows, and timing to ensure that riparian, wetland, and aquatic resources are in proper functioning condition.

Strategies:

19C1. Minimize development (roads and timber) in riparian areas (plan section 4.3: M&E).

19C2. Utilize grazing strategies (strategies 14A2 and 14A3) that minimize impacts to streambanks and riparian vegetation (plan section 4.3: M&E).

19C3. Monitor water allocations and diversions to ensure that wetland and riparian resources are not degraded (plan section 4.3: M&E).

19C4. Work with water users to improve equipment and/or methods that result in increased efficiency and decreased consumption in the subbasin (plan

section 4.1: Research Needs). Coordinate with efforts to maintain spring flows in the Snake River aquifer (see comments in discussion).

19C5. Reduce the impacts of vegetation conversion projects (e.g. vege conversion to irrigated agriculture) on hydrologic regimes through use of established BMPs (plan section 4.3: M&E).

Discussion: Altered hydrologic regime is a primary limiting factor in mainstem and some tributary systems (Camas Creek and the Little Wood River) in the subbasins (assessment section 3.5.3: Terrestrial Limiting Factors, Table 33). Hydromodification has become widespread due to activities that capture, control, store, and divert water. These alterations support drinking water supplies, hydropower, irrigation, flood control, manufacturing uses, and recreation. Few human actions have more significant impacts on a river system than dam construction (assessment section 3.5.3: Terrestrial Limiting Factors). Dams change upstream and downstream habitats, water temperatures, water quality, and sediment movement

Channelization (river and stream channel engineering undertaken for the purpose of flood control, navigation, drainage improvement, and reduction of channel migration potential) includes activities such as straightening, widening, deepening, or relocating existing stream channels and clearing operations. These forms of hydromodification typically result in more uniform channel cross-sections, steeper stream gradients, a reduction in average pool depths and altered stream/river flow. These activities also deprive wetlands of enriching sediments, change the ability of natural systems to both absorb hydraulic energy and filter pollutants from surface waters. Frequently channelization and channel modification activities diminish suitability of instream and riparian habitat for fish and wildlife (assessment section 3.5.3: Terrestrial Limiting Factors).

Significant amounts of water consumption can also alter hydrologic processes. Water conservation and efficiency challenges largely result from agricultural use, as municipalities use far less than agriculture in Idaho. Water conservation is an important issue in this subbasin. In many cases transfer loss (conveyance loss from evaporation and infiltration) is where most water is lost. Measures to improve conveyance efficiency could result in substantial water savings.

Water savings attained should not be re-appropriated, but used for the benefit of fish and wildlife in the context of this management plan. Irrigators will benefit from increased efficiencies through cost savings associated with reduced electricity costs.

3.4 Socioeconomic Components

These social and economic objectives are designed to provide guidance for implementing the terrestrial and aquatic protection and restoration objectives and strategies outlined in the Middle Snake Subbasins Plan. They are essential to the short- and long-term success of overall efforts in

the subbasin. The problem statements and socioeconomic objectives in Table 8 were developed to address factors limiting the implementation of the Vision of the Middle Snake subbasins. They are not meant to be optional or to be implemented to the detriment of aquatic and terrestrial objectives and strategies, but are process-oriented and should be addressed whenever possible as part of all planning and implementation activities. They address important aspects of the context within which aquatic and terrestrial protection and restoration occur. The successful management of fish and wildlife in the subbasin is partially dependent on implementing the strategies detailed in this section.

The following objectives and strategies were developed by the Planning Team during regular subbasin planning meetings. These objectives, strategies and discussions were developed within a collaborative, consensus-based discussion. All changes and revisions were reviewed and approved by the Planning Team.

Table 8. Problems statements and socioeconomic objectives in the Middle Snake subbasins.

Problem Statements		Socioeconomic Objectives	
20	Lack of coordination and integration limit the economic, social, cultural and biological benefits of aquatic and terrestrial protection and restoration	20A	Form a group in the Middle Snake subbasins focused on fish and wildlife planning and implementation to coordinate and prioritize activities
21	The management of both public and private lands and water in the Middle Snake subbasin impacts local communities and their economies	21A	Balance negative impacts and benefits to local communities and economies with benefits to fish and wildlife
22	Many important cultural uses of the Middle Snake subbasins are impacted by fish and wildlife activities	22A	Protect and foster cultural uses of natural resources in the Middle Snake subbasins.

Problem 20: As reflected in the inventory, numerous agencies and entities are implementing programs and projects in the subbasin. Insufficient coordination and integration limit the economic, social, cultural and biological benefits of aquatic and terrestrial protection and restoration in the subbasin

Socioeconomic Objective 20A: Form a group in the Middle Snake subbasins focused on fish and wildlife planning and implementation to coordinate and prioritize activities.

Strategies:

20A1. Develop a group to coordinate project development and planning, including strategies 20A2 through 20A8.

20A2. Involve communities and finer scale efforts in subbasin planning, and in program and project planning.

20A3. Coordinate plan implementation with federal, tribal, state, local, and other interests, and avoid program and project duplication.

20A4. Assist Soil and Water Conservation Districts, Watershed Advisory Groups, and other existing groups to organize project goals and implementation strategies.

20A5. Promote stewardship of natural resources through enhanced local involvement and support.

20A6. Implement information and education actions identified in this management plan.

20A7. Provide opportunities for subbasinwide information distribution, such as periodic public meetings, newsletters, web sites, etc.

20A8. Develop ongoing public involvement process.

Discussion: Systematic coordination of programs and plans in the subbasin will achieve benefits beyond the value of an individual program or project, and will promote the application of ecosystem management principles. Existing programs and projects are listed in the inventory. Current activities are taking place at a variety of scales, many of them finer than subbasin planning (e.g. watershed or reach scales). Some activities would more effectively accomplish the objectives of this plan if they were coordinated with subbasin planning efforts. Subbasin scale coordination would enable the development and coordination of synergistic benefits as well as and the more efficient and effective use of limited resources, while providing the communication necessary to avoid duplicate efforts.

Implementing this plan will be a complex and time intensive task requiring efforts at multiple scales and in multiple political and funding forums. To be successful over the long run, a coordinator will be needed to spearhead the effort. No existing group is fulfilling this role for the Middle Snake subbasins. The Planning Team expressed the need to identify an organization to represent a broad cross section of stakeholders, agencies and tribes active in the Middle Snake subbasins. The Resource Conservation and Development (RC & D) Coordinators already provide a forum for the integration of efforts at federal, state, tribal and local levels. The Southwest Idaho RC & D has expressed interest in leading the effort to organize this subbasin scale organization, facilitate the process of seeking funding and hiring a coordinator, and organizing and coordinating efforts across the subbasins. The subbasin scale organization will provide a forum for prioritization and recommendations for funding and will coordinate the technical and financial resources necessary to implement this plan. Southwest Idaho RC&D has offered to start developing this group and seeking funding for this effort. The Planning Team recommends that the RC&D spearhead the effort to form the subbasin-scale organization. Once a coordinator is hired, they will continue to develop the group and coordinate its activities. The group needs to

include but would not be limited to representatives of tribes, local, state and federal agencies, private individuals, local interest groups, landowners, Watershed Advisory Groups and Soil Conservation Districts. Everyone needs to be involved throughout the process to avoid conflicts later.

Implementation of the subbasin plan will require efforts at multiple scales including subbasin, terrestrial and aquatic populations, watershed and finer scales. Technical expertise needs to be available for participation in finer scale efforts. This will help achieve continuity and consistency in local efforts as well as informing subbasin scale efforts. The subbasin scale group will provide a forum for coordinating the application of technical expertise across multiple jurisdictions and management areas in the Middle Snake subbasin.

Over the long run, broad public understanding and commitment to fish and wildlife efforts need to be developed in the Middle Snake subbasins. This effort needs to involve individuals as well as agencies. Groups operating at finer scales need to coordinate with the subbasin scale effort. Technical resources need to be provided to local groups, while local data, information and priorities need to be integrated into the subbasin scale effort. A sustained, long-term public involvement effort is needed to provide information to communities and residents of the subbasin and to involve them in decision making in the subbasin. These activities should be woven into projects and programs whenever possible. Multiple roles and efforts should be underway at the same time. Programs and project proposals need to be developed that are compatible with existing community needs and that integrate with local watershed protection, restoration and management activities.

Problem 21: The management of both public and private lands and water in the Middle Snake subbasin impacts local communities and their economies.

Socioeconomic Objective 21A: Balance negative impacts and benefits to local communities and economies with benefits to fish and wildlife.

Strategies:

21A1. Minimize negative impacts on the communities and economies in the Middle Snake subbasin while achieving sustainable aquatic and terrestrial populations.

21A2. Minimize impacts on local community culture and custom.

21A3. Minimize the economic impacts on local agricultural community.

21A4. Utilize local labor forces, contractors, and suppliers when implementing habitat improvement projects.

21A5. For land purchases or easements, every effort should be made to avoid impacts caused by shifts in the tax burden to the private sector.

21A6. Evaluate the economic efficiency and impacts of projects as part of prioritization processes in the subbasin.

Discussion: The economy of the Middle Snake subbasin depends highly on natural resources, although this dependency has changed over time. In the past, the focus was on natural resource-based uses, while more recently, recreation and other uses have increased to be closely balanced with continued natural resource use. Agriculture is the largest component of the economies of the Middle Snake subbasin and impacts to agriculture need to be considered when prioritizing and implementing projects in the subbasin. The populations of adjacent subbasins use and influence the Middle Snake subbasins. This influence is not always reflected in the economic and social data for the subbasin. The Planning Team believes that it is important to protect and foster continued natural resource use in the subbasin into the future.

Whenever possible, involve local labor and resources in protection and restoration efforts to provide direct participation in the process while providing work and economic benefits to local areas.

The social and economic benefits and impacts of restoring and protecting fish and wildlife in the Middle Snake subbasins need to be evaluated and integrated into subbasin planning. Low cost economic analysis tools need to be developed for use at the subbasin scale. Trend information is particularly important for understanding benefits and impacts that may take decades to manifest. Baseline data needs to be collected or augmented to support trend analysis. This analysis needs to be targeted towards the specific economic and social factors affecting resource decision making. These tools are needed throughout the Columbia Basin and should be developed at a regional level to provide consistency and efficiencies across multiple subbasins. Once these tools have been developed, a baseline established and an evaluation of current conditions made, this information needs to be integrated into prioritization processes.

Community support is critical to the success of long-term program and project implementation. Education and public involvement strategies and discussion are included in the previous objective.

Problem 22: Fish, wildlife and plants are important to many cultural uses of the Middle Snake subbasin. Indian tribes are continually losing opportunities to practice long standing traditions that keep their cultures alive, traditions related to and contingent on responsible natural resource management. Non-Indian users also face difficulty in maintaining cultural uses. Traditional uses, hunting and fishing, river floating, back packing and other activities are uses important to all users of the subbasin. Local industries that support these users may suffer or benefit from impacts on these uses.

Socioeconomic Objective 22A: Protect and foster both Indian and non-Indian cultural uses of natural resources in the Middle Snake subbasins.

Strategies:

22A1. Integrate information and education on important Indian and non-Indian culture, treaty rights, and historic and current resource use into project selection and implementation. Provide such information to land managers, regulatory agencies, policymakers, and the public.

Discussion: Healthy habitats and fish and wildlife populations provide cultural survival for tribes, and economic and other cultural benefits to all users of the Middle Snake subbasins. The Middle Snake subbasins are the homeland of the Shoshone-Paiute Tribes, with unrelinquished land title and rights to hunt and fish. This need provides context for fish and wildlife planning and implementation.

In addition to economics, social values need to be incorporated when implementing activities. The protection of treaty rights is a key component of public land management. The living culture of the Indian Tribes and nontribal citizens in the Middle Snake subbasins relies heavily on continued opportunities to harvest the natural resources managed on public and private lands. Wildlife viewing, hiking, photography, and other non consumptive uses are important uses of the subbasin. Through the protection of federally managed lands comes the protection of treaty rights and fulfillment of the trust obligations of federal agencies.

General changes to natural resource and public land management in the Middle Snake subbasins impact traditions and cultural uses. The abuse of private lands by outside users has led to the posting of lands and loss of access. This situation will continue until recreationalists develop a respect for private and public lands that eliminates the current abuse of private and public property by recreationists.

4 Research, Monitoring, and Evaluation Plan

This section describes conditions identified in the *Middle Snake Subbasins Management Plan* that will require research, monitoring, and evaluation (RM&E) activities to aid in resolving management uncertainties. This RM&E section is closely related to the vision, objectives, and strategies described in plan section 3 of this subbasins management plan, which were developed to address limiting factors identified in the *Middle Snake Subbasins Assessment*.

The need for adaptive management, monitoring, and evaluation of project implementation was an issue of focus during the development of objectives and strategies. Each objective has a set of strategies to either gain further understanding of limiting factors or take actions toward correcting limiting factors. Objectives also have a strategy focused on evaluating the effectiveness of implementation strategies in achieving desired objectives, modifying where necessary. In order to assess the effectiveness of a strategy, the measurable impact of implementing the strategy on environmental conditions will need to be collected throughout implementation activities. This section seeks to guide the collection of the most appropriate data to allow for effective adaptive management.

Successful adaptive management begins with stakeholder gatherings following a policy planning process that begins with goal identification, an understanding of uncertainties, and culminates in model simulations to understand potential management policies (Aldridge et al. 2004). This subbasin planning process has supported most of these efforts. Two key components of adaptive management are 1) to conduct management as an experiment with sound experimental design, and 2) maintain a direct feedback loop between science and management (Aldridge et al. 2004). The result is the incorporation of the scientific method (experiments) into a management framework (policy decisions), a substantial step above traditional trial and- error or learn-as-you-go management. A major flaw that often leads to a failure in adaptive management is the breakdown of progress from the development stage to the design and implementation of field experiments (Aldridge et al. 2004).

A series of meetings with technical personnel representing various tribal, federal, state, and county agencies involved in management of fish and wildlife resources in the Middle Snake subbasins guided development of this RM&E section. The group reviewed guidance in *A Technical Guide for Subbasin Planners* (NPPC 2001) and incorporated elements they considered appropriate and feasible based on the projects timeline, the needs of the subbasin, and the current state of knowledge in the subbasin. The group attempted to develop an integrated and iterative monitoring and evaluation plan that is consistent with the three tiered system advocated by the ISRP (2003) and the Columbia Basin Fish and Wildlife Authority's (CBFWA) Collaborative Systemwide Monitoring and Evaluation Project (CSMEP). The three tiers integral to this type of RM&E plan are described below as they were defined by CBFWA. The three tiers and their relationship to adaptive management are illustrated in Figure 1.

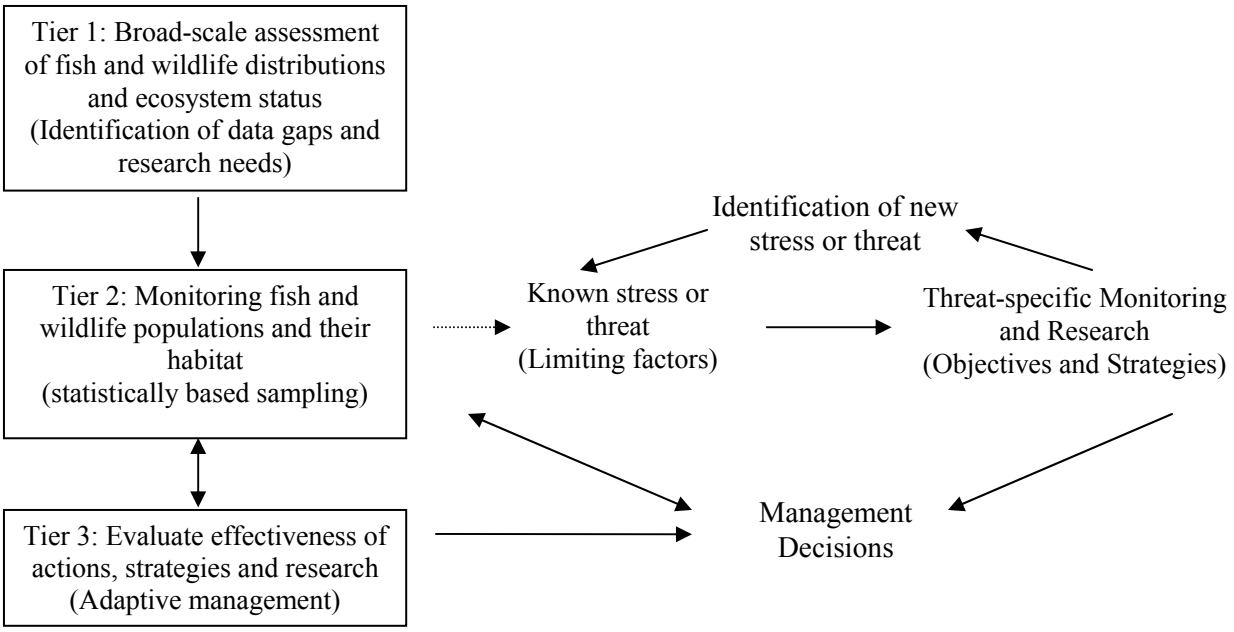

Figure 1. Ecological framework for research, monitoring and evaluation in the Middle Snake subbasins.

Both terrestrial and aquatics sections of the management plan describe RM&E needs. Needs include research or monitoring that fills existing knowledge or data gaps, answers questions critical to successfully managing species or communities, tests or develops innovative restoration/management techniques, or allows evaluation of the relative success of ongoing restoration/management activities. Other needs are defined as programs for gathering data or conducting research to further understanding of specific populations, their habitats and ecosystems. All RM&E projects must provide a clear linkage to adaptive management processes that improve the direction of future actions.

In the context of a subbasin plan, RM&E is needed to: (1) ensure strategies selected and implemented are addressing limiting factors as anticipated, and (2) verify that the limiting factors identified in the assessment are, in fact, elements limiting the environmental expression and biological performance desired. Three main types of strategies were identified for achieving the objectives and improving the limiting factors in the subbasin; strategies focused on filling data gaps, addressing research needs, or implementing actions to improve or preserve conditions. The types of data that will be need to be collected to assess the successfulness of each strategy in contributing to meeting the objective will vary among the three above mentioned types of strategies. Additionally, the amount of information available to the Technical Teams to make these recommendations varied among the three types of strategies.

Tier 1 monitoring and analyses will provide broad-scale assessments of aquatic and terrestrial focal species distributions and status of focal habitats across the subbasin (trend monitoring) filling data gaps and supporting research needs identified in the objectives and strategies. Research requires the use of experimental designs incorporating “treatments” and “controls” randomly assigned to study sites (ISRP 2003).

Addressing data gaps and conducting research contribute to an overall assessment of conditions and trends in the subbasin and, potentially, ecosystem. Additional monitoring of fish and wildlife populations and habitat (Tier 2) entail a monitoring component that provides measurable outcomes.

The effectiveness of specific actions taken (strategies) will be measured in the evaluation component (Tier 3). An evaluation of information collected through monitoring should assess any deviation of monitoring results from target goals or anticipated results. Three levels of evaluation are necessary: 1) an objective and independent scientific evaluation that interprets the strengths and weaknesses of available information, 2) a decision-making evaluation where contractors responsible for conducting monitoring projects shall coordinate with management agencies or entities to adaptively modifying management activities accordingly, and 3) a public evaluation where opportunity exits for comments. Recommendations to modify policy or management activities should follow evaluation.

The following topics were discussed during RM&E development:

1. Existing data gaps limiting management decisions or prioritization of activities.

2. Conditions in the subbasin requiring research to help resolve management uncertainties. Hypothesis testing. The spatial and temporal scale at which research be conducted?

3. The short-term indicator variables to measure during M&E activities to determine the success of strategies in achieving the desired objective. The predicted long-term biological outcome of successful strategy implementation.

4.1 Data Gaps

Fisheries and Terrestrial Technical Teams compiled a list of data gaps needed for management in the subbasins (Table 9 and Table 10). Data gaps represent areas where limited baseline data is a hindrance to effective management of the fish and wildlife resources of the subbasins. In most cases, these gaps are related to a basic understanding of species or habitat distribution, condition and trends. While it would be possible, and probably worthwhile, to develop research projects focused on closing many of these data gaps, they do not generally fit the criteria of a classic research need. Aquatic and terrestrial data gaps have been identified individually. The order in which gaps are listed in no way implies priority. Restoration efforts directed at either aquatic or terrestrial resources are likely to impact the ecosystem as a whole and aquatic and terrestrial needs are not perceived to be mutually exclusive.

Table 9. Data gaps identified as strategies to achieve aquatic biological and environmental objectives.

Strategy	Middle Snake Aquatic Data Gaps
2A1	Determine usable habitat for adjustments in white sturgeon population goals listed in Table 5
2A2	Continue to monitor success of white sturgeon spawning and early life history survival
2A6	Conduct periodic white sturgeon population assessment

Strategy	Middle Snake Aquatic Data Gaps
2A7	Develop genetics plan to address current status and implications of potential translocation or hatchery introductions
3A1	Continue with Native Salmonid Assessment including activities aimed at identification of stocks endemic to Middle Snake subbasins and introgressed populations
3B1	Continue ongoing evaluation of redband trout population structure and limiting factors
3B3	Build from information in assessment section 3.4.1 redband to define population areas and establish restoration priority and feasibility
3B5	Develop a genetics monitoring plan that integrates past genetics work and includes documentation and interpretation of natural or hatchery influenced genetic interaction between hatchery rainbow and redband trout
4A1	Determine current population abundance for the three existing population areas within Indian Creek (one population unit) and Wildhorse Creeks (Bear Creek and Crooked Creek populations)
4B3	Continue and expand ongoing surveys of both brook and bull trout, including standardized genetic sampling to determine levels of hybridization
5A1	Define appropriate population productivity and production goals through technical discussion and working groups
5A3	Identify and develop indices to evaluate biological response(s) to habitat improvement projects, using appropriate fish production models or empirical data to link the developed index to fish production potential
6A2	Define appropriate population productivity and production goals through technical discussion and working groups
6A4	Identify and develop indices to evaluate biological response(s) to habitat improvement projects
7A2	By 2009, define and prioritize for study, additional areas (as necessary) within the subbasin where native species populations may be negatively impacted by predation
11A2	Prioritize activities based on cost-effectiveness and expected biological response, taking account of and working with the social economic complexity and its restraints in the subbasin
11B1	Inventory and prioritize areas where temperature amelioration would most benefit various target species at a finer scale than presented in Plan
11B2	Conduct habitat inventories in priority areas of the Middle Snake subbasins, placing emphasis on data collection for canopy closure and stream shading
11B3	Develop a water temperature database for the subbasin and prioritize problems, opportunities, and areas for restoration based on strategy 11B1.
11B6	Continue TMDLs, Ecosystem Analysis at the Watershed Scale (EAWS), and other watershed-scale assessments to define localized factors negatively influencing temperature regimes and differentiate between natural and anthropogenic influences
11C1	Continue development of TMDLs, EAWSs, and other watershed-scale assessments designed to define both localized sediment sources and opportunities to ameliorate impacts
11C2	Develop a coordinated monitoring program for sediment production, transport, and fate through existing monitoring entities
11C3	Inventory and prioritize areas where sediment reductions would be most beneficial to various target species at a finer scale than presented in Plan
11D1	Prioritize stream reaches for nutrient reduction where excess nutrients (or related water quality concerns) are negatively affecting listed and focal species at a finer scale than available in this plan
11D2	Coordinate with and utilize TMDLs and other efforts to evaluate nutrient sources negatively affecting listed and focal species in prioritized reaches

Strategy	Middle Snake Aquatic Data Gaps
11E2	Compile a database of existing and potential barriers to fish migration (culverts, bridges, stream crossings, etc.) and unscreened diverstions in tributary habitats of the Middle Snake subbasins
11E3	Prioritize barriers for removal or modification and diversions for screening at a finer scale than presented in Plan
11F1	Identify habitats at a finer scale than presented in Plan that have been simplified to a degree detrimental to focal species populations

Table 10. Data gaps identified as strategies to achieve terrestrial biological and environmental objectives.

Strategy	Middle Snake Terrestrial Data Gaps
10A1	Develop a subbasinwide survey program and database for terrestrial focal, ESA listed, and culturally important species.
10A2	Increase documentation by supporting the efforts of the Idaho Conservation Data Center (IDCDC) to document the occurrence of rare species and work toward increased reporting of sightings.
10A3	Research life history requirements continue to research the habitat requirements of the terrestrial species of the Middle Snake subbasin, focus efforts on focal, ESA listed, and culturally important species.
12A1	Identify and prioritize native plant communities for protection from exotic weeds using plan section 6: Prioritization and other plans as part of a finer scale prioritization effort.
12B1	Identify and prioritize, at a finer scale than presented in plan section 6: Prioritization, noxious weed infestations for treatment in the subbasins in cooperation with existing Cooperative Weed Management Areas (CWMA).
13A1	Identify and prioritize areas for fire management needs at a finer scale than presented in Plan in coordination with existing management entities.
14A1	Identify and prioritize areas impacted by grazing for protection and restoration at a finer scale than presented in the plan.
15A1	Identify, map, and prioritize (at a finer scale than presented in plan section 6.1: Prioritization) protection of focal habitats and travel corridors important to aquatic and terrestrial species.
16A1	Inventory and map existing mature pine/fir forest habitats at a finer scale than presented in the assessment.
16B1	Identify and prioritize areas to develop into pine/fir forest communities at a finer scale than presented in the plan or assessment.
17A1	Identify and prioritize areas of existing good and excellent shrub-steppe habitats for protection and degraded areas for restoration at a finer scale than presented in the plan.
18A1	Inventory and map existing native grassland remnants building on existing data presented in the assessment.
18B2	Identify prioritize and map areas for native grassland restoration at a finer scale than presented in the plan.
19A1	Inventory and survey wetlands by completing National Wetlands Inventory maps across the subbasin.
19B1	Identify and prioritize riparian habitats for protection and restoration at a finer scale than presented in the plan.

4.2 Research Needs

Addressing data gaps will provide a strong foundation for the design of research projects. Determining the status of focal species and their habitats will require determination of sampling frequencies, sampling protocols, experimental design, and statistical analysis appropriate for the species of interest and the scope of research. Such details should 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 in the subbasin (Table 11 and Table 12). The hypotheses given should be considered examples to begin research, not a complete list.

Table 11. Aquatic research needs identified as strategies to achieve biological and environmental objectives (plan sections 5.3.1: Aquatic Species and 5.4.1: Aquatic Ecosystem). Hypotheses for testing and the scale at which research is to be conducted is provided, where possible.

Strategy	Middle Snake Aquatic Research Needs	Spatial Scale	Temporal Scale
1A2	Evaluate effects of lost anadromous components on the aquatic ecosystems in the subbasin.	Subbasin	5-10 Years
1A3	Continue to investigate the feasibility of restoring anadromous fish runs above Hells Canyon complex. Evaluate new technology for smolt collection and passage. H_0: It is not feasible to restore anadromous fish runs above Hells Canyon complex.	Below Swan Falls Dam	Ongoing
2A3	Evaluate the potential limiting factors to recruitment of white sturgeon. H_o: There is no difference in recruitment success with or without submerged riparian habitats during seasonal high water in Middle Snake subbasins (Coutant 2004). H_o: Altered flow regimes , loss of connectivity, reduced water quality.	Reach	Ongoing, at least 10-15 years.
2A4	Evaluate impacts of entrainment on white sturgeon population abundance and distribution. H_o1: Downstream genetic mixing due to entrainment does not limit population productivity or persistence. H_o2: Entrainment rates are not great enough to result in lost production upstream.	Basin wide	5-10 years.
2B1	Determine areas where catch and release angling may be impacting white sturgeon populations giving consideration to population size, angler effort, and catch rates.	Mainstem basinwide	10-15 years
2B2	Evaluate sport catch release angling impact on white sturgeon. Is incidental mortality from catch and release fishing impacting population's persistence (especially where limited recruitment exists)? H_o: There is no difference in mortality between catch rates.	Reach	Ongoing, at least 10-15 years.
2B4	Evaluate potential angling regulations which might contribute to reduced catch and release related mortality of white sturgeon (e.g. use of circle hooks, limited leader strength) and compare years. H_o: There is no difference in mortality resulting from different angling regulations.	Basinwide	5 years
3A2	Continue the genetic evaluation using data collected during the Native Salmonid Assessment including activities aimed at identification of stocks endemic to Middle Snake subbasins and introgressed populations. H_o 1: There is no difference between redband trout in the Middle Snake subbasins or redband trout elsewhere. H_o 2: Redband trout in the Middle Snake subbasins are not introgressed.	Subbasin	2-3 years.
3C3	Evaluate the management option of stocking only sterile rainbow trout. Evaluate the management option of using local native broodstock for fisheries mitigation and genetic conservation	Population	5 years
4B5	Develop and test methods to prevent the spread of brook trout, thereby reducing the spread of impacts of hybridization on bull trout.	Watershed	5-10 years

Strategy	Middle Snake Aquatic Research Needs	Spatial Scale	Temporal Scale
5A2	Evaluate alternative habitat treatments and expected biological outcomes to address water quantity and/or quality issues in various mountain whitefish habitat areas throughout the subbasins.	Watershed	10-15 years (multiple generations)
5A3	Identify and develop indices to evaluate biological response(s) to water quality improvement projects in the mainstem and water quantity improvement projects in tributaries, using appropriate fish production models or empirical data to link the developed index to fish production potential.	Subbasin	Long-term contingent on rate of water quality/ quantity improvement
6A1	Evaluate population limiting factors for Wood River and Shoshone sculpin.	Population	5 years
7A1	Evaluate the impact of predation where it is suspected to be a problem for native fish species. Give priority to relationships defined in Table 6. H_o: Predation does not limit production or viability of native fish species.	Watersheds	2-3 years per species
8A1	Assess impacts to white sturgeon and bull trout from loss of anadromous stocks. Quantify the ecological process and population impacts associated with the loss of anadromous fish species. Determine impact on white sturgeon growth rates. H_o: white sturgeon growth, survival, and productivity have not been diminished by loss of anadromous fish runs. H_o: No bioenergetic difference in various food sources.	Basinwide	5 years
8A2	Evaluate potential for offsetting negative impacts on bull trout and white sturgeon due to use of alternative food sources. Assess diet, growth, condition, etc. by life stage as it relates to similar stocks in areas where substantial anadromous fish runs still exist. H_o: no bioenergetic difference.	subbasin	5 years

Strategy	Middle Snake Aquatic Research Needs	Spatial Scale	Temporal Scale
9A3	Research environmental factors limiting the growth, survival, and reproduction of freshwater molluscs in the Snake River and its tributaries. H_o: there is no difference b/t the growth, survival, and reproduction of listed freshwater mollusks in springs and spring-fed tributaries compared to main-stem Snake River locations. H_o: "peak loading" from hydroelectric power generation has no effect on the growth, survival, and reproduction of listed freshwater mollusks in the main-stem Snake River. H_o: anthropogenic increases in nitrate+nitrite concentrations in spring discharges has no effect on the growth, survival and reproduction of listed freshwater mollusks in springs or spring-fed tributaries to the Snake River. H_o: contaminants (e.g. Cu, Cd, Pb, Hg, Se, et al.) from anthropogenic sources have no effect on the growth, survival, and reproduction of listed freshwater snails from the Snake River. H_o: native fish predation (e.g. suckers, sturgeon) has no effect on listed freshwater snails from the Snake River or its spring-fed tributaries. H_o: non-native fish predation (*e.g.* sunfish, crappie, trout?) has no effect on listed freshwater snails from the Snake River or its spring fed tribs.	1. reach 2. reach 3. spring 4. basin 5. basin 6. basin	1. 2 yrs 2. 2yrs 3. 5 yrs 4. 5yrs 5. 2yrs 6. 2yrs
11A1	Research adequate flows for specific life history needs of aquatic communities. H_o: Aquatic community composition is not dependant on natural hydrographs and, therefore, habitat conditions.	Subbasin	3-5 years
11F6	Develop a method to monitor biological response to habitat improvements	Reach or Watershed	10-15 years

Table 12. Terrestrial research needs in the Middle Snake subbasins identified as strategies to achieve biological and environmental objectives (plan sections 5.3.2: Terrestrial Species and 5.4.2: Terrestrial Ecosystem).

Strategy	Middle Snake Terrestrial Research Needs	Spatial Scale	Temporal Scale
10A3	Continue to research the habitat requirements of the terrestrial species of the Middle Snake subbasins, focus efforts on focal, ESA listed, and culturally important species	Subbasin and surrounding area	Life of management plan

Strategy	Middle Snake Terrestrial Research Needs	Spatial Scale	Temporal Scale
13A5	Assess each site for the combination of methods (thinning, prescribed fire, etc.) necessary to achieve appropriate distribution of seral stages	Dry conifer habitats	Until conditions are back within historic range of variability
17A4	Research shrub-steppe restoration methods and explore techniques for effectively restoring habitats in coordination with interested landowners, agencies and organizations	Shrub-steppe habitats	Until effective techniques are developed
18B1	Research grassland restoration methods and explore techniques for effectively restoring grassland habitats in coordination with interested landowners, agencies and organizations	Grassland habitats	Until effective techniques are developed
19C4	Work with water users to improve equipment and/or methods that result in increased efficiency and decreased consumption in the subbasin, including the urban environment	Mainstem, tributary, and spring areas	Until adequate flows for dependant species are achieved

4.3 Monitoring and Evaluation

The RM&E plan proposed below is not intended to be a field-ready program; rather, it represents a first step in program development. The focus is on the strategy level, not on the project level. Current or ongoing RM&E programs (as described in the inventory) likely incorporate many of the RM&E needs identified in this section. Development of any new plans will therefore be coordinated with existing programs to maximize effectiveness and reduce redundancy. Technical Teams designed the RM&E plan in response to recommendations by the NPCC (2001) in consideration of time limitations and the scale of planning activities.

Objectives and strategies that entail a monitoring component are outlined in Table 13 (Aquatic) and Table 14 (Terrestrial). A list of short-term indicators to measure the successful implementation of strategies that achieve desired objectives, and the expected long-term biological outcome, are provided to guide monitoring in the Middle Snake subbasin.

Table 13. Indicators and expected biological outcome used to evaluate success of implemented strategies in achieving aquatic objectives in the Middle Snake subbasins.

Objective	Strategy	Short-term Indicators to measure success	Long-term Biological Outcome
2A: Achieve white sturgeon population recovery	2A5: Determine and seek adequate flows via the State of Idaho instream flow statute (I.C. Title 42 Chapter 15) to meet spawning, incubation and early life history stages	Definition of adequate flows, potential establishment of adequate flows	Improved population productivity and abundance
	2A9: Implement translocation plan to improve productivity and genetic diversity, if necessary	Successful translocation of white sturgeon	Improved productivity and genetic diversity in areas where translocation has occurred
	2A11: Implement measures to improve water quality throughout the mainstem Snake River	Reduced levels of temperature, sediment, pollutants Increased number of stream miles restored	Increased abundance of native fish species including white sturgeon.
3A: Ensure continued existence of high density (core) redband trout populations at or near current levels	3A2: Expedite analysis of archived and/or additional necessary genetic samples	All samples completed Genetic baseline and/or profile(s) of redband trout.	Long-term population viability
3C: Ensure continued existence of moderate or low density (satellite) populations	3C1: limit further introduction and expansion of hatchery rainbow trout into redband trout habitats	Population distribution(s); Stocking records	Reduced hybridization Increased redband trout population viability

Objective	Strategy	Short-term Indicators to measure success	Long-term Biological Outcome
	3C2: restore degraded habitat to promote natural distribution of native resident fish	Defined under environmental objectives Increased number of stream miles restored	Reduced abundance/distribution of hybrids Increased redband trout population viability
	3C4: Continue to improve fish sterilization techniques relevant to stocking in this subbasin	% sterility of hatchery rainbows	Reduced numbers of viable hatchery rainbow trout Reduced hybridization Increased redband trout population viability
4A: Maintain and increase bull trout distribution and abundance (greater than or equal to 500 adults) within each of the defined local population watersheds (Indian and Wildhorse Creeks)	4A2: Maintain existing local population levels by protecting existing water temperature, stream flows, habitat quality, connectivity, and invasion from non-native species	Stable trends in water temperature, flow, habitat quality, passage, and distribution of non-native species	Stable population levels.
	4A3: Increase populations to at least 500 adults within each watershed by achieving relevant environmental objectives	Defined under environmental objectives	Increased population abundance and possibly expanded distribution.
	4A4: By 2015, define and complete all activities which will expand the potential range of bull trout within these population areas where it is believed to have been reduced due to anthropogenic impacts.	Bull trout range	Expanded population distribution and possibly increased abundance.
4B: Reduce and prevent impacts of brook trout on bull trout where they exist	4B1: Prevent introduction and expansion of brook trout into bull trout habitats without compromising connectivity for bull trout.	Brook and bull trout range	Reduced competitive interaction between brook and bull trout.
	4B2: Identify and eradicate isolated populations of brook trout where feasible.	Brook trout range and relative density	Reduced abundance and range of brook trout. Reduced competitive interaction between brook and bull trout

Objective	Strategy	Short-term Indicators to measure success	Long-term Biological Outcome
5A: Increase mountain whitefish productivity and production… through habitat improvements	5A4: Coordinate implementation projects with environmental problems, objectives and strategies based on information from strategies 5A1 and 5A2		
6A: Increase productivity and production of Wood River sculpin… through habitat improvements	6A3: Continue implementation of beneficial activities detailed in the Wood River Sculpin Habitat Conservation Assessment and Strategy	Defined in Habitat Conservation Strategy	Increased population abundance and/or distribution. Increased population viability of all fish species
7A: Establish the impact of predation on productivity of native fish populations throughout the mainstem and tributary habitats by 2019	7A3: Adjust management strategies to lessen impacts of predation on native species		
9A: Support freshwater mollusk conservation and recovery through habitat restoration, ground and surface water conservation, and continued research	9A1: Pursue the establishment of conservation areas on springs and spring-fed tributaries along with ground water conservation	Increased number of conservation areas. Improved condition of and flow from springs	Increased abundance of mollusks in springs and spring fed tributaries.
	9A2: Pursue opportunities for water conservation for the benefit of trust aquatic and wildlife resources.	Adequate instream flows. Number/amount of water rentals or water rights for the benefit of aquatic and wildlife resources	Increased abundance of mollusks.
	9A4: Support the attainment of recovery criteria for threatened and endangered mollusks…	Delisting of T&E mollusks	Increased abundance and population viability of mollusks.
11A: Restore flows in limited reaches and spring complexes.	11A3: Complete designation of adequate flow requirements where appropriate	Completed adequate flow designations.	Improved population viability, distribution and abundance.

Objective	Strategy	Short-term Indicators to measure success	Long-term Biological Outcome
	11A4: Continue and expand efforts aimed at increasing base flows and restoring natural flow timing through riparian, floodplain, and wetland enhancements. Implement forest and agricultural BMPs.	Increased base flows. Hydrograph improvements. Number of forest and agricultural BMPs implemented and acreage affected. Increased stream miles with adequate flows	Improved population distribution and abundance.
	11A6: Secure water rights designated to meet flows where necessary and possible	Increased number of water rights designating minimum instream flows.	Improved population distribution and abundance.
11B: Reduce water temperatures to levels meeting applicable water quality standards for life stage-specific needs of aquatic focal species	11B2: Rehabilitate wetland and floodplain areas to restore hydrologic function	Restoration of more natural hydrograph. Increased base flows.	Improved population distribution and abundance.
	11B3: Continue efforts aimed at increasing streamside shading, including implementing forest and agricultural BMPs to restore watershed functions where impairment has impacted temperatures	Increased shading from canopy cover. Increased miles or percent of streams meeting temperature criteria. Restoration of more natural hydrograph, resulting in increased base flows.	Improved population distribution and abundance.
11C: Reduce instream sedimentation to levels that meet applicable water quality standards and measures and establish an upward trend in the number of stream miles meeting such criteria	11C3: Reduce sediment inputs by cooperatively implementing practices that address problems from logging, mining, agriculture, and other historic and current sediment-producing activities.	Decreased percent fines. Increased D50. Decreased embeddedness.	Improved population distribution and abundance.
11D: Coordinate with TMDL process to support nutrient reduction efforts in areas affecting ESA listed or focal species	11D3: Target nutrient reduction efforts accordingly to benefit aquatic and terrestrial species in a cooperative manner	Reduced number of stream miles listed for nutrient impairment. Reduction in nutrient concentration of prioritized streams.	Improved population abundance and distribution
11E: Reduce number of artificially blocked streams	11E1: Remove or modify known barriers or screen diversions limiting aquatic focal species	Decreased number of barriers and unscreened diversions. Increased habitat available for fish	Expanded population distribution and possibly increased abundance.

Objective	Strategy	Short-term Indicators to measure success	Long-term Biological Outcome
	11E4: Remove or modify additional barriers or screen diversions	Decreased number of barriers.	Expanded population distribution and possibly increased abundance.
11F: Improve aquatic habitat diversity and complexity in tributary and spring systems where focal species populations are limited	11F2: Continue aquatic habitat improvement efforts consistent with existing federal, tribal, state, and local habitat improvement plans and guidelines	Improved habitat conditions including: decreased embeddedness, D50, % fines, and temperature and increased riparian condition, low flows, bank stability, structure density/distribution	Improved population distribution and abundance.
	11F4: Address priority problems with protection and restoration activities designed to promote development of more complex and diverse habitats through improved watershed condition and function. This will involve coordination of activities aimed at individual components (e.g. temperature and sediment).	Watershed Condition indicators: Equivalent Clearcut Area, Sediment production/delivery. Individual Factor indicators: improved riparian condition, decreased temperature, decreased embeddedness/fines/D50, increased base flow, decreased peak flows.	Improved population distribution and abundance.
	11F5: Restore ecosystem functions--identify and rehabilitate upland, wetland and floodplain areas	Improved riparian condition, decreased temperature, decreased embeddedness/fines/D50, increased base flow, decreased peak flows. Hydrograph improvements.	Improved population distribution and abundance.

Table 14. Indicators and expected biological outcome used to evaluate success of implemented strategies in achieving terrestrial objectives in the Middle Snake subbasins.

Objective	Strategy	Short-term Indicators to measure success of Strategy	Long-term Biological Outcome
12A: Protect the existing quality, quantity, and diversity of native plant communities providing habitat to native wildlife species by	12A2: Prevent new infestations by minimizing ground-disturbing activities in habitats highly susceptible to weed invasion through local cooperation and revegetate following disturbance.	Reduction in the number of new infestations, decreasing number of acres that need to be treated each year. Reduction of acreage of incidents of invasive exotic plant infestations related to fire impacts.	Native plant communities without invasive exotic plant problems.

Objective	Strategy	Short-term Indicators to measure success of Strategy	Long-term Biological Outcome
preventing the introduction of noxious weeds and invasive exotic plants into native habitats	12A3: Prevent dispersal by encouraging the use of weed-free seeds and feeds. Limit the transportation of weed seeds and other propagules from vehicles and livestock.	Programs implemented and policies enacted, such as establishment of weed-free regulation, posting of signs regarding weed-free seed use, and others.	Fewer opportunities for introductions.
	12A5: Minimize establishment of new invaders by supporting early detection and eradication programs	Reduced incidence of new infestations. Decreasing trend in the number of acres that need to be treated each year	Native plant communities without invasive plant problems
12B: Reduce the extent and density of established noxious weeds and invasive exotics and restore native habitats	12B2: Treat weed infestations using the area and species identified in prioritization	Number of infested acres treated. Number of infestations treated.	Reduced number of infestations. Reduced acreage of infestations.
	12B3: Control or mitigate for the adverse impact of invasive vegetation in reservoir drawdown zones	Number of infested acres in drawdown (net reduction in infestation) Acres of habitat with similar ecological function and value acquired	Increased availability of high quality wildlife habitat and reduced impact of non-native vegetation
	12B4: Reestablish appropriate native plant communities after successful weed eradication efforts	Acres of restored native habitats.	Increase in native plant communities without invasive exotic plant problems.
	12B5: Encourage best management practices and land use that will decrease the likelihood of invasion. Use the most effective and environmentally appropriate biological, mechanical, or chemical treatments for control	Implementation rates of BMPs	Native plant communities without invasive exotic plant problems and environmentally sound
13A: Manage a natural historic fire regime on the landscape that would allow for ecosystem processes and succession	13A2: Increase fire suppression efforts in shrub-steppe to limit the size and frequency of wildfires to mimic the historic fire regime	Number of acres burned within a ten year period, size of individual burns and long-term alterations to vegetative structure	Native species composition, structure and disturbance regime in shrub-steppe habitats that approximate historic condition. Improved habitat quality for shrub-steppe dependent wildlife Reduction in coverage of non-native annuals

Objective	Strategy	Short-term Indicators to measure success of Strategy	Long-term Biological Outcome
	13A3: Rehabilitate burned areas in conjunction with Objective 7B (Reduced extent and density of invasive exotics) following methods to increase seed germination success. Emphasize use of native shrub, grass, and forb species in rehabilitation seed mixture	Number of infested acres successfully treated and restored to native sagebrush steppe habitat. Number of infestations treated.	Reduced number of infestations. Reduced acreage of infestations.
	13A4: Maintain, and improve existing native species in the long-term during rehabilitation efforts (short-term impacts may not be avoidable).	Acres of habitat for native species maintained	Increased quantity and improved long-term stability of native habitats
	13A5: Alter fire frequency in pine and juniper habitats in the subbasins to mimic the historic fire regime. Assess for each site the combination of methods necessary to achieve appropriate distribution of seral stages	Acres of ponderosa pine and juniper habitats Comparison of availability of ponderosa pine and juniper habitat to historic condition Acres of ponderosa pine and juniper habitats burned	Ponderosa pine and juniper habitats within historic range of variability
14A: Manage grazing to reduce impacts on the aquatic and terrestrial communities in the subbasin. Protect and restore riparian, wet meadow, and native upland habitats.	14A2: Manage grazing to reduce impacts by encouraging establishment of riparian pasture systems, exclusion fences (passable to wildlife), off-site watering areas, riparian conservation easements, or consider retirement of grazing permits in priority areas. Adjust seasonal timing of livestock grazing to minimize soil compaction, erosion, noxious weed propagation and conflicts with wildlife.	c	Improved quality and quantity of riparian, wet meadow, spring, native upland habitats and streams.
	14A3: Identify concentrated feeding areas negatively impacting water quality, and design management actions to minimize sediment and nutrient inputs to streams	Number of concentrated feeding operations in existence with adequate safeguards (to protect or improve water quality Implemented actions to reduce impacts on water quality	Improved water quality
14B: Reduce conflicts between livestock and native wildlife and plant populations	14B1: Encourage the reduction or elimination of domestic sheep and goat grazing within bighorn sheep habitat	Updated allotment management plans and implemented actions that improve habitat for focal species in problem areas	Increased number of livestock operations compatible with resource objectives.

Objective	Strategy	Short-term Indicators to measure success of Strategy	Long-term Biological Outcome
	14B2: Protect important plant populations by developing grazing management plans to limit adverse impacts to rare or culturally important plant populations.	Updated allotment management plans and implemented actions that improve habitat for focal species in problem areas Number of acres exhibiting a change in the condition of the vegetation (e.g. from poor to fair, or fair to good range condition) Number of effective conservation practices implemented	Maintenance or restoration of rare or culturally important plant populations.
	14B3: Prevent seed dispersal by minimizing the potential for livestock to spread noxious weeds through weed-free hay programs, quarantine requirements, and other actions	Special-use permits on federal lands incorporate weed-free information. Completion of the plan by the Idaho Invasive Species Council.	Fewer opportunities for introductions.
	14B3. Alter grazing management to minimize livestock and native species conflicts	Updates to allotment management plans and, if necessary, removal of grazing conflicts (such as with native sheep).	Increased number of livestock operations compatible with resource objectives.
15A: Minimize the negative impact of current and future development on the native terrestrial species of the subbasins	15A5: Protect existing functional habitats under threat of development through land purchase, fee title acquisitions, conservation easements, land exchanges and other actions	Acres of existing functional habitats that are protected.	Increase in number of protected acres.
16A: Protect mature pine/fir forest habitats	16A3: Protect existing mature ponderosa pine communities through land purchase, fee title acquisitions, conservation easements, land exchanges or other strategies. Encourage the planting of ponderosa pine in existing state, federal and tribal reforestation efforts	Acres of existing ponderosa pine communities that are protected.	Increase in number of protected acres of ponderosa pine communities.
	16A4: Where appropriate to the habitat type, use prescribed burning and/or understory removal to protect mature stands from stand-replacing fire events	Acres of prescribed fire in pine/fir forest communities. Acres of understory removal in pine/fir forest communities.	Restored historical functioning of pine/fir forest communities.
	16A5: Continue existing, and develop new, programs that work to acquire and restore low elevation pine/fir forests	Increase in acreage of low elevation pine/fir forests	

Objective	Strategy	Short-term Indicators to measure success of Strategy	Long-term Biological Outcome
16B: Manage for a minimum of 20-40% mature old growth stands of ponderosa pine and Douglas-fir in warm/dry-ponderosa pine, Douglas Fir, and grand fir habitat groups	16B2: Where appropriate to the habitat type, use prescribed burning and selective thinning to encourage succession and the establishment of mature pine/fir forest communities	Number of acres treated	Shift back to historic species composition and structure
	16B3: Where historic pine/fir forest communities have been deforested, actively restore	Number of acres reforested	Increase in pine/fir forest
17A: Protect existing shrub-steppe habitats from additional fragmentation and degradation. Prevent the additional loss of shrub-steppe habitats. Restore areas important for focal species	17A2: Protect existing important habitats (particularly big game winter range and rare plant habitat) under threat of development through land purchase, fee title acquisitions, conservation easements, land exchanges, candidate conservation agreements, and other actions	Number of acres of suitable winter range Number of protected areas	Increased suitable winter range available to big game
	17A5: Increase fire suppression efforts in shrub-steppe habitats to limit the size and intensity of wildfires	Number of acres burned and long-term alterations to vegetative structure	Reduced risk of high intensity fires Reduction in coverage of non-native annuals
	17A7: Restore fragmented and degraded sagebrush habitats	Number of acres of restored shrub-steppe habitat.	Increase in number of acres of functioning-quality shrub-steppe habitat.
	17A8: On private lands, when possible, assist private landowners in restoring native vegetation	Number of landowners participating in agricultural land programs.	Increase in the number of protected acres of shrub-steppe habitat.
18A: Protect remaining native grassland remnants	18A3: Protect remaining native grassland remnants through land acquisition, fee title acquisitions, conservation easements, or land exchanges	Number of protected acres Number of rare/focal species populations protected	Sustainable grassland habitats adequate to preserve native grassland dependant species
18B: Restore historic native grassland habitat to natural conditions.	18B3: Restore native grassland habitats by actively improving or creating native grassland habitats through noxious weed control, cultural practices and seeding. Encourage the use of native species in existing state, federal, and tribal habitat programs	Number of acres successfully treated and restored to native grassland habitats.	Sustainable grassland habitats adequate to preserve native grassland dependant species

Objective	Strategy	Short-term Indicators to measure success of Strategy	Long-term Biological Outcome
	18B4: Acquire and restore grasslands by continuing existing programs that work to acquire and restore prairie and canyon grasslands. Develop new programs to acquire and restore prairie and canyon grasslands	Number of protected acres Number of rare/focal species populations protected	Sustainable grassland habitats adequate to preserve native grassland dependant species
19A: Protect, enhance or restore wetlands and spring habitats or create new wetlands to mitigate for permanently lost wetlands	19A2: Protect wetland and springs habitats through land acquisition, fee title acquisitions, conservation easements, land exchanges, public education, promotion of BMPs, promotion of alternative grazing strategies and the installation of alternative forms of water for livestock.	Decreasing trend in number of acres of wetland habitat lost.	Increase in number of protected acres of wetland habitat.
	19A3: Restore wetland habitats by improving wetland function and quality	Number of acres of restored wetland habitat. Wetland functions and values enhanced	Increase in acres of functioning high quality wetlands.
	19A4: Create and/or reestablish wetlands where it will help mitigate the impacts of nonpoint and point sources of pollution to achieve complinace with TMDL	Acres of wetlands developed	Increase in acres of functioning high quality wetlands..
	19A6: Where priority wetlands and springs exist on private land collaborate with private landowners, communicate and cooperate with landowners to protect or improve wetland and spring habitats	Number of effective conservation practices implemented	Increase in acres of functioning high quality wetlands.
19B: Protect, enhance or restore riparian habitats	19B2: Restore prioritized degraded riparian areas in coordination with existing plans and programs addressing riparian habitats, when possible	Number of acres of restored riparian habitat.	Increase in number of acres of functioning-quality riparian habitat.
	19B3. Protect riparian communities through land purchase, fee title acquisitions, conservation easements, land exchanges, promotion of BMPs, land stewardship, promotion of alternative grazing strategies, and the installation of alternative forms of water for livestock	Decreasing trend in number of acres of riparian habitat lost.	Increase in number of protected acres of riparian habitat.
	19B4: Minimize road and other land-use impacts in riparian areas	Miles of roads in riparian areas.	Improved water quality

Objective	Strategy	Short-term Indicators to measure success of Strategy	Long-term Biological Outcome
	19B5. Protect and restore riparian communities in agricultural lands through increased enrollment by landowners in the Continuous Conservation Reserve Program (CCRP), conservation easements and other agricultural land programs	Number of landowners participating in agricultural land programs.	Increase in the number of protected acres of riparian habitat.
	19B6: Increase stewardship and public knowledge by increasing understanding of the importance of riparian habitat through education programs for the general public, irrigation districts, water users, land owners and land managers	Number of people contacted Survey to determine effectiveness of education	Improvements in land stewardship practices and improved habitat quality
19C: Achieve hydrologic processes that protect water quality, base flows, peak flows, and timing to ensure that riparian, wetland, and aquatic resources are in proper functioning condition	19C1: Minimize development (roads and timber) in riparian areas	Miles of roads in riparian areas.	Improved water quality
	19C2: Utilize grazing strategies that minimize impacts to streambanks and riparian vegetation	Increased % canopy cover. Decreased fine sediment	Improved water quality
	19C3: Monitor water allocations and diversions to ensure that wetland and riparian resources are not degraded	Adequate stream flows are defined and met	Increased baseflows
	19C5: Reduce the impacts of vegetation conversion projects (e.g. timber harvest, agriculture) on hydrologic regimes through use of established BMPs.	Pre- and post measurement of target to improve with BMPs	Improved water quality

We encourage collaboration between University scientists and relevant entities (e.g. state and federal agencies, tribal, private landowners) for the development of sampling design and setting of performance standards. Because the scope of this plan is broad, experts in relevant fields are most qualified to design individual projects addressing monitoring objectives. For well studied habitats and species (e.g. sage grouse), performance standards may be available in peer reviewed literature. Building on existing knowledge established across the range of a focal habitat or species is encouraged.

Data management and information dissemination are critical for an effective monitoring program. The Idaho Conservation Data Center (IDCDC) serves as a central repository and provider of information on rare terrestrial species. For many terrestrial monitoring objectives, the IDCDC will most effectively manage the data. StreamNet (http://www.streamnet.org/) is a repository for regional fisheries data. Monitoring projects will likely span multiple jurisdictions and cover objectives that do not necessarily pertain only to rare species. The development of an interagency database would facilitate consistency in data entry and allow access by multiple stakeholders to monitoring data. Interagency Species Management System (ISMS) was

developed to “achieve efficiencies in implementing the Northwest Forest Plan by facilitating the sharing of species data among survey & management, watershed analysis, monitoring, and other cooperating agency programs” (see http://www.reo.gov). This system can serve as a model for the development of a central database for the Middle Snake subbasins. In the development of all research and monitoring projects, technical reports and peer reviewed publication preparation should be included in the budgets and timelines. Availability and use of research and monitoring results are the ultimate measure of success for this RM&E plan.

5 Coordination with Existing Programs

For a subbasin plan to be adopted by the NPCC, the plan must conform to existing federal guidelines of the Endangered Species Act (ESA) and Clean Water Act (CWA). The status of listed species and of water quality conditions are discussed in assessment section 3.2: Species Federally Listed as Threatened or Endangered and assessment section 2.9: Water Quality. Planning must be reflective of, and integrated with, recovery plans for listed species within the subbasins, and the Water Quality Management Plan of the state (NPCC 2001). Following is a description of ESA and CWA considerations and of how recommended objectives and strategies conform to these federal guidelines.

5.1 Endangered Species Act Considerations

The Middle Snake subbasins contain species listed as threatened or endangered under the Endangered Species Act (ESA) (16 U.S.C. §§ 1531–1544). The ESA, amended in 1988, establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants and the habitats on which they depend. Section 7(a)(2) of the ESA requires federal agencies to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Fisheries Service (NOAA Fisheries), as appropriate, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or to adversely modify or destroy their designated critical habitats.

Section 7 of the ESA also makes it clear that all federal agencies should participate in the coordination of programs that involve endangered species. Under this provision, federal agencies often enter into partnerships and memoranda of understanding with the USFWS for implementing and funding conservation agreements, management plans, and recovery plans developed for listed species. The development of these partnerships is encouraged as such planning efforts enable proactive approaches for managing listed species.

USFWS has developed, and is in the process of developing, recovery plans for species listed under the ESA in the Middle Snake subbasins. Actions called for in the *Middle Snake Subbasins Management Plan* should be coordinated, consistent, and integrated with these recovery plans as well as with any applicable performance measures from the Federal Columbia River Power System Biological Opinion (BiOp) (NPCC 2001).

5.1.1 Consistency with applicable performance measures in Biological Opinion.

As the Middle Snake subbasins are blocked from anadromous fish runs, the Federal BiOp, which extends up the Snake River to Hells Canyon Dam, the downstream boundary of the subbasins, does not apply to the Middle Snake subbasins. While the Middle Snake subbasins are outside the geographical scope of the BiOp, the subbasin plan remains consistent with habitat actions and ecological objectives called for in the BiOp for anadromous tributary systems in the Columbia River Basin. Habitat actions described in the BiOp are intended to accelerate efforts to improve listed anadromous species survival in priority areas in the short-term, while laying a foundation for long-term strategies through subbasin assessment and planning (NMFS 2000). Since priority

areas under the BiOp occur only in anadromous habitat, implementation of BiOp-related habitat protection and improvement activities is not likely to benefit the Middle Snake subbasins since Hells Canyon Dam blocks anadromous species passage into the subbasin. The long-term habitat strategy in the BiOp has three overarching objectives: 1) protect existing high quality anadromous habitat, 2) restore degraded habitats on a priority basis and connect them to other functioning habitats, and 3) prevent further degradation of tributary habitats and water quality. Direct application of these objectives would most likely eliminate the Middle Snake subbasins from consideration for habitat improvement actions related to the BiOp, since it is not a part of critical or priority listed anadromous habitat. While these objectives will not be directly applied to the Middle Snake subbasins through implementation of ESA related directives, they are similar to rules developed by Technical Team members during prioritization (plan section 6: Prioritization), and with objectives for focal habitats in the Middle Snake subbasins (plan section 3.3.2: Terrestrial Environmental Objectives).

Performance standards and measures are described in the "All H Strategy" (Habitat, Hatcheries, Harvest, Hydropower), which is the "umbrella" under which the BiOp falls (Federal Caucus 2000). The only measures applicable in the blocked Middle Snake subbasins are related to habitat. Habitat performance standards are: 1) prevent habitat degradation, 2) restore high quality habitat, and 3) restore/increase habitat complexity. These performance measures are consistent and similar to those in the *Middle Snake Subbasins Plan* and their implementation will benefit aquatic species in both anadromous and blocked habitats, including the Middle Snake subbasins. They include the following (related sections in Middle Snake Subbasins Plan are referenced):

- Increased stream miles meeting water quality standards (temperature and sediments) (environmental objectives 11B and 11C, plan section 4.3: M&E).

- Increased stream miles with adequate instream flows (environmental objective 11A, plan section 4.3: M&E).

- Increased stream miles opened to fish access (environmental objective 11E, plan section 4.3: M&E).

- Increased number of diversion areas screened (environmental objective 11E, plan section 4.3: M&E).

- Increased acres and/or stream miles of habitat protected or restored (plan section 4.3: M&E).

For species limited by habitat, the ultimate performance standard for habitat is fish productivity (Federal Caucus 2000). However, this will be difficult to establish, as survival improvements from habitat actions cannot be measured in the short term. Even in the long term, measuring progress toward a biologically based standard will be challenging and expensive. Based on our current understanding of the associations between ecosystem processes and salmonid populations, four habitat factors will influence performance measures throughout the basin (Federal Caucus 2000):

- In-stream flows;

- Amount and timing of sediment inputs to streams;

- Riparian conditions that determine water temperature, bank integrity, wood input, maintenance of channel complexity; and

- Habitat access.

The *Middle Snake Subbasins Management Plan* addresses each of these measures with detailed objectives and strategies (plan section 3.3.1: Aquatic Ecosystem and plan section 3.3.2: Terrestrial Ecosystem) as well as a research, monitoring, and evaluation plan (plan section 4: R, M&E). This subbasin plan contains objectives and performance measures consistent with those in the "All H Strategy", but with a prioritization focused on the needs of species currently occurring in the Middle Snake subbasins. The objectives and strategies in the subbasin plan are similar to those called for in the Federal BiOp without a prioritization based on the needs of listed anadromous species.

5.1.2 Consistency with existing recovery plans

The Middle Snake Subbasins Plan provides important resources for classifying and prioritizing areas for protection and restoration, and provides a starting point for ESA recovery planning for listed species in the subbasin.

Bull trout are the only fish species listed under the Endangered Species Act (ESA) currently present in the Middle Snake subbasins. Steelhead (*O. mykiss*), Chinook salmon (O. *tshawytscha*), and sockeye salmon (*O. nerka*) are listed under the ESA, but have been extirpated from the subbasins and critical habitat was not designated above Hells Canyon Dam (NMFS 2000). Other threatened or endangered species in the subbasins include 5 species of freshwater aquatic snail (see text below), the Northern Idaho ground squirrel (*Spermophilus brunneus brunneus*), bald eagle (*Haliaeetus leucocephalus*), lynx (*Lynx canadensis*), Spalding's silene (*Silene spaldingii),* and MacFarlane's four o' clock (*Mirabilis macfarlanei*) (assessment section 3.2: Species Designated as Federally Threatened or Endangered). The Columbia spotted frog (*Rana luteiventris*), yellow-billed cuckoo (*Coccyzus americanus occidentalis*), and southern Idaho ground squirrel (*Spermophilus brunneus endemicus*) are currently candidate species under the ESA (assessment section 3.2: Species Designated as Federally Threatened or Endangered).

Of the focal species in the Middle Snake subbasins, six aquatic species, bull trout, Banbury springs limpet, Utah valvata, Idaho springsnail, Snake River physa, and Bliss Rapids snail, and one terrestrial species, Spalding's silene, are listed as threatened or endangered under the ESA (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization and assessment section 3.5.1: Selection of Focal Habitats and Focal Species). The remaining species (lynx, bald eagle, North and South Idaho ground squirrel, MacFarlane's four o' clock, Columbia spotted frog, and Yellow-billed cuckoo) listed under the ESA in Table 12 were not included as focal species for the priority habitat types, but are included in the assessment (assessment section 3.2: Species Designated as Federally Threatened or Endangered) as they effect future management actions or projects.

In the Middle Snake subbasins, species occur with special species status designations by Oregon and Idaho in addition to the federally listed threatened or endangered species (assessment section

3.3: Special Status Species). These species could be future candidates for ESA listing and need to have their status determined. Plant and wildlife species with state or federal special status designations present or with potential habitat in the Middle Snake subbasins are summarized in assessment Appendices C and D.

5.1.2.1 Bull trout (Salvelinus confluentus)

Bull trout were listed under the ESA as threatened on November 1, 1999 (64 FR 58910) (assessment section 3.2: Species Designated as Federally Threatened or Endangered, Table 14). The Bull Trout Recovery Team (BTRT) developed a draft recovery plan that provided a framework for implementing recovery actions for the species (USFWS 2002). The bull trout draft recovery plan was also used as the principle basis for identifying critical habitat for the species. The proposed designation of critical habitat was published on November 29, 2002 (67 FR 71236) (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, bull trout).

Within the Middle Snake subbasins, bull trout populations are limited to tributaries in the lower subbasin near Hells Canyon Dam (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, bull trout, Figure 27). Pine Creek in Oregon and Indian Creek and Wildhorse River in Idaho contain bull trout populations. The Hells Canyon Complex Recovery Unit is comprised of the Snake River mainstem and tributaries in Oregon and Washington that drain to the Snake River within the Hells Canyon Complex. Two core areas[1] were identified in the Hells Canyon Complex Recovery Unit, one of which lies within the Middle Snake subbasins and encompasses all known areas of bull trout distribution within the subbasins including the Pine and Indian creeks and Wildhorse River. This particular core area currently includes at least seven identified local bull trout populations (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, bull trout).

Bull trout populations in the subbasins are small, mostly resident, and isolated in headwaters within the core areas. Additional populations exist upstream and downstream in major tributaries to the Snake River, including the Bruneau, Boise, Weiser, Malheur, Payette, Powder rivers. Historic and current interaction among these populations is unknown, although presumably all historic bull trout populations periodically interacted with other populations in the Snake River basin. Currently, interaction is difficult or impossible as most populations are isolated by fish barriers, primarily dams (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, bull trout).

Isolation of local populations and habitat fragmentation due to passage barriers posed by culverts, irrigation diversions, and dams are the primary threats to bull trout in the Pine-Indian-Wildhorse core area. Brook trout are also a significant threat to bull trout in the core area. Brook trout co-occur with bull trout in many locations and numerous hybrids have been documented (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, bull trout). Bull trout also have more specific habitat requirements than most other salmonids. Habitat components that influence bull trout distribution and abundance include water

[1] Chapter 1 of the draft bull trout recovery plan (USFWS 2002b) defines core areas as follows: The combination of core habitat (i.e., habitat that could supply all elements for the long-term security of bull trout) and a core population (i.e., bull trout inhabiting core habitat) of bull trout.

temperature, cover, channel form and stability, substrate for spawning and rearing, and migratory corridors (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization, bull trout).

The *Middle Snake Subbasins Plan* provides objectives and strategies that address factors limiting bull trout. Environmental objective 11E (plan section 3.3: Environmental Components) reduces the number of artificially blocked stream miles to increase fish access, while screening diversions that negatively affect focal species. Biological objective 4B (plan section 3.2: Biological Components) reduces and prevents impacts of brook trout on bull trout where they exist, especially within the Indian Creek drainage. Additional environmental objectives (plan section 3.3: Environmental Components) are to achieve adequate temperatures (environmental objective 11B), habitat complexity (environmental objective 11F), and migratory corridors (environmental objective 11E) for bull trout and other listed or focal species.

5.1.2.2 Bald eagle (Haliaeetus leucocephalus)

Bald eagles were listed under the ESA as threatened July 12, 1995 (60 FR 35999), but are being considered for de-listing by USFWS as of July 4, 1999 (64 FR 128) (assessment section 3.2: Species Designated as Federally Threatened or Endangered, Table 14). Their population status is described as in recovery, with the breeding population doubling every 6-7 years (USFWS 1986). Bald eagles have other status designations by state and federal agencies (Assessment Appendix C). The Middle Snake subbasins are in the Pacific Recovery region for the bald eagle (USFWS 1986). The USGS Forest and Rangeland Ecosystem Science Center's Snake River Field Station coordinates the Midwinter Bald Eagle Survey, in which standard, nonoverlapping routes are surveyed by several hundred people. Seven midwinter count routes occur within the Middle Snake subbasins and are summarized in assessment section 3.2: Species Designated as Federally Threatened or Endangered, Table 14.

Bald eagles typically nest in forested areas adjacent to large bodies of water. Nests are usually in mature forests that have some habitat edge, for ease of access, and are near water with suitable foraging opportunities (assessment section 3.2: Species Designated as Federally Threatened or Endangered). Environmental objectives 19A and 19B aim to protect and restore riparian and wetland habitats, which will support bald eagle needs. Environmental objectives 16A and 16B to protect and manage for mature, old growth stands of ponderosa pine are also consistent with bald eagle needs, as large ponderosa pine snags make good nest sites (plan section 3.3: Environmental Components). Environmental objective 15A to minimize the negative impact of current and future development on the native terrestrial species of the subbasins will also support bald eagles including reducing the impacts from power lines and other structures, which are threats to the species (assessment section 3.2: Species Designated as Federally Threatened or Endangered).

5.1.2.3 Lynx (Lynx canadensis)

On March 24, 2000, the North American lynx (*Lynx canadensis*) was federally listed as threatened (65 FR 16051) under the ESA (assessment section 3.2: Species Designated as Federally Threatened or Endangered, Table 14). No recovery plan currently exists for lynx; however, the *Canada Lynx Assessment and Strategy* (Ruediger *et al*. 2000) describes conservation measures and objectives (M. Hemker, USFWS, personal communication, April 6, 2004). The USFWS considers Idaho a state where lynx are known to occur; however, viable

populations have not been documented in the Middle Snake subbasins. Only four historical records of lynx occurrence in the subbasins have been reported to the Idaho Conservation Data Center (assessment section 3.2: Species Designated as Federally Threatened or Endangered).

In the western mountains, lynx are associated with coniferous forests and upper elevations using early successional forest stands for foraging and mature forest stands containing large woody debris for denning. Lynx can be managed by managing for snowshoe hare (*Lepus americanus*), as they comprise up to 83% of the lynx diet. Hare populations increase dramatically following disturbance, particularly fire that creates hare cover and food, generally benefiting lynx (Ruediger et al. 2000).

Restoring fire as an ecological process was listed in the *Canada Lynx Assessment and Strategy* as a conservation measure addressing risk factors affecting lynx productivity. It was suggested that fire be used to move toward landscape patterns consistent with historical succession and disturbance regimes using mechanical pre-treatment and management ignitions as necessary. Objective 13A and associated strategies to manage fire on the landscape that would allow for natural ecosystem processes and succession (plan section 3.3.2: Terrestrial Ecosystem) consistent with conservation measures.

Timber management modifies the vegetation structure and mosaic of forested landscapes and can be used as a disturbance process to create and maintain lynx habitat and that of their prey (red squirrel and snowshoe hare). Greater emphasis has been placed on retention of live and dead trees and coarse woody debris, which are important habitat components (Ruediger et al. 2000). Dense horizontal cover of conifers, just above the snow level in winter, is critical for snowshoe hare habitat. This structure may occur either in regenerating seedling/sapling stands or as an understory layer in older stands. Relatively few snowshoe hares are found in large openings, and lynx do not spend much time hunting in open areas, especially in winter. Clearcuts, shelterwood cuts, seed tree cuts, and diameter-limit prescriptions that result in distance to cover greater than 100 m (325 feet) may restrict lynx movement and use patterns until forest regeneration occurs. It may take approximately 15 to 30 years following forest management practices or fire for conifers and/or brush species to regenerate to heights sufficient to extend above average winter snow levels and create high quality habitat for snowshoe hare (Ruediger et al. 2000). Environmental objective 16A and associated strategies are to protect pine/fir forest habitats and promote ecological processes leading to seral stages important lynx use. This objective supports lynx. Unless other information becomes available, implementation activities associated with the Middle Snake Subbasin Plan should remain consistent with standards and guidelines in *Canada Lynx Assessment and Strategy*. As most lynx habitat is in headwater systems, management should also be consistent with recommendations in the Sawtooth National Forest Land Management Plan (USFS 2000) (M. Robertson, USFWS, personal communication, May 14, 2004).

The main sources of mortality are starvation (prey scarcity) and harvest by humans, which is no longer legal. It is also speculated that habitat fragmentation facilitating access by interspecific competitors may affect the structure and function of lynx populations (assessment section 3.2: Species Designated as Federally Threatened or Endangered). Plowed roads and groomed over-the-snow routes may allow competing carnivores such as coyotes and mountain lions to access lynx habitat in the winter, increasing competition for prey. Planning objectives in the *Canada*

Lynx Assessment and Strategy (Ruediger et al. 2000) suggest the following to manage for recreational activities while protecting the integrity of lynx habitat:

a) Maintain the natural competitive advantage of lynx in deep snow conditions by minimizing snow compaction in lynx habitat.

b) Concentrate recreational activities within existing developed areas, rather than developing new recreational areas in lynx habitat.

c) On federal lands, ensure that development or expansion of developed recreation sites or ski areas and adjacent lands address landscape connectivity and lynx habitat needs.

Environmental objective 15A is to minimize the negative impact of current and future development, including roads, on the native terrestrial species of the subbasins (plan section 3.3.2: Terrestrial Ecosystem). Strategies include the identification, mapping, and prioritization focal habitats and travel corridors important to aquatic and terrestrial species for protection and to provide such information to regional planners and natural resource managers. In addition, strategy 12B6 (environmental objective related to noxious weeds and invasive exotics) is to regulate and enforce off-road vehicle restrictions (OHV) and educate to minimize impacts of recreation. Each of these strategies will support the needs of lynx.

5.1.2.4 North Idaho Ground Squirrel (Spermophilus brunneus brunneus)

The northern Idaho ground squirrel was federally listed as a threatened species on April 5, 2000 (65 FR 17779) (assessment section 3.2: Species Designated as Federally Threatened or Endangered, Table 14). The species has the most restricted geographical range of any *Spermophilus* taxa and one of the smallest ranges among North American mainland mammals. It occurs only in isolated populations in Valley and Adams counties in Idaho. The entire range of the subspecies is about 32 by 108 km (20 by 61 miles), and, as of 2002, 34 of 40 known population sites were extant (assessment section 3.2: Species Designated as Federally Threatened or Endangered). All known occurrences of the northern Idaho ground squirrel in the lower Middle Snake subbasins are in the Wildhorse River drainage, which flows into Hells Canyon Reservoir. Four of the 12 primary metapopulation sites delineated by the USFWS and 12 of the 21 occurrences of this subspecies recorded in the Idaho Conservation Data Center database occur in the Wildhorse River drainage (assessment section 3.2: Species Designated as Federally Threatened or Endangered).

The northern Idaho ground squirrel is known to occur in shallow, dry rocky meadows usually associated with deeper, well-drained soils and surrounded by ponderosa pine and Douglas-fir forests at elevations of about 915 to 1,650 meters (3,000 to 5,400 feet). Similar habitat occurs up to at least 1,830 meters (6,000 feet). Consequently, ponderosa pine/shrub-steppe habitat association with south-facing slopes less than 30 percent at elevations below 1,830 meters (6,000 feet) is considered to be potentially suitable habitat (USFWS 2003). Environmental objective 16A will support recovery criteria by protecting mature pine/fir forest habitats. Associated strategies are to mimic the natural fire regime using prescribed burning and/or understory removal (strategy 16A4), which will protect meadow habitats from pine/fir encroachment and benefit the North Idaho ground squirrel (plan section 3.3.2: Terrestrial Ecosystem).

The northern Idaho ground squirrel is primarily threatened by habitat loss due to forest encroachment into former suitable meadow habitats. Forest encroachment results in habitat fragmentation, eliminates dispersal corridors, and confines the northern Idaho ground squirrel populations into small isolated habitat islands. The subspecies is also threatened by land-use changes, recreational shooting, poisoning, genetic isolation and genetic drift, random naturally occurring events, and competition from the larger Columbian ground squirrel (*S. columbianus*) (USFWS 2003).

The primary cause of habitat loss is meadow invasion by conifers. Fire suppression has allowed conifers to invade once suitable meadow habitats. The dense regrowth of conifers resulting from past logging activities have also significantly reduced meadow habitats for ground squirrels over the past 40 years. As the amount of meadow habitat has been reduced, ground squirrel dispersal corridors have been reduced or eliminated, further constricting the subspecies into smaller isolated areas (USFWS 2003). Environmental objective 13A and associated strategies (plan section 3.3.2: Terrestrial Ecosystem) to manage a natural historic fire regime on the landscape that would allow for ecosystem processes and succession supports Northern Idaho ground squirrel recovery efforts.

For the past 70 years, agricultural conversion and rural housing developments near the communities of Round Valley, New Meadows, and Council, Idaho, have fragmented some suitable habitat formerly occupied by the northern Idaho ground squirrel. Other types of developments continue to threaten remaining occupied sites in Adams and Valley Counties (USFWS 2003). Environmental objective 15A to minimize the negative impact of current and future development, including roads, on the native terrestrial species of the subbasins will support recovery criteria for ground squirrels. Strategy 15A2 to work with city and county governments and natural resource managers to include consideration of important habitats and travel corridors in the planning process will be especially helpful (plan section 3.3.2: Terrestrial Ecosystem).

Some activities or lack of management on private property appear to pose a threat to northern Idaho ground squirrels. Of the 34 extant population sites, 13 are entirely on private property, 2 are on both private and federal property, and 1 is on both private and state property. Implementing management or survey activities for northern Idaho ground squirrels requires cooperation from private landowners making consideration of socioeconomic objectives (plan section 3.4: Socioeconomic Objectives) of considerable importance. Controlled burning and reseeding with suitable native forbs and grasses is important to establish appropriate food sources for ground squirrels and other animals. These are factors crucial to the continued survival and recovery of northern Idaho ground squirrels, but are often difficult to implement on private lands (USFWS 2003). Implementation of objectives and strategies in the *Middle Snake Subbasin Plan* will support efforts to recover northern Idaho ground squirrel in the Middle Snake subbasins.

5.1.2.5 Spalding's catchfly (Silene spaldingii)

Spalding's catchfly (sometimes called Spalding's silene), a member of the pink or carnation family, was listed as a threatened species on 10 October 2001 (66 FR 51598) (assessment section 3.5.1: Selection of Focal Habitats and Focal Species, Spalding's silene). A recovery plan is in early stages of development and has not yet been released. The 2004 Conservation Strategy for

Spalding's Catchfly (*Silene spaldingii* Wats.) (Hill and Gray 2004) is a useful interim guide for describing limiting factors, protection and restoration priorities, and additional survey needs (M. Hemker, USFWS, personal communication, April 6, 2004).

In Idaho, Spalding's catchfly is currently known to occur in three counties: Nez Perce, Idaho, and Lewis, none of which are in the Middle Snake subbasins. However, 98% of Spalding catchfly occurrences in Idaho occur within native grasslands, (Hill and Gray 2004). Suitable habitat has been identified on the Payette National Forest, and downstream of the Middle Snake subbasins in Hells Canyon, suggesting that suitable habitat may occur in the subbasins.

Spalding's catchfly prefers open native grassland habitats and is associated with Idaho fescue (*Festuca idahoensis*), rough fescue (*F. scabrella*), or bluebunch wheatgrass (*Pseudoroegneria spicata*, formerly called *Agropyron spicatum*). Scattered individuals of ponderosa pine may also be found in or adjacent to Spalding's catchfly (assessment section 3.5.1: Selection of Focal Habitats and Focal Species, Spalding's catchfly). Additional surveys in grasslands in the Middle Snake subbasins (assessment section 3.5.1: Selection of Focal Habitats and Focal Species, Figure 29: wildlife habitat types in the Middle Snake subbasins), may result in documented occurrences of Spalding's catchfly in the subbasins. A number of objectives and strategies recommended in the Middle Snake subbasins management plan will address factors potentially limiting Spalding's catchfly, if the species turns out to occur in the subbasins.

Weed invasion is the major cause of Spalding's silene habitat degradation. Disturbances to soil and vegetation, both natural (fire, soil slumps, animal burrowing and trailing, etc.) and anthropogenic (livestock grazing and trampling, cultivation, road-building, fire suppression activities, off-road recreational use, etc.) are also major contributing factors (Hill and Gray 2004). Environmental objective 12A is to protect the existing quality, quantity, and diversity of native habitats. Environmental objective 12B supports this effort by recommending strategies to reduce the extent and density of established invasive exotics weeds and restore native habitats (plan section 3.3.2: Terrestrial Ecosystem). These objectives will address factors potentially limiting Spalding's catchfly, if the species turns out to occur in the subbasins.

Livestock grazing has major negative effects on Spalding's silene and its habitat (Hill and Gray 2004). Prolonged heavy grazing pressure from domestic livestock in some areas has resulted in major alterations of the structure, function and composition of the fescue bunchgrass communities that support Spalding's catchfly and has promoted weed invasion. Environmental objective 14A and associated strategies to manage grazing to reduce impacts on the aquatic and terrestrial communities in the subbasins (plan section 3.3.2: Terrestrial Ecosystem) will support Spalding's silene needs if it occurs in the subbasin.

Life histories of native plant species are often fine-tuned to a particular regime of fire frequency, intensity and seasonal distribution (Hill and Gray 2004). Alterations of fire regimes, including fire suppression, increasing fire severities and frequencies, and out-of-season fires, have the potential to degrade Spalding's catchfly habitat. Environmental objective 13A and associated strategies to manage fire on the landscape in a manner to allow for natural ecosystem processes and succession are consistent with Spalding's silene needs.

The conservation recommendations for Spalding's catchfly focus on protection of existing populations and habitat, and maintenance of potential habitat (Hill and Gray 2004). The following recommendations were summarized by Hill and Gray (2004) to reduce the most imminent and pervasive threats to Spalding's silene and its habitat. In order of priority recommendations address the following issues (additional details can be found in Hill and Gray 2004): 1) habitat degradation from non-native invasive plants, and major contributing disturbance factors, livestock grazing and fire (see additional guidelines for effective weed, livestock, fire management, and habitat restoration), 2) inventory of potential unsurveyed habitat (specific recommendations identify areas with immediate survey needs), 3) habitat fragmentation (specific recommendations are given to help protect pollinators, reduce further habitat fragmentation, protect small populations on isolated habitat fragments, retain genetic diversity of threatened small populations, and suggest areas that would allow protection of groups of small populations), 4) monitoring (recommendations identify priority monitoring needs and provide suggestions of appropriate monitoring methodology), and 5) reporting and record-keeping (recommendations are made to help standardize and improve reporting and record-keeping across the four-state region of Spalding's catchfly known distribution). Aquatic and Terrestrial priorities (plan section 6.1 and 6.2) in the Middle Snake subbasins are to protect existing habitat and build from strength, which would benefit Spalding's catchfly and its habitat.

5.1.2.6 MacFarlane's four o' clock (Mirabilis macfarlanei)

At the time of its original listing as endangered in 1979 (Federal Register, Vol. 44, No. 209, 61912–61913), MacFarlane's four o'clock was known from only three populations along Hells Canyon in Oregon (Hells Canyon National Recreation Area) and the Salmon River in Idaho (BLM Cottonwood Field Office area), totaling approximately 25 plants on 25 acres (assessment section 3.2: Species Designated as Federally Threatened or Endangered). Additional surveys and active management of some populations on federal lands resulted in MacFarlane's four o'clock being downlisted to threatened in March 1996 (Federal Register, Vol. 61, No. 52:10693–10697). The number of known individuals has increased 260-fold, from 27 plants when listed to approximately 7,212 plants in 1991 (Federal Register, Vol. 61, No. 52, 10693–10697). MacFarlane's four o'clock has a recovery priority of 2 on a scale of 1 to 18. This ranking reflects a high degree of threat, high potential for recovery, and taxonomic rank as a full species (assessment section 3.2: Species Designated as Federally Threatened or Endangered).

Eleven populations of MacFarlane's four o'clock are currently known. Three of these populations are found in Hells Canyon (Idaho County, Idaho, and Wallowa County, Oregon), six in the Salmon River area (Idaho County), and two in the Imnaha River area (Wallowa County, Oregon) (Federal Register, Vol. 61, No. 52:10693–10697). All of these populations are located north of the Middle Snake subbasins in native grasslands (assessment section 3.2: Species Designated as Federally Threatened or Endangered). Potential MacFarlane's four o'clock habitat has been identified on the Payette National Forest and surveys could potentially identify this species as occurring in the native grasslands of the Middle Snake subbasins.

MacFarlane's four o'clock and its habitat are potentially threatened by a number of factors, including herbicide and pesticide spraying, landslide and flood damage, disease and insect damage, exotic plants, livestock grazing, off-road vehicles, and possibly road and trail construction and maintenance. The collecting of MacFarlane's four o'clock has also been

determined to be a limiting factor, as have mining, competition for pollinators, and inbreeding depression (assessment section 3.2: Species Designated as Federally Threatened or Endangered). Care should be taken to protect MacFarlane's four o' clock during noxious weed or other invasive exotic treatments (strategy 12B2). Until the species is documented in the subbasin, the particular limiting factors impacting a population cannot be determined and the specific objectives that apply to MacFarlane's four o' clock and its habitat within the Middle Snake subbasins will remain speculative.

Environmental objective 12A is to protect the existing quality, quantity, and diversity of native habitats. Environmental objective 12B recommends strategies to reduce the extent and density of established invasive exotics weeds and restore native habitats (plan section 3.3.2: Terrestrial Ecosystem). These objectives will address factors potentially limiting MacFarlane's four o'clock, if the species turns out to occur in the subbasins.

Prolonged heavy grazing pressure from domestic livestock has resulted in major alterations of the structure, function and composition of the native grasslands that support MacFarlane's four o' clock. Another impact of heavy grazing has been increased weed invasion. Environmental objective 14A and associated strategies to manage grazing to reduce impacts on the aquatic and terrestrial communities in the subbasins (plan section 3.3.2: Terrestrial Ecosystem) will support MacFarlane's four o' clock needs if it occurs in the subbasin.

Life histories of native plant species are often fine-tuned to a particular regime of fire frequency, intensity and seasonal distribution (Hill and Gray 2004). Alterations of fire regimes, including fire suppression, increasing fire severities and frequencies, and out-of-season fires, have the potential to degrade MacFarlane's four o' clock habitat. Environmental objective 13A and associated strategies to manage fire on the landscape to allow for natural ecosystem processes and succession are consistent with MacFarlane's four o' clock needs, if MacFarlane's four o' clock occurs in the subbasins and if it is being limited by altered fire regime.

5.1.2.7 Snake River Aquatic Species

Mollusc species are an important component of the aquatic ecosystem within the Middle Snake subbasins. On December 14, 1992, five aquatic snails from the Snake River in south central Idaho were added to the federal list of threatened and endangered wildlife (Federal Register 57 FR 59244). All five of these listed molluscs are found within the Middle Snake subbasins. The Idaho springsnail (*Pyrgulopsis* [=*Fontelicella*] *idahoensis*), Utah (or desert) valvata (*Valvata utahensis*), Snake River physa (*Physa natricina*), and the undescribed Banbury Springs lanx (*Lanx* sp.) are listed as endangered. The Bliss Rapids snail (*Taylorconcha serpenticola*) is listed as threatened (assessment section 3.4.1: Aquatic Focal Species Selection and Characterization). Presently, the listed snails occur mainly in the remaining free-flowing reaches or spring alcove habitats of the Snake River (USFWS 1995).

The short-term objectives for recovery are to protect known live colonies of listed snails by eliminating or reducing known threats. The long-term objectives are to restore viable, self-reproducing colonies of the 5 listed snail species within their specific geographic ranges to the point they are delisted (see USFWS 1995 for detailed description of each species range and recovery criteria).

The habitat requirements of all 5 species are generally similar: cold, clean, well-oxygenated flowing water of low turbidity (USFWS 1995). The actions needed to initiate recovery include 1) ensure water quality standards for cold-water biota are met, 2) develop and implement conservation management plans that include measures to protect cold-water spring habitats occupied by the listed species, 3) stabilize the Snake River Plain aquifer to protect discharge levels of cold-water springs, 4) evaluate the effects of non-native flora and fauna on the listed snail species (USFWS 1995).

Biological objective 9A (plan section 3.2) is to support freshwater mollusk conservation and recovery through habitat restoration, ground and surface water conservation, and continued research of environmental factors limiting mollusk growth, survival, and reproduction. This objective is consistent and coordinated with ESA recovery planning. In addition objectives 2A, 4A, 5A, 7A, 9A and 11A, 11B and 11C address water quality issues and, if implemented, have the potential to benefit the habitats of the 5 listed snail species

5.2 Clean Water Act Considerations

Formed in 1970, the U.S. Environmental Protection Agency (USEPA) administers the federal Clean Water Act (CWA), requiring enforcement of water quality standards by states. These standards are segregated into *point* and *nonpoint* source water pollution, with point sources requiring permitting. Although controversial, this segregation means that most farming, ranching, and forestry practices are considered nonpoint sources and do not require permitting by the USEPA. A TMDL, or Total Maximum Daily Load, is a tool for implementing water quality standards where impairment of beneficial uses exists (plan section 5.2.2: TMDLs in the Middle Snake subbasins) (USEPA 2004). The USEPA provides funding through section 319 of the CWA for TMDL implementation projects. Section 319 funds are administered by IDEQ in Idaho (USEPA 2004).

The Idaho Nonpoint Source Management Program is an umbrella under which all CWA activities in Idaho are consistent. Objectives and strategies in the Middle Snake Plan shall be consistent and integrated with the water quality management plans in the state (NPPC 2001).

5.2.1 Consistency with Idaho State's Water Quality Management Plan

The revised 1999 Idaho Nonpoint Source Management Program Plan outlines the state's strategy to meet the EPA's revised Clean Water Act 319 program guidance dealing with nonpoint source pollution (IDEQ 1999). The primary purpose of the Nonpoint Source assessments and Management Programs is to provide the states and tribes with a new blueprint for implementing integrated programs to address priority nonpoint source water quality problems. The focus is needed in order to identify innovative funding opportunities and to effectively direct limited resources toward the highest priority issues and waterbodies.

The Idaho Nonpoint Source Management Program (1999) seeks to incorporate nine elements identified as necessary components for nonpoint source programs:

1. Explicit short and long-term goals, objectives and strategies to protect surface and groundwater.

2. Strong working partnerships and collaboration with appropriate state, tribal, regional, and local entities, private sector groups, citizens' groups, and federal agencies.

3. A balanced approach that emphasized both statewide nonpoint source programs and on-the-ground management of individual watersheds where waters are impaired or threatened.

4. The program (a) abates known water quality impairments resulting from non-point source pollution, and (b) prevents significant threats to water quality from present and future activities.

5. An identification of waters and watersheds impaired or threatened by nonpoint source pollution and a process to progressively address these waters.

6. The State reviews, upgrades, and implements all program components required by §319 of the Clean Water Act and establishes flexible, targeted, interactive approaches to achieve and maintain beneficial uses of waters as expeditiously as practicable.

7. Identification of federal lands and objectives which are not managed consistently with State program objectives.

8. Efficient and effective management and implementation of the State's nonpoint source program, including necessary financial management.

9. A feedback loop whereby the State reviews, evaluates, and revises its nonpoint source assessment and its management program at least every five years.

The vision, objectives and strategies of the subbasin plan are consistent with and support these elements and are compatible with implementation efforts and measures identified in approved TMDL and Watershed Restoration Action Strategies (WRAS) to protect and restore beneficial uses. Additional efforts were to prevent significant threats from present and future activities from degrading water quality. Finally, long-term goals were to target nontraditional partners and incorporate their roles into planning and implementation activities. The following are goals for nonpoint source management in Idaho (IDEQ 1999):

1. Develop and implement coordinated restoration and water quality improvement plans (TMDL/WRAS/ or other implementation plans) which include appropriate BMP design, implementation, monitoring, and maintenance schedules for nonpoint source impacted surface and ground waters that help to restore, protect, or remediate (where appropriate) existing or designated beneficial uses of the State's surface and ground waters (#/yr).

2. Implement nonpoint source BMPs to meet approved TMDLs, TMDL implementation plans, and ground water standards.

3. Provide technical assistance in the development of surface and ground water BMPs and pollution prevention strategies for nonpoint source categories which are not currently listed as approved in the water quality standards.

4. Confirm that all agencies are implementing the nonpoint source management feedback loop in a manner consistent with the nonpoint source management program and, where appropriate, are revising and/or maintaining BMP catalogs and effectiveness protocols.

5. Support ground or surface water monitoring efforts which provide needed data for contaminant transport modeling and investigation work.

6. Integrate ground and surface water quality concerns within basins and watersheds to provide for better protection and restoration (where appropriate) of ground and surface water beneficial uses.

7. Develop and implement pollution trading approaches.

8. Implement measures to protect drinking water from the effects of nonpoint source activities.

9. Update and maintain the Nonpoint Source umbrella Memorandum of Understanding and appendices.

The vision of the Idaho Nonpoint Source Management Program is that all long-term goals and short-term objectives be implemented in a manner to protect or restore (where possible) the beneficial uses of the State's surface and ground water (IDEQ 1999). The continuing focus for the State of Idaho within the foreseeable future will be to develop and implement TMDLs/WRASs for §303(d) listed water bodies. The state of Idaho has committed to the completion of TMDL implementation plans within an 18 month period following the EPA approval of a TMDL (IDEQ 1999).

The vision and guiding principles (plan sections 2.1 and 2.2), environmental objectives (plan Section 3.3.1: Aquatic Ecosystem), and socioeconomic objectives (plan section 3.4) are consistent and integrated with the Idaho Nonpoint Source Management Program. In particular objectives for sturgeon, redband trout, bull trout, and mollusks include strategies to improve water quality, which will also help meet the goals of the Idaho Nonpoint Source Management Program. The objectives of the *Middle Snake Subbasin Management Plan* are both consistent with and mutually support of the vision, goals and objectives of the Idaho Nonpoint Source Management Program. Monitoring and evaluation activities (plan section 4.3: M&E) describe measurable short-term outcomes and expected biological response of implementation strategies, and if implemented would provide valuable data useful to Working partnerships and collaborative efforts have been developed during subbasin planning and public involvement meetings and outlined (plan section 5.3: Coordination with federal, tribal, state, and local entities, plan section 1.2.3: Public Outreach). Local involvement during activities in impaired watersheds has been recommended (Plan section 3.4: Socioeconomic objectives). Data gaps, research needs and monitoring activities are recommended and a feedback loop for adaptive management described (plan section 4: Research, monitoring, and evaluation). Water quality is a major component of habitat quality that impacts or supports aquatic focal species in the subbasin. Efforts resulting from the Nonpoint Source Management Program that improve water quality will result in improvements to aquatic habitat quality, which is a major objective of the subbasin management plan for aquatic focal species.

5.2.1.1 303(d) Listed Segments

Section 303(d) of the CWA requires that water bodies violating state or tribal water quality standards be identified and placed on a 303(d) list. Water bodies that do not meet water quality standards with implementation of existing management measures are listed as impaired under §303(d) of the CWA. It is each state's responsibility to develop its respective 303(d) list and establish a TMDL for the parameter(s) causing water body impairment (USEPA 2004).

Over 1,400 stream miles—including 10 reservoirs, 12 Snake River segments, 2 springs, and 95 tributary segments—have been classified as water quality limited in the subbasin under § 303(d) of the Clean Water Act (assessment section 2.9: Water quality). A complete list of streams listed under § 303(d) is provided in Assessment Appendix A, Table 38: 303(d)-listed streams in the Middle Snake subbasins, grouped by 4th field HUC.

Nearly the entire length of the mainstem Snake River in the subbasin is listed as water quality impaired. The major water quality issues in the Snake River develop from a variety of point and nonpoint sources include excessive sediment loading, elevated temperatures, reduced flows, reduced dissolved oxygen, excessive aquatic plant growth, and nutrient enrichment (assessment section 2.9: Water quality). The primary nutrient impairing beneficial uses is phosphorus although high ammonia and nitrate levels can also be toxic to fish and humans. A total phosphorus target of 0.07 mg/L (May-September) has been set for the Middle Snake River–Succor Creek watershed (assessment section 2.9: Water quality). Only 24% of sediment is transported into the subbasins from upstream; most of the sediment is from local inputs, which include tributary streams, irrigation return flows, bank erosion, and irrigation drains. Instream channel erosion is the primary source of sediment loading in studied tributaries (Castle Creek, Sinker Creek, and Succor creeks). Land management practices contribute to unstable banks, and this resultant instability leads to sediment delivery to the stream channel.

Objectives 2A, 4A, 5A, 7A, 9A and 11A, 11B and 11C recommend actions to improve water quality. When implemented, these objectives and strategies will support the effort to reduce the number of stream miles listed as 303 (d) impaired (plan section 3.3.1: Aquatic Ecosystem).

5.2.2 TMDLs in Middle Snake subbasins

A TMDL, or Total Maximum Daily Load, is a tool for implementing water quality standards and is based on the relationship between pollution sources and in-stream water quality conditions. The TMDL establishes the allowable loadings or other quantifiable parameters for a waterbody and thereby provides the basis to establish water quality-based controls. These controls should provide the pollution reduction necessary for a waterbody to meet water quality standards (USEPA 2004).

Five TMDLs have been developed for subbasins, as delineated by IDEQ, entirely or partially within the Middle Snake subbasins: Brownlee Reservoir, Snake River-Hells Canyon, Middle Snake/Succor Creek, Big Wood River, and Billingsley Creek.

<u>Brownlee Reservoir (Weiser Flat) Subbasin TMDL</u>

The Brownlee Reservoir subbasin is entirely within the Middle Snake subbasins boundaries. There are five water quality limited streams in this subbasin. The streams and listed pollutants of concern are summarized in Table 15.

Table 15. Streams and listed pollutants in Brownlee Reservoir (IDEQ 2003b).

Stream	Pollutants
Dennett Creek	Flow alteration, temperature, sediment
Hog Creek	Nutrients and sediment
Scott Creek	Nutrients and sediment
Warm Springs Creek	Nutrients and sediment
Jenkins Creek	To be re-listed

TMDLs have been written for nutrients (Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek) and sediment (Dennett Creek, Scott Creek, Warm Springs Creek and Jenkins Creek). Bacteria is proposed to be listed for Hog Creek, Scott Creek, Warm Springs Creek and Jenkins Creek as a pollutant as part of the first §303(d) list submitted by the State of Idaho subsequent to the approval of this TMDL. Scheduling for the bacteria TMDLs will be identified at the time of listing (IDEQ 2003b).

Snake River—Hells Canyon Subbasin TMDL

The scope of the this TMDL extends from where the Snake River intersects the Oregon/ Idaho border near Adrian, Oregon to immediately upstream of the inflow of the Salmon River. This includes the Hells Canyon Complex reservoirs: Brownlee, Oxbow and Hells Canyon, which are in the Middle Snake subbasins. The overall reach has been divided into five smaller segments based on similar hydrology, pollutant delivery and processing mechanisms, and operational, management or implementation strategies. The five segments are (IDEQ and ODEQ 2003):

- Upstream Snake River (RM 409 to 335, 74 miles total).
- Brownlee Reservoir (RM 335 to 285, 50 miles total).
- Oxbow Reservoir (RM 285 to 272.5, 12.5 miles total).
- Hells Canyon Reservoir (RM 272.5 to 247, 25.5 miles total).
- Downstream Snake River (RM 247 to 188, 59 miles total).

Within these segments, all designated beneficial uses and the following listed pollutants from both states have been addressed by the TMDL: bacteria; nutrients, nuisance algae and dissolved oxygen; pesticides; pH; sediment; temperature; and total dissolved gas. The mercury TMDL has been postponed to 2006 due to a lack of water column data (IDEQ and ODEQ 2003).

Mid Snake River/Succor Creek Subbasin TMDL.

Within the Mid Snake River/Succor Creek Subbasin, 21 segments were identified on the §303(d) list of impaired water bodies and were assessed to determine the need for development of TMDLs (IDEQ 2004). The streams and pollutants for which TMDLs were developed are summarized in Table 16.

Table 16. The streams and pollutants for which TMDLs were developed in the Middle Snake River/Succor Creek Subbasin (IDEQ 2004).

Streams	Pollutants
Snake River (Swan Falls to Oregon Line)	nutrients, dissolved oxygen
Castle Creek	sediment
Jump Creek (Mule Creek to Snake River)	sediment
Sinker Creek	sediment, temperature
Succor Creek (Headwaters to Oregon Line)	sediment, temperature
Succor Creek (Oregon Line to Snake River)	sediment, bacteria

Big Wood River TMDL

Table 17 summarizes the streams and pollutants in the Big Wood River Subbasin for which TMDLs will be developed as a consequence of the Big Wood River Watershed Management Plan. For total suspended solids and substrate sediments (both interpreted as Ex Sed), total phosphorus (interpreted as Ex Nut), and E. coli, full TMDLs will be established immediately. Flow (Q) will be added to USEPA's pollution list to be further evaluated. Nitrite + nitrate (interpreted as NOX) is not being pursued at this time. Temperature and dissolved oxygen TMDLs will be deferred until year 2003 pending collection of more information. No TMDL for turbidity is being pursued as TMDL reductions in Ex Sed will create reductions in turbidity. Total ammonia will be delisted for the 303(d) list (IDEQ 2002).

Table 17. Streams and pollutants for which TMDLs were developed in the Big Wood River Subbasin (IDEQ 2002).

Streams and WQLS no.	Pollutant
Big Wood River Mainstem Segments	
BWR—1	Meeting beneficial uses. -
BWR—2	Q, HI
BWR—3	Tem, Ex nut, excess sed, Q, HI
BWR—4	Tem, Ex nut, excess sed, Q, HI
BWR—5	Tem, Ex nut, Q, HI
BWR—6	Tem, Ex nut, excess sed, DO, Q, HI
BWR—7	Tem, Ex nut, excess sed, Q, HI
BWR—8	Ex nut, excess sed, Q, HI
Tributaries or Tributary Segments	

Streams and WQLS no.	Pollutant
Eagle Ck—5291	Tem, Ex nut, excess sed, MBI
Lake Ck—7614	Ex nut, MBI
Placer Ck—5293	Ex nut, MBI
Cove Ck—5296	Ex nut, excess sed, HI, MBI
Greenhorn—5294	Tem, Ex nut, excess sed, MBI
Quigley Ck—5297	Tem, Ex nut, excess sed, DO, HI, MBI
Croy Ck—2491	Ex nut, excess sed, HI, MBI
Seamans—5298	Tem, Ex nut, excess sed, HI, MBI
Rock Ck—2487	Tem, Ex nut, excess sed, E Coli, HI, MBI
EFRC—5299	Tem, Ex nut, excess sed, HI, MBI
Thorn Ck—5300	Tem, Ex nut, excess sed, DO, HI, MBI

Q = Flow alteration. Tem = Temperature. Ex nut = Excess nutrients. Sed = Excess sediments. HI = Habitat Index not meeting beneficial uses. MBI = MBI does not meet beneficial uses. WQLS = Water Quality Limited Segment.

Billingsley Creek TMDL

The Billingsley Creek stream is a 303(d)-listed waterbody in the Upper Snake-Rock Creek subbasin, which is within the Middle Snake subbasins. Point and nonpoint sources provide sufficient pollutants to create eutrophication problems inclusive of nuisance aquatic plant growths, algae, slimes, molds, excess nutrients, and excess sediment (IDEQ 2003). Point sources include aquaculture fish hatcheries. Nonpoint sources include irrigated agriculture, grazing, confined feeding operations, stream corridor natural background, and recreational activities. Additional to these pollutant-linked stressors is flow alteration (IDEQ 2003). Flow alteration is not considered a pollutant. However, it can be a stressor on a drainage system. Within Billingsley Creek and its associated tributaries, flow alteration is a serious concern that has placed the stream in jeopardy of de watering over the past six (6) years.

Billingsley Creek is listed on the federal 1998 303(d) list for sediment, dissolved oxygen, ammonia, and flow alteration. The Creek is also considered a special resource water and for domestic water supply, cold water aquatic life, salmonid spawning, and primary contact recreation. Water quality targets (or standards) to meet the special resource water and domestic water designation include: (1) a 0.100 mg/L TP instream target; (2) a 25.0 mg/L TSS instream target; and, (3) a 235 cfu/100 mL E. coli instream target. These are preliminary instream water quality targets. Depending on how the stream responds to the wasteload allocations defined in the TMDL, other additional reductions may or may not be necessary (IDEQ 2003).
plan section 3.3: Environmental Components describes environmental objectives 11A, 11B, 11C, and 11D which address flow, temperature, sediment, and nutrient impairment in coordination with existing TMDL assessments. Impairment due to bacteria will largely be addressed using strategies associated with environmental objective 14A to minimize grazing impacts. Impairment due to dissolved oxygen will be addressed following nutrient reduction efforts (environmental objective 11D).

6 Prioritizations

This chapter prioritizes restoration and protection efforts for aquatic and terrestrial species in the Middle Snake subbasins. The scale of limiting factors impacting species and habitats in the Middle Snake subbasins dwarfs the financial resources available restoration and protection efforts. This gap between existing resources and needs within the subbasins indicates the necessity of prioritizing the activities and project areas to ensure that the limited resources available are used as efficiently and effectively as possible to protect and restore aquatic and terrestrial species and their habitats. The number of issues and diversity of species and habitats impacted make prioritization a major task that needs be periodically repeated and fine-tuned based on new information. Filling key data gaps (plan section 4.1: Data Gaps) will further improve the accuracy of prioritization processes.

The objective of this repeated, ongoing prioritization process is to identify the most effective and needed actions and the highest priority habitat areas requiring protection or restoration. To do this, a prioritization process must balance multiple objectives, values, and benefits. As reflected in the socioeconomic objectives and strategies in this plan, the planning team believes that benefits and impacts to humans needs to be integrated into planning and implementation activities in the subbasin. Prioritization of activities that achieve maximum fish and wildlife benefits with least negative impacts to humans will be more likely to receive local acceptance and support.

6.1 Aquatic Prioritization

Prioritization of the aquatic components of the Middle Snake Subbasins Plan was carried out collaboratively by the Aquatics Technical Team. The Qualitative Habitat Assessment (QHA; Mobrand Biometrics 2003) tool provided by the Council for use in subbasin planning was not used to prioritize restoration and protection efforts in the Middle Snake subbasins (see assessment section 3.4.2).

The Technical Team developed a list of rules for prioritization, based on examples given in technical guidance, reviews of other subbasin planning efforts, and through a brainstorming exercise. From this list, the Technical Team chose a structure most appropriate for prioritization of activities in the Middle Snake subbasins. Little effort to develop a quantified prioritization method was attempted due to lack of time.

The Fisheries Technical Team developed the following rules for prioritization activities in the Middle Snake subbasins:

- Prioritize mainstem and tributary habitats in the subbasins separately,
- Prioritize actions within areas of mainstem and tributary habitats, but not between,
- Build out from strong areas within each identified unit,
- Prioritize actions for each species, rather than prioritizing between species

- Prioritize the potential limiting factors affecting each species beginning with high priority (1) factors described as limiting in assessment section 3.4.2: Aquatic Resources Limiting Factors.

- Prioritize the actions needed to address each limiting factor.

This structure was followed during prioritization activities:

1) Mainstem habitats

a. below CJ Strike Reservoir

b. above CJ Strike Reservoir

2) Tributary habitats

a. Wood River drainage

b. Rock Creek drainage

c. Salmon Falls Creek

d. Camas Creek

e. Canyon springs

f. Lower tributaries (Weiser to Hells Canyon dam)

g. Upper-central tributaries (Weiser to Malad)

3) Focal species

a. White sturgeon

b. Mountain whitefish

c. Redband trout

d. Wood River sculpin

e. Bull trout

f. Molluscs

4. Potential Limiting Factor: listed in order of priority to address.

5. Action to address limiting factor, in order of priority.

6. Comment section to add details or clarification where needed.

Mainstem Habitats

Below CJ Strike Reservoir

White sturgeon

Potential limiting factors: loss of connectivity to suitable spawning habitat, altered flows, water quality limitations (temperature and DO)

Actions: consider options for increasing recruitment in the CJ Strike-Swan Falls Reservoir reach. Investigate white sturgeon genetics to determine the most appropriate action. Restoration of normative hydrograph. Improve water quality (especially temperature and DO) conditions for white sturgeon by supporting TMDL efforts

Comments: consider options such as transferring adults to upstream reaches or juveniles downstream reaches to allow spawning before genetics are lost from older age classes.

Mountain whitefish/redband trout.

Potential limiting factors: water quality limitations (temperature and DO)

Actions: improve water quality (especially temperature and DO) conditions for mountain whitefish and redband trout by supporting TMDL efforts

Above CJ Strike Reservoir

White sturgeon

Potential limiting factors: loss of connectivity impacting genetic interchange, altered flows, water quality limitations (nutrients in relation to temperature and DO)

Actions: improve connectivity between isolated populations. Restore natural hydrograph. Improve temperature and DO for white sturgeon and decrease nutrient inputs by supporting TMDL efforts.

Comments: consider trap and haul methods or dam passage to increase genetic interchange. Explore other opportunities to increase passage.

Mountain whitefish/redband trout

Same as white sturgeon.

Comments: Build out from strong areas on redband trout distribution map, using high, med, low density data points from map to prioritize. High and moderate density = protect. Low density = restore. (assessment section 3.4.1: Aquatic Focal Species Characterization and Selection, redband trout).

Molluscs

Potential limiting factors: water quality (temp, sediment, and contaminants in mainstem), water quantity, quality, nitrate+nitrites (in adjacent spring systems e.g. Thousand Springs)

Actions: restore and protect water quality and quantity in springs and spring-fed tributaries by exploring the opportunity (land purchase, easements, water rights) to restore lands and spring habitats adjacent to the main-stem Snake River. Restore the natural course of springs and tributaries to the Snake River. Improve water quality (especially temperature and DO) conditions for mollusks by supporting TMDL efforts (e.g. support upland habitat restoration to reduce sedimentation, fertilizer runoff), support research into toxicology of mollusks.

Tributaries

Wood River Drainage

Wood River sculpin
Potential limiting factors: loss of flow, temperature, sediment
Actions: Increase water conservation efforts and explore lease purchase options for water rights or a potential water bank with statewide approval. Reduce temperature and sediment through restoration and protection of riparian zones.

Mountain whitefish
Same as Wood River sculpin

Redband trout
Same as Wood River sculpin

Molluscs
Potential limiting factors: water quality, quantity
Actions: reduce temperature and sediment through restoration and protection of riparian zones. Establish instream flows below Magic Reservoir for fish and wildlife (currently dries up pretty regularly).

Comments: Build out from strong areas on redband distribution map, using high, med, low density data points from map to prioritize. High and moderate density = protect. Low density = restore. (assessment section 3.4.1: Aquatic Focal Species Characterization and Selection).

Rock Creek

Mountain whitefish
Potential limiting factors: watershed disturbance however mountain whitefish are documented only in the lower segments of Rock Creek; their true distribution is unknown.
Actions: implement BMPs to restore riparian areas and reduce sedimentation.

Redband trout
Potential limiting factors: watershed disturbance.
Actions: implement BMPs to restore riparian areas and reduce sedimentation.

Comments: Build out from strong areas on redband distribution map, using high, med, low density data points from map to prioritize. High and moderate density = protect. Low

density = restore. (assessment section 3.4.1: Aquatic Focal Species Characterization and Selection).

Salmon Falls Creek

Mountain whitefish

Potential limiting factors: sediment, watershed disturbance (upland factors and upstream riparian area disturbance).

Actions: implement upland and riparian BMPs.

Comments: Salmon Falls Creek is influenced by the lack of flow from Salmon Falls Creek Reservoir resulting in sediment accumulation. Caution: increasing flows from Salmon Falls Reservoir may result in walleye entrainment downstream, precautionary measures must be taken.

Redband trout
Same as mountain whitefish

Comments: Build out from strong areas on redband distribution map, using high, med, low density data points from map to prioritize. High and moderate density = protect. Low density = restore. (assessment section 3.4.1: Aquatic Focal Species Characterization and Selection).

Camas Creek

Redband trout
Potential limiting factors: loss of flows, sedimentation.
Actions: Increase water conservation efforts and explore lease purchase options for water rights or a potential water bank with statewide approval. Protect and restore riparian areas.

Wood River sculpin
Same as redband trout, for distribution see assessment section 3.4.1: Aquatic focal species selection and characterization, Figure 28: Wood River sculpin distribution in the Middle Snake subbasins.

Mountain whitefish
Same as redband trout; however, presence is unknown

Canyon Springs

Redband trout
Potential limiting factors: connectivity, baseflows, instream habitat degradation, localized sediment impacts (not widespread, Billingsley Creek)
Actions: restore fish passage issues that are unique to each spring. Increase water conservation efforts and explore lease purchase options for water rights or a potential water bank with

statewide approval. Possibly restore segments of stream channels to induce instream sediment transport and reduce contributions.

Comments: Billingsley Creek has a serious sediment problem with blowouts and naturally little sediment transport due to low flow variation in springs (a natural regime). As a result, any sediment above natural levels is retained in the stream channel.

Molluscs
Potential limiting factors: water quality, quantity
Actions: reduce temperature and sediment through restoration and protection of riparian zones. Restore aquatic habitats degraded from irrigation or aquaculture operations. Support agricultural BMPs that reduce the amount of nitrite+nitrate concentrations entering the groundwater system from upland sources and discharging through springs in the Canyon Springs basin. Purchase, lease, or otherwise obtain water rights to augment instream flows in first order tributaries of the Snake River to benefit invertebrates, fish, and wildlife.

Comments: spring habitats in the Middle Snake are the most important habitats for molluscs, due to impairment in mainstem habitats.

Lower tributaries

Bull trout
Potential limiting factors: connectivity, habitat fragmentation, introduced species
Actions:

Comments: The Hells Canyon Complex of three dams in the Snake River lack two-way fish passage, which has isolated bull trout among the three reservoirs or their tributaries. Migratory bull trout occur in Hells Canyon Reservoir and likely use spawning and rearing habitat in the Pine Creek basin in Oregon and may use the Indian Creek basin in Idaho. Bull trout also occur in tributaries of the two upstream reservoirs, Wildhorse River draining into Oxbow Reservoir and the Powder River draining into Brownlee Reservoir. Because of impassible barriers to fish movement within tributaries (e.g., Thief Valley Dam and Mason Dam in the Powder River basin) and no observations of migratory bull trout within the reservoirs, bull trout in the management unit upstream of Oxbow Dam are thought to be resident fish (USFWS 2004).

Pine-Indian-Wildhorse core area. Isolation of local populations and habitat fragmentation due to passage barriers posed by culverts, irrigation diversions, and dams are the primary threats to bull trout in the Pine-Indian-Wildhorse core area. Brook trout are a significant threat to bull trout in the Pine-Indian-Wildhorse core area. Brook trout co-occur with bull trout in many locations and numerous hybrids have been documented (USFWS 2004).

Redband trout
Potential limiting factors: watershed disturbance, habitat degradation
Actions: Forest BMPs

Comments: Need additional expertise in this area, problems are likely watershed specific. Talk to Jeff Dillon (IDFG) and Paul Jannsen (IDFG) for project specific details. Build out from strong areas on redband distribution map, using high, med, low density data points from map to

prioritize. High and moderate density = protect. Low density = restore. (assessment section 3.4.1: Aquatic Focal Species Characterization and Selection).

Upper-central Tributaries

Redband trout
Potential limiting factors: baseflows, temperature, and connectivity
Actions: Increase water conservation efforts and explore lease purchase options for water rights or a potential water bank with statewide approval. Protect and restore riparian areas.

Comments: temperature and connectivity issues are strongly related to baseflows. There are some riparian issues and redband trout are generally found in areas with good overhead cover.

Build out from strong areas on redband distribution map, using high, med, low density data points from map to prioritize. High and moderate density = protect. Low density = restore. (assessment section 3.4.1: Aquatic Focal Species Characterization and Selection).

Molluscs
Potential limiting factors: water quality, quantity
Actions: reduce temperature and sediment through restoration and protection of riparian zones. Restore aquatic habitats degraded from irrigation or aquaculture operations. Support agricultural BMPs that reduce the amount of nitrite+nitrate concentrations entering the groundwater system from upland sources and discharging through springs in the Upper Central Tributarires. Purchase, lease, or otherwise obtain water rights to augment instream flows in first order tributaries of the Snake River to benefit invertebrates, fish, and wildlife.

Comments: Current distribution for molluscs in this area is restricted to few springs and tributaries from King Hill Creek to the mouth of the Malad (see mainstem: above CJ strike potential limiting factors for information on additional distributions). Spring habitats in the Middle Snake subbasins are the most important habitats for mollusks due to impairment in mainstem habitats.

6.2 Terrestrial Prioritizations

6.2.1 Rules for Prioritization

The Terrestrial Technical Team applied the following prioritization rules in determining priorities for the Middle Snake subbasins:

- Prioritize areas for restoration by focal habitat type. It is too expensive and impractical to address a particular limiting factor across the entire subbasin so areas of focus must be identified. Recognizing that all habitats in the subbasin are important, the Technical Team attempted to identify those critical for preserving the subbasins biodiversity and/or most imperiled. Within these habitat types they also attempted to select priority areas for action.

- Build from strength. Work from the areas in the best condition outward. Efforts to improve the status of fish and wildlife populations in the basin should protect habitat that supports existing populations that are relatively healthy and productive. Next, efforts should expand

to adjacent habitats that have been historically productive or have a likelihood of sustaining healthy populations by reconnecting or improving habitat. Efforts should try to conserve the best areas of the subbasin and then build into areas with high need. Protecting strongholds shouldn't be done as the expense of protecting areas where populations are in rapid decline or habitat is critically fragmented. In these instances intense focused actions may be required to prevent extinction and preserve all the parts.

- Prioritize for multiple species and benefits. Projects that benefit multiple species in single or multiple habitat types should receive priority.

- Prioritize by importance of limiting factors to be addressed. Efforts should address priorities established in the assessment for limiting factors (assessment section 3.5.3).

- Maximize overlap between terrestrial and aquatic benefits. Efforts should address areas and limiting factors that provide the greatest benefit to both terrestrial and aquatic species and habitats.

- Prioritize projects that benefit fish and wildlife and local communities. When selecting among projects that offer similar biological benefit, choose projects that provide the most benefit to local communities.

- Prioritize strategies and activities that are practical and possible. Consider where a project or strategy is cost-efficient, whether it has beneficial or acceptable economic and social impacts, and whether it is likely to provide significant benefits within the scale of the limiting factors.

- Prioritize strategies that implement ESA recovery goals, species conservation agreements, or work to eliminate the need for listing other species . Projects that benefit ESA targeted species and habitat, or work to keep critically imperiled species off the Endangered Species List should be prioritized over projects that do not. Projects for ESA listed species should be implemented in priority focal habitats before implementing projects to prevent species from becoming listed under the ESA in those same focal habitats. When choosing which focal habitat to place priority for projects. It should be the highest priority in the plan to restore habitat with species that are already listed under the Endangered Species Act and/or species that have the highest Global rating for rarity and threats. These are the habitats with species that are in the most peril.

Application of these rules generated a suite of decisions that provide prioritized framework for protection and restoration efforts in the Middle Snake subbasins.

6.2.2 Recommendations

- Prioritize areas for restoration by focal habitat type. The Terrestrial Technical Team determined that shrub-steppe habitats (including both dwarf shrub steppe and shrub steppe (WHTs) riparian/wetland/spring habitats, and native grasslands are the most important to protect and restore in the Middle Snake subbasins. The decision to focus efforts on shrub-steppe habitats was a reflection of the defining role this habitat type plays in the subbasins, the numerous threats to its condition, and its importance to wildlife species of the subbasins. This habitat type contains the highest percentage of potentially listed species of all habitat

types in the subbasins. The Terrestrial Team indicated that this habitat type is on the verge of unraveling, a timely effort to protect and restore portions of this habitat may have important long-term benefits that will be much harder to achieve in the future. Riparian, wetland, and spring habitats drew focus based on the importance of this habitat to numerous terrestrial and aquatic species, the uniqueness of spring features in the subbasins, and the importance of riparian in habitat connectivity. Native grasslands were identified as a priority due to the extent of their loss and degradation and use by the threatened Spalding's silene and northern Idaho ground squirrel.

6.2.2.1 Information Used During Prioritization

The Terrestrial Technical Team utilized the numerous GIS layers that were collected during the assessment process in making their prioritization discussions. The GIS layer and other information used in making decisions for each of the priority habitats in the subbasin are discussed below. Overlaying the available layers and applying the rules allowed the Technical Team to identify particular areas of the subbasin as priorities for protection, and restoration activities. These priority areas are displayed in Figure 2. The application of the rules and the decision making process that resulted in the development of this figure are discussed in the following sections:

Shrub Steppe

During the shrub-steppe prioritization effort, the Technical Team consulted numerous Figures contained in the assessment including current WHT distribution, sage grouse habitat condition and restoration priorities (assessment section 3.5.2, Figure 37), sage grouse stronghold populations (assessment section 3.5.2, Figure 37), historic range of slick-spot peppergrass (assessment section 3.5.1, Figure 32), pygmy rabbit observations (the Technical Team decided not to use the pygmy rabbit survey priorities map in prioritization as it is still being tested and refined) (assessment section 3.5.1, Figure 40), areas identified as conservation priorities by The Nature Conservancy (TNC) (assessment section 3.1, Figure 24), and mule deer winter range areas (assessment section 3.5.1, Figure 39). Although Figures were not available to illustrate the range of southern Idaho ground squirrels, the Technical Team was aware of their range and took it into account during the prioritization process.

Native grassland

In considering areas important for native grassland conservation, the Technical Team used the distribution of native grassland habitats as determined by the Northwest Habitat Institute (assessment section 3.5.1, Figure 29) and the range of the T&E species that inhabit or may inhabit the native grassland habitats of the subbasin (GIS layers for Spalding's silene, northern Idaho ground squirrel and Macfarlane's four-o'clock were not available for the subbasin, but the Technical Team was familiar with their habitat requirements and used this information during the prioritization process.

Riparian/wetland/spring

The Technical Team used the wetland condition classes developed by Jankowsky-Jones (1997;2001; assessment section 3.5.1, Figure 36) during the prioritization process. Other layers utilized included stream network layers and fish distribution layers.

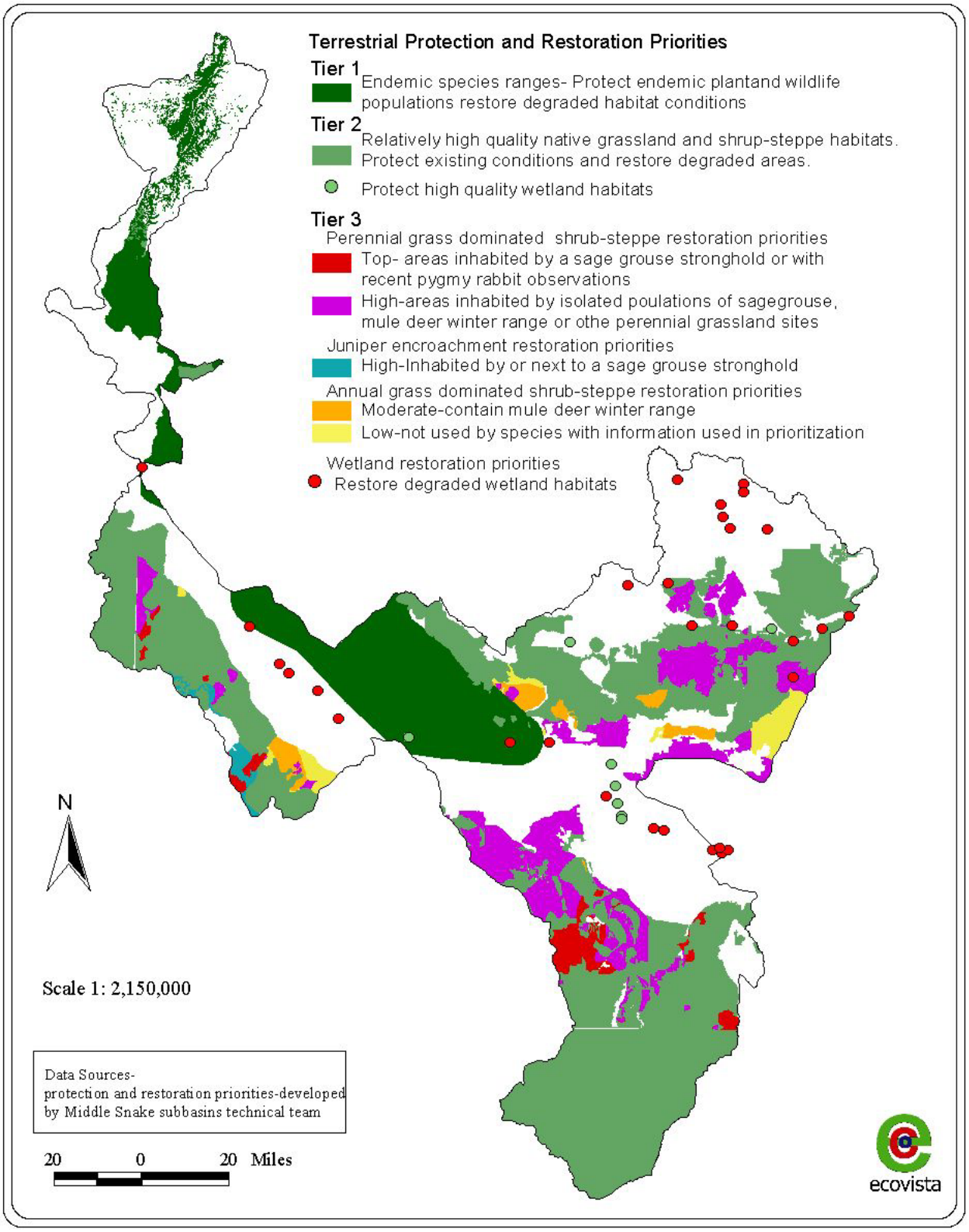

Figure 2. Terrestrial protection and restoration priorities.

6.2.2.2 Tier-1 Protect and Restore Habitat for Imperiled Species (particularly ESA listed or endemic populations)

Prioritize strategies that implement ESA recovery goals, species conservation agreements, or eliminate the need for listing other species. Projects that benefit ESA listed species and prevent their extinction are considered the highest priority projects by the Technical Team. Those that protect critical habitat, or work to keep critically imperiled species off the Endangered Species List should be prioritized over projects that do not. The northern Idaho Ground squirrel is a species listed as threatened under the ESA that utilizes native grassland habitats in the lower subbasin. The threatened Macfarlane's four-o'clock and Spalding's silene also potentially inhabit native grassland habitats in the lower subbasin. Slick-spot peppergrass and Southern Idaho ground squirrels are two species endemic to Southern Idaho that were recently considered for listing under the ESA. Both or these species occur within shrub-steppe habitats of the subbasins.

In many areas habitats utilized by these species has been degraded through land-use activities. Protection and restoration of habitat utilized by these imperiled terrestrial species was identified as the top priority by the Terrestrial Technical Team. The range of northern Idaho ground squirrel, slick-spot peppergrass, and southern Idaho ground squirrel and the potential range Spalding's silene was identified as the highest priority areas needing protection and restoration in the subbasin and is shown in Figure 2 'protect/restore ESA listed and endemic species habitat'.

6.2.2.3 Tier 2- Protect Existing High Quality Habitats

Build from strength. Protection and restoration efforts that work outward from high quality areas are considered higher priority than efforts starting in low quality areas. Figure 37 in assessment section 3.5.2 identifies sage grouse habitat areas of generally intact sagebrush steppe habitat that provide sage grouse habitat during some portion of the year. *Prioritize for multiple species and benefits.* The preservation and protection of these areas would provide benefits to many sage-steppe dependent species. For instance, three of the four observations of pygmy rabbit in the subbasins since 1994 occur within these areas. Information on the quality of sagebrush-steppe habitats in Nevada was not available, but based on intensive use by sage grouse and identification of the Nevada border area as likely to contain a major population of pygmy rabbits (Roberts 2003), the Nevada portion of the subbasins was also assigned high protection priority. Areas identified by TNC as conservation priorities, through the use of SITES or BMAS models, should also be considered high priority for protection. Protecting the unique features and generally good condition of Class 1 and Class 2 Riparian/Wetland/Spring habitats (surveyed by Jankowsky Jones 1997, 2001) in the subbasins should be a priority.

Prioritize according to expected biological benefits vs cost. Protection of high quality habitat in will be more cost effective than restoring degraded areas.

6.2.2.4 Tier 3- Restore degraded areas that have the greatest biological potential

Shrub-steppe

Prioritize according to expected biological benefits vs cost. The sage grouse habitat map (assessment section 3.5.2, Figure 37) identifies areas in need of three types of restoration activities to improve habitat conditions for sage grouse and other shrub-steppe dependent

species; restoration to reduce the extent of crested-wheatgrass, restoration to reduce the extent of cheatgrass and restoration to reduce juniper encroachment into shrub-steppe habitat. The Technical Team prioritized between these three restoration activities based on expected biological benefits and cost.

- Areas in need of restoration to reduce the extent of **perennial grasses** in shrub-steppe habitats of the subbasins were considered to be most feasible and to have the greatest biological benefits for the cost. This decision was based on the availability of effective methods for addressing crested-wheatgrass issues and the location of many of the crested wheat grass sites adjacent to, or surrounded by, large areas of intact sage-brush steppe habitats.

- Areas in need of restoration to reduce the extent of **juniper encroachment** in the subbasins were prioritized as second restoration priority. Juniper encroachment is currently a minor problem in the subbasins but areas where it is occurring border high quality sage-brush steppe habitats. The Technical Team felt that intervening before juniper encroachment problems increase would be beneficial to wildlife species of the subbasins.

- Areas in need of restoration to reduce the extent of **annual grasses** were considered lowest priority of restoration areas. Currently available methods for restoring cheatgrass habitats to native shrub-steppe are usually cost prohibitive or ineffective over the long-term. Priorities in these areas would likely focus on preventing the spread of cheatgrass or on research into more effective techniques.

Prioritize for multiple species and benefits In the context of the restoration priorities developed above, species use and connectivity to existing high quality areas (*Build from strength)* was evaluated to further stratify restoration priorities. These priorities should be considered in the context of the decisions made about the feasibility of restoring these areas presented in the previous paragraphs.

Perennial grassland (primarily crested-wheatgrass) restoration priorities

- Crested-wheatgrass restoration areas identified as containing stronghold populations of sage grouse or those with recent (last 10 years) pygmy rabbit sighting were considered top priority crested-wheatgrass restoration sites (Figure 2).

- Crested-wheatgrass areas containing isolated populations of sage grouse separated from intact sage-steppe areas, or stronghold populations of sage grouse separated from other sage grouse populations only by a crested-wheatgrass area were considered high priority crested-wheatgrass restoration sites. Areas that contained both winter range for mule deer and an isolated sage grouse population, but which were slightly more isolated, were also considered high priority crested-wheatgrass restoration sites (Figure 2).

Juniper encroachment restoration priorities

- Areas identified as degraded because of juniper encroachment were assigned high restoration priority. This was due to the small size of effected areas and the occurrence of a stronghold population of sage grouse either within or adjacent to the area.

Annual grass (primarily cheatgrass) restoration priorities

- Areas identified for cheatgrass restoration overlapped very little with sage grouse strongholds or isolated populations. These areas, and those used by mule deer for winter range, were considered moderate restoration priorities.

- Areas identified for cheat grass restoration without documentation of use by species with available prioritization information were assigned low restoration priorities.

Riparian/wetland/springs

Wetland/springs areas classified as habitat or referenced by Jankovsky-Jones (1997, 2001; assessment section 3.5.1, Figure 36) are high priorities for restoration in the subbasins (Figure 2). For most of these wetlands/springs, Jankovsky-Jones has already identified threats and management needs which are summarized in assessment Appendix F. Addressing these issues is a wetland restoration priority. Large areas in the subbasin have not yet had wetland surveys completed (assessment section 3.5.1, Figure 36); completing theses surveys, surveying additional important wetlands in previously surveyed areas and monitoring the success of restoration and protection work are also priorities. After reviewing the available information on riparian habitat restoration needs, the Terrestrial Technical Team for the Middle Snake subbasins decided to defer to the Fisheries Technical Team in setting riparian restoration priorities. *Prioritize for multiple species and benefits*. *Maximize overlap between terrestrial and aquatic benefits.* The group decided that because riparian habitats are used so extensively by such a wide variety of wildlife species, improvements to riparian habitat condition and connectivity anywhere in the subbasin will benefit wildlife species and so should be prioritized according to benefit to aquatic species.

Native grasslands

Due to the importance of this habitat to ESA listed terrestrial species in the subbasin, the entire area of concentrated native grassland habitats in the subbasin were selected as a Tier 1 priority. Within this area, priorities for protection and restoration include areas containing populations of rare and threatened plant species and areas where conifer encroachment into native grassland habitats threatens populations of northern Idaho ground squirrel.

6.2.2.5 Prioritize projects that benefit fish and wildlife and local communities.

Protecting and restoring the native grassland, shrub-steppe and riparian/wetland spring habitats of the subbasins would have numerous positive benefits for the human communities in and adjacent to the subbasins. Restoring the vegetative composition of shrub-steppe and native grassland habitats would result in reduced fire frequencies, reduced fire fighting costs and reduced potential for damage to human structures and loss of life. Restoring native vegetation would result in improved forage quality for livestock and grazing/browsing wildlife species. Restoring these communities would improve water quality and quantity through reduced erosion and improved water storage capacity. Protecting and restoring riparian and wetland communities would also result in improved water quality.

Protection of the high quality natural resources and improvement of degraded areas of the Middle Snake would ensure scenic integrity. Resulting in higher quality of life for residents of

the subbasin and increased tourism dollars. Enhancing population of wildlife dependent on these habitats would result in increased tourism and associated revenues, from hunters, anglers, and bird watchers.

6.2.2.6 Prioritize by importance of limiting factors to be addressed.

Prioritize by importance of limiting factors to be addressed. Factors limiting shrub-steppe in the subbasins identified by the Technical Team include altered fire regime, grazing/browsing, land-use conversion, and invasive exotics. Strategies to address these limiting factors and which will achieve plan objectives were developed in plan section 5.2. Strategies to protect important areas from noxious weeds are outlined in Objective 12A; strategies to reduce the density of populations or eliminate noxious weeds where they are already established are outlined in Objective 12B. Strategies for returning the subbasin to a more natural fire regime are outlined in Objective 13A. Strategies for reducing the impacts of grazing on the aquatic and terrestrial species and habitats in the subbasin are outlined Objectives 14A and 14B. Objective 15A contains strategies for reducing the impact of historic and future land-use conversion on the wildlife and plant populations of the subbasin. In general, the Technical Team felt addressing noxious weeds/invasive exotics and grazing issues were most feasible and would provide greatest benefit to shrub-steppe habitats in the subbasins. However, the feasibility and importance of addressing limiting factors to shrub-steppe habitats will vary depending on site specific conditions. Priority areas and actions for the limiting factors are discussed below.

- **Objective 12A- protect existing high quality habitats from noxious weeds/exotics**
  Objective 12 B restore areas degraded by noxious weeds/invasive exotics

  In most areas of high quality habitat, the prevention of spread and establishment of noxious weeds and invasive plants needs to be the priority of protection efforts, following strategies of Objective 12A. Eradicating invasive exotic weeds or preventing their spread should be prioritized in high quality habitats. In degraded areas already infested by noxious weeds or other invasive plants, strategies in Objective 12B focused on reducing weed populations will be most important to implement. In the absence of special circumstances (e.g. when a noxious weed population threatens a rare plant or wildlife population) general strategies for addressing noxious weeds are prioritized as follows:

  1. Prevent establishment of noxious weeds/invasive plants in areas where they are absent.

  2. Preventing the spread of and reduce densities of noxious weeds/invasive plants in moderately infested areas.

  3. Reduce noxious weed densities in heavily infested areas.

- **Objective 14A and 14B Reduce the impacts of grazing**

  Strategies in Objectives 14A support grazing practices that reduce impacts on habitats in the subbasins. Implementation of these strategies should be attempted in all habitats in the subbasins where grazing occurs and local cooperation is present.

Strategies associated with Objective 14B strive to reduce the impacts of grazing on rare plant and wildlife populations. Priority areas for implementing strategies to achieve this Objective include the following:

- areas supporting Spalding's silene, Macfarlane's four-o'clock, slick-spot peppergrass and other critically imperiled rare plants
- bighorn sheep habitats
- big-game winter range
- high quality riparian/wetland/ spring habitats

- **Objective 13A Restore natural fire**

Objective 13A focuses on restoring the natural fire regime; some areas of the subbasin have more frequent fire return intervals than historically occurred, while other areas experience a less frequent fire return interval. Different priorities exist for addressing these issues depending upon areas of the subbasins. Top priority issues that need to be addressed to restore the natural fire regime include

- preventing fires in areas of relatively intact shrub-steppe
- increasing fire frequency in areas of conifer encroachment into shrub-steppe or native grasslands
- containing fires in cheatgrass dominated areas to prevent damage to property and surrounding habitats that would further enable the spread of cheatgrass
-

- **Objective 15A Reduce the impacts of land-use conversion**

Strategies associated with Objective 15A attempt to reduce the impacts of historic and future land-use conversion. Priority areas for addressing this issue include

- big-game winter range
- areas supporting rare plants or wildlife
- areas where construction will impact riparian or wetland function
-

- **Objective 19C Restore hydrologic processes**

Strategies associated with Objective 19C attempt to reduce the impacts of water use on riparian and wetland habitats in the subbasin and associated aquatic and terrestrial species. Priority areas for addressing this issue include

- areas of high quality riparian/wetland/spring habitats
- riparian/wetland/spring habitats supporting rare or ESA listed terrestrial and/or aquatic species
- areas with high tourism value or cultural significance

7 Recommendations and Conclusions

The Planning Team developed the following recommendations to guide implementation of the Middle Snake Subbasin Management Plan.

7.1 General Recommendations

While the purpose of this process is to mitigate the impacts of the federal hydropower system on fish and wildlife resources, this plan is intended to achieve "a healthy ecosystem with productive and diverse aquatic and terrestrial species, with emphasis on native species, which will support sustainable resource-based activities, for a growing human population" (Middle Snake subbasins vision statement).

The Planning Team believes that implementing this plan will provide opportunities for local natural resource-based economies to coexist and participate in recovery of aquatic and terrestrial species and habitats. Critical to the successful implementation of this plan is the increase in local participation and contribution to information, education, problem solving, and subbasin-wide conservation efforts. Promoting the understanding and appreciation of healthy and properly functioning ecosystems with residents and stakeholders in the subbasin is important to long-term success of the effort. The Planning Team recognizes that respecting and honoring tribal and private property rights is important to a successful, collaborative effort.

The Planning Team believes a scientific foundation is needed to diagnose ecosystem problems, and to design, prioritize, implement, and monitor and evaluate management activities that will achieve plan objectives. The Middle Snake Subbasins Plan provides a major step towards developing this scientific foundation within the restraints of a short time frame and limited funding resources. The scientific foundation also serves as a resource for public involvement and education activities outlined in this plan.

Sufficient data and professional judgment exists to give direction on near term implementation projects, but the many data gaps need to be filled before a complete, holistic implementation can occur. The Research, Monitoring and Evaluation chapter of this plan provides an initial outline of information needed before a more comprehensive and refined iteration of an implementation plan can be developed.

The Middle Snake Subbasins Plan needs to be understood in the context of existing fish and wildlife plans, the Snake River Basin Adjudication, the FERC relicensing of hydropower dams, ESA recovery plans, TMDL implementation plans and the many other planning efforts and documents affecting the subbasin. All these plans provide the context, and in many cases direction, for implementing the Middle Snake Subbasins Plan. The long-term effort to protect and restore aquatic and terrestrial species and their habitats will be more effective if this integration and coordination of processes and efforts takes place

7.2 Social Impact Conclusions

The Planning Team desires to implement this plan in a way which minimizes adverse impacts to stakeholders and maximizes local public support. Maintaining a viable farming and ranching industry is critical to sustaining a local population in the subbasin, which is an important value to the Planning Team.

Livestock: Grazing is an important land use in the Middle Snake subbasins involving important economic and multigenerational cultural traditions. A number of the terrestrial and aquatic objectives include recommendations that would alter current grazing management practices (Objectives). Altering current grazing practices involves implementing appropriate BMPs from state and federal technical guides.

How BMPs are implemented is a concern among livestock producers in the subbasins. The timetable for implementing BMPs needs to be realistic and achievable, and should be jointly developed with livestock producers. Livestock producers are not opposed to reasonable grazing BMPs, they are troubled, however, by rapid, unplanned policy shifts that do not allow them time to revise operations with a minimum of disruption and economic consequences. New practices should be implemented reasonably to allow time for producers to find alternative grazing locations without incurring major operational impacts.

Farming: A number of aquatic objectives (i.e. restore flows, reduce temperature, decrease sedimentation, etc.) include recommendations that impact practices related to irrigated agriculture. Goals for BMP implementation related to these recommendations not only need to be realistic and achievable, but also must be developed in concert with agricultural producers with enough time to allow successful transitions, without major operational impacts. These recommendations need to be economically feasible for producers to implement. The economic and cultural base of the Middle Snake subbasin relies heavily on irrigated agriculture. The wide variety of irrigated croplands, vineyards, orchards, and pasturelands produced within the subbasin enhances both local and statewide economies while supporting multigenerational cultural traditions.

Restoring fire regimes to a more historic trend in the Middle Snake subbasins will benefit a number of stakeholders with no identified negative impacts. Aggressive fire suppression in shrub steppe habitat is a tool for restoring historic fire regimes. Reducing impacts of catastrophic wildfire on forage resources is important to maintaining a stable local agriculture. These fires destroy the forage base and provide an avenue for invasive exotic plant invasion. Fires in shrub-steppe habitats have economic impacts by reducing short-term forage resources and, through weed invasion, reducing long-term forage. Altered fire regimes are negatively impacting shrub-steppe habitats and associated species. Addressing these problems now could potentially reduce future economic impacts. Restoring fire regimes will help avoid this problem, benefiting local communities, natural resource users, as well as the species that depend on impacted habitats.

Noxious weeds and other invasive exotics invade habitats after fire and other disturbances. Their intrusion impacts agriculture, water quality, recreationists, ranchers, and other people, and native terrestrial and aquatic species and habitat. A need exists for more effective management of

noxious weed programs in the subbasin. The entire scale of the current invasive exotic plant control efforts needs to grow; a need exists for more funding for projects and programs to address current problems. Implementing the objectives and strategies in this plan addressing invasive exotic plants will benefit all stakeholders without negative impacts.

Recreation: Currently hunting, fishing and other wildlife related recreation is a billion dollar industry in the state of Idaho (USFWS 2000). Successful implementation of this plan will benefit anglers, hunters and wildlife watchers by helping preserve and/or improve fish and wildlife populations and habitats. This will also benefit the local economies that support such recreational activities.

Development: The Planning Team is concerned about the irreversible adverse effects on habitats and species of converting agricultural and timberlands into commercial and residential developments. In the Middle Snake subbasins the impacts of municipalities have important effects on species and habitats. The impacts of increased growth need to be managed by municipalities and counties in concert with other activities called for in this plan.

Final recommendations

Implementation in the Middle Snake subbasins needs to integrate the other major subbasins integral to the Snake in this area. Fish and wildlife are not always restricted to subbasin boundaries. Future work needs to integrate the results of multiple subbasin planning and implementation efforts to address these multiple subbasin issues.

The Planning Team is concerned because it is unclear how future comments will be addressed and the plan revised. Review comments and revisions need to be addressed through a process that includes Planning Team involvement and oversight. This will include funding for Planning Team involvement, facilitation and review and update of the plan. The timeline for this process has been too limited. Planning Team members had very little time to review assessment and plan products. Insufficient time existed for this to be a fully integrated planning process that allowed policy makers and public to integrate with the technical committees.

The Planning Team believes this process has provided positive interaction with stakeholders and has resulted in information to direct future implementation activities in the subbasin. This plan provides the rationale for increasing BPA funding to activities in the Middle Snake subbasins. This plan provides an adequate foundation for prioritization and implementation of activities in the subbasin while pointing towards the need to develop additional information and planning to refine future activities.

The Planning Team intends that this plan will provide a structure for implementation and future research and planning in the Middle Snake subbasins. This plan will streamline the process for project selection and implementation. The Planning Team also thinks that BPA funds should be more equitably distributed among subbasins in proportion to losses, which would result in more BPA funding for the Middle Snake subbasins. The Middle Snake is one of the subbasins that has been the most impacted but the least compensated for impacts of the hydropower system on anadromous aquatic species.

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9 Technical Appendices

Appendix A—Participation Summary

PLANNING TEAM RECRUITMENT AND PARTICIPATION

The Northwest Power & Conservation Council (NPCC) directed that subbasin planning include local elected officials, property owners and land managers from the private sector along with the federal, state and tribal fish and wildlife managers.

As part of the public involvement process, the Idaho Council on Industry and Environment actively recruited a wide variety of stakeholders and local elected officials to participate in the process as members of the Planning Team. In addition, the Technical Teams also welcomed participation by the private sector. Both Technical Team and Planning Team meetings were open to the public, as well.

ICIE used mail, fax and e-mail invitations to recruit Planning Team members.

- County commissioners for each county within the Upper and Lower Middle Snake subbasins received a letter asking that they participate as a member of the Planning Team and a packet of introductory material on the subbasin planning process with the date and location of the first meeting.

- Counties originally included: Adams, Washington, Owyhee, Elmore in Idaho, and Baker and Malheur in Oregon. Several months into the process, the boundaries were redrawn to include some portions of Camas, Blaine, Lincoln, Gooding and Twin Falls counties in Idaho and a portion of Elko County in Nevada.

- ICIE identified a number of groups, associations, landowners, and businesses who would be interested in subbasin planning and requested names of individuals who might serve on the Planning Team.

- Groups, associations and businesses included: Idaho Association of Soil Conservation Districts, Idaho Water Users Association, Idaho Cattle Association, Idaho Farm Bureau Federation, Idaho Power, Boise Cascade, individual land owners.

- ICIE also identified sportsmen groups and environmental groups with members in the Middle Snake subbasins and contacted them with the same request for participation.

- These included: Idaho Conservation League, Idaho Rivers United, the Nature Conservancy, Idaho Wildlife Federation, Concerned Sportsmen of Idaho, Ducks Unlimited, Idaho Chapter of the Sierra Club, the Wilderness Society, Foundation for North American Wild Sheep, Idaho Snowmobile Association, the Idaho Chapter of Safari Club.

- Federal and state agencies operating within these subbasins were contacted about participation as well.

- Agencies included: the Bureau of Reclamation, National Forests, Bureau of Land Management, U.S. Fish & Wildlife Service, Idaho Department of Fish & Game, Idaho Department of Environmental Quality, Idaho Department of Water Resources.

Many of the organizations contacted supplied names of potential members or agreed to participate on behalf of their members. Some groups simply ignored the invitation and the follow-up. Others responded with interest but stated that they did not have enough staff to participate in the project but were interested in being kept informed. ICIE developed an e-mail list that included all those who had been contacted as well as others who expressed interest in following the process.

PUBLIC MEETINGS

Three public meetings were held to introduce the subbasin plan and provide an opportunity for input from local people and resource managers. Pat Barclay of the Idaho Council for Industry and the Environment (ICIE) coordinated public meeting announcements and logistics for the Middle Snake subbasins.

The meetings were held in different locations in an attempt to allow access to the largest number of people possible. Overall, not many of the general public attended these meetings.

Locations for the Upper and Lower Middle Snake subbasin public meetings were Boise, Weiser, and Glenns Ferry, Idaho.

The meetings were announced through local media and 200 post cards mailed to individuals as well as announcements in various association newsletters. ICIE also notified all those on its subbasin planning lists and broader e-mail list of 600 names across the state.

Daily and weekly newspaper, radio and television stations were notified in Boise, Mountain Home, Twin Falls, Burley, Buhl, Gooding, Ketchum, Jerome, and Hailey. For the final meeting, flyers were sent to 350 individuals in an attempt to increase the attendance by explaining the subbasin planning process, which was not possible using postcards. In addition, Pat Barclay and Lisa Jim did a radio interview with a news organization, which was distributed to 12 radio stations in the region.

Public Meeting #1: The purpose of the first public meeting was to introduce subbasin planning to local people living, working, and using land in various ways within the subbasin. In addition, the meeting facilitator sought and documented comments and opinions on the subbasin plan. The comments were taken to the Planning Team and considered in management plan development.

On December 17, 2003, the first public meeting for the Upper and Lower Middle Snake subbasins was held in the Trophy Room at the Department of Fish & Game in Boise. Attendance at the meeting was poor since severa; of those who were interested had attending the Boise Payette Weiser meeting the evening before

Public Meeting #2: The purpose of the second public meeting was to present the draft subbasin assessment and solicit comment from local land and natural resource users. The comments were used in the draft subbasin assessment.

The second public meeting was held in Weiser, Idaho on March 17, 2004. Those in attendance included one person representing the City of Weiser, two Washington County commissioners and members of the Weiser River Watershed Advisory Group.

Public Meeting #3: The purpose of the third public meeting was to present the entire subbasin plan (assessment, inventory, and management plan) and obtain comments from local people and resource managers. The comments were documented and presented to the Planning Team for incorporation into the draft subbasin plan.

The third public meeting was held in Glenns Ferry, Idaho on April 21, 2004. This meeting was attended by two local businessmen who are working with Idaho Department of Fish & Game to help re-establish white sturgeon in this stretch of the Middle Snake, an Elmore County Commissioner and an Idaho State Representative representing this district.

Overall, attendance at the public meetings remained small, in part because this process was not controversial. There was not enough time to educate people in the rural communities about their stake in this process. The NPCC is very well known among the tribes, groups such as electric cooperatives, federal and state fish and wildlife agencies and some sportsmen groups; however, the general public seems to have little knowledge of the Council's programs—especially in the areas like the Upper and Lower Middle Snake subbasins which do not have anadromous fish.

Appendix B—Letters of Endorsement

To be solicited by ICIE and submitted post May 28, 2004 due to time constraints.

Appendix C—Statements of Loss

This appendix was submitted by Shoshone-Paiute Tribes of the Duck Valley Indian Reservation. These materials were written by Deward Walker for the SPT to document the impacts of the loss of anadromous species on the members of the Shoshone-Paiute Tribes.

An important goal of federal Indian policy has been to establish self-sufficient reservation communities. This has been interpreted by the Shoshone-Paiute as well as by various government agents to require development of various enterprises such as irrigated farming and cattle and horse ranching. Despite various projects and efforts by the federal government, there have been frequent failures in Duck Valley Indian Reservation history due to lack of investment and development of the reservations' water resources by the federal government. These failures have made the importance of various traditional food resources critical for survival in the domestic economy of many Shoshone-Paiute families who live in economic poverty. A principle impact on such families has been the blockading of anadromous fish passage to the Owyhee, Bruneau, as well as the Boise-Payette-Weiser and Middle and Upper Snake River drainages. These losses must be taken into account in any subbasin planning effort, especially in view of the previous failure to compensate or otherwise mitigate damages done to the Shoshone-Paiute by the loss of these important resources.

Research by Dr. Walker (2004) has established a baseline for determination of the extent of these losses. For example, Dr. Walker determined that before the blockading of the fish passage the Shoshone-Paiute of the Duck Valley Indian Reservation enjoyed three annual salmon runs of about ten days each. Dr. Walker determined from interviews of elders as well as from recorded interviews of tribal members born in the 19th century that these three annual salmon runs could be expected, in normal years, to last about ten days each. The research also demonstrates that the location of the Duck Valley Indian Reservation was chosen in part because of the abundant fisheries available in the region. For example, in an interview with Federal Agent Levi Gheen, the *Territorial Enterprise* (1-3-1878) quoted saying, "The country abounds in deer, grouse, prairie chickens and other wild game, while the creeks and river[s] literally swarm with excellent fish. All in all Duck Valley is a veritable Indian paradise." Again, it was at this time that Captain Sam first mentioned Duck Valley to Gheen as a "place about seventy or eighty miles northeast of [Elko] where [the Indians] say there is plenty of game and fish and a good farming country as near as they can judge with plenty of timber [and in the mountains] water and grass" (Gheen 1875).

Using information gained from tribal fishermen as well as from comparative catch records from other related tribes (Walker 1967, 1992, 1993b), Dr. Walker estimates catches to have been about 200 fish per day, averaging 15 pounds each (for each of ten separate weirs), yielding a potential average annual catch of 90,000 pounds, or about 6,000 fish. As further verification of these numbers estimates have been derived for other important fisheries (the Boise-Payette-Weiser Valley and the Hagerman-Shoshone Falls sites) which the Shoshone-Paiute shared with other tribes of southern Idaho. It is estimated that this large area contained at least 25 traditional weir sites, and based on tribal accounts each site could produce significant catches for about ten days, three times per year. For 25 weirs the catches are estimated to have been 200 fish per day, per weir, averaging 15 pounds each, yielding an average annual catch of 2,250,000 pounds or about 150,000 fish. Of course, some of these fisheries were destroyed early by mining and

agriculture as other were later destroyed by damming of the Columbia, Snake, and many of their tributaries. While these 19th century salmon catch estimates are large when compared to contemporary catches in the Columbia-Snake system, they are supported by the evidence discovered in Dr. Walkers research.

Beginning in the late 19th century, the destruction of these fisheries has been a significant blow for the Shoshone-Paiute. They have suffered not only economic and subsistence shortfalls because of it, but also have experienced declines in the quality of their diet which in various serious health problems such as diabetes that are becoming extremely common. The loss of this significant source of easily obtained protein and related nutrients cannot be disregarded in subbasin planning; neither can the fact that the Shoshone-Paiute have never been compensated for their losses.