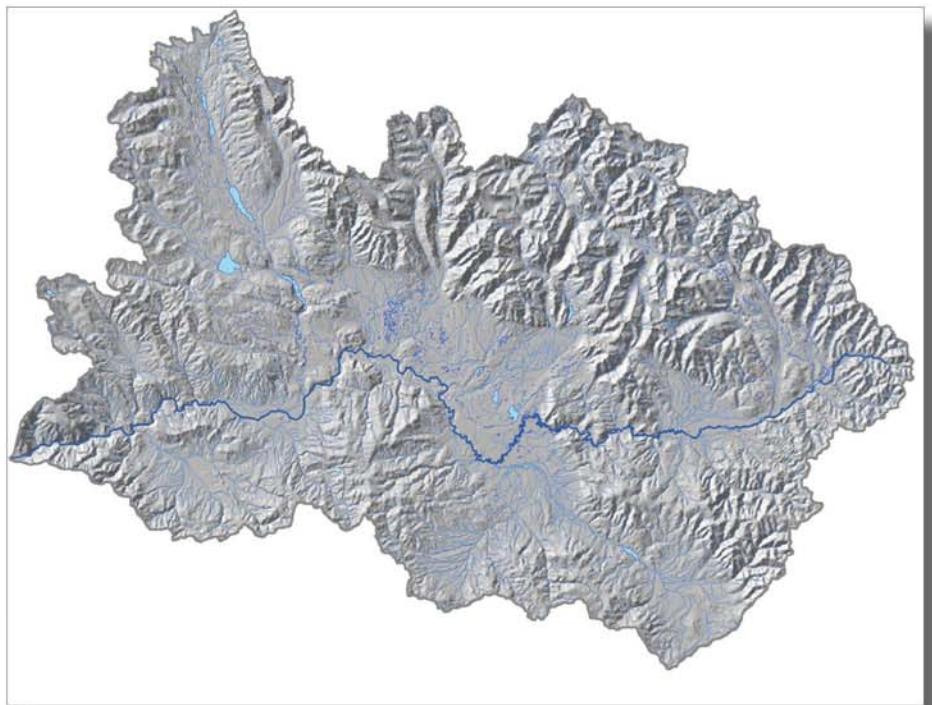


Blackfoot Subbasin Plan



**Prepared for the Northwest Power and Conservation Council
Prepared by the Blackfoot Challenge and Trout Unlimited**

August 2009

© 2009 Blackfoot Challenge and Trout Unlimited

Citation: Blackfoot Challenge and Trout Unlimited 2009. Blackfoot Subbasin Plan. *A report prepared for the Northwest Power and Conservation Council.* Portland, OR.

Subbasin Plan Coordination: Stan Bradshaw & Ali Duvall
Document Prepared By: Jenny Tollefson
GIS Work By: Heather Kreilick, SEM LLC

For information on this document, contact:

Blackfoot Challenge
405 Main Street
P.O. Box 103
Ovando, MT 59854
Phone: 406-793-3900
Email: info@blackfootchallenge.org

Trout Unlimited, Montana Water Project
432 N. Last Chance Gulch, Ste S
PO Box 412
Helena, MT 59624
Phone: 406-449-9922
Email: SBradshaw@tu.org

List of Participants

A remarkable group of people representing public agencies, private organizations, and the general public dedicate their energy and expertise to the ecological, social, and economic well-being of the Blackfoot Subbasin and its inhabitants. Many of those people served on the technical work groups that steered the development of the Blackfoot Subbasin Plan. Numerous others contributed to the editorial process, helping us to refine the plan into a form that will be most useful to conservation and restoration partners working in the subbasin. We thank them for their generous assistance throughout the subbasin planning process.

Blackfoot Subbasin Technical Work Group Participants:

Native Salmonids Work Group

Ryen Aasheim - Big Blackfoot Chapter of Trout Unlimited
Ali Duvall - Blackfoot Challenge
Shane Hendrickson - U.S. Forest Service, Lolo National Forest
Steve Kloetzel - The Nature Conservancy
Brian McDonald - Blackfoot Challenge
Greg Neudecker - U.S. Fish and Wildlife Service
Ron Pierce - Montana Fish, Wildlife and Parks
Karen Pratt - Seeley Lake Landowner
Bruce Rieman - Clearwater Resources Council

Forest Work Group

Matt Arno - Woodland Restoration, Inc.
Gary Burnett - Blackfoot Challenge
Richard Briskin - Ovando Landowner
Jim Costamagna - Department of Natural Resources & Conservation
Ali Duvall - Blackfoot Challenge
Hank Goetz - Blackfoot Challenge
George Hirschenberger - Community Member
Amber Kamps - U.S. Forest Service, Helena National Forest
Steve Kloetzel - The Nature Conservancy
Rich Lane - Big Blackfoot Chapter of Trout Unlimited
Tim Love - U.S. Forest Service, Lolo National Forest
Maria Mantas - The Nature Conservancy
Carolyn Mehl - Clearwater Resources Council
Steve Shelly - U.S. Forest Service, Lolo National Forest
Scott Tomson - U.S. Forest Service, Lolo National Forest

Vegetation Work Group

Elaine Caton - Ovando Landowner
Ali Duvall - Blackfoot Challenge
Kevin Ertl - U.S. Fish and Wildlife Service
Steve Kloetzel - The Nature Conservancy
Maria Mantas - The Nature Conservancy

Vegetation Work Group (cont.)

Mary Manning - U.S. Forest Service, Lolo National Forest
Mike McGrath - Department of Natural Resources & Conservation
Carolyn Mehl - Clearwater Resources Council
Greg Neudecker - U.S. Fish and Wildlife Service
Steve Shelly - U.S. Forest Service, Lolo National Forest
Brad Weltzien - North Powell Conservation District
Leigh Wiley - Potomac Landowner

Grizzly Bear Work Group

Jamie Jonkel - Montana Fish, Wildlife and Parks
Steve Kloetzel - The Nature Conservancy
Jay Kolbe - Montana Fish, Wildlife and Parks
Maria Mantas - The Nature Conservancy
Greg Neudecker - U.S. Fish and Wildlife Service
Seth Wilson - Blackfoot Challenge

Other

Colden Baxter - Idaho State University
Jeff Collins - Department of Natural Resources & Conservation
Lynn Ducharme - Confederated Salish and Kootenai Tribes
Jon Haber - U.S. Forest Service, Region One
Dick Hutto - University of Montana
Land Lindbergh - Greenough Landowner
Martin Miller - Montana Natural Heritage Program
Scott Mincemoyer - Montana Natural Heritage Program
Eileen Ryce - Montana Fish, Wildlife and Parks
Dave Stagliano - Montana Natural Heritage Program
Brian Sugden - Plum Creek Timber Company
Leonard Walch - U.S. Forest Service, Helena National Forest
Carly Walker - Missoula County Rural Initiatives

Table of Contents

1.0 Executive Summary	11
1.1 Overview	11
1.2 Subbasin Planning Process	11
1.3 Elements of the Blackfoot Subbasin Plan	12
1.3.1 Subbasin Assessment	12
1.3.2 Inventory of Existing Programs	13
1.3.3 Management Plan	14
2.0 Introduction to the Blackfoot Subbasin Plan	17
2.1 What is a Subbasin Plan?	17
2.2 Purpose and Intent of the Blackfoot Subbasin Plan	18
2.3 Overview of the Blackfoot Subbasin Planning Process	18
2.3.1 Subbasin Plan Partners	18
2.3.2 Integration with Related Planning Efforts in the Blackfoot Subbasin	19
2.3.3 Blackfoot Subbasin Planning Framework: Conservation Action Planning	20
2.3.4 Public Involvement	21
3.0 Subbasin Assessment	22
3.1 What is the Subbasin Assessment?	22
3.2 Blackfoot Subbasin Overview	22
3.2.1 Geography and Regional Context	22
3.2.2 Geology	24
3.2.3 Soils	25
3.2.4 Climate	28
3.2.4.1 Blackfoot Subbasin Climate	28
3.2.4.2 Macroclimate Trends	31
3.2.5 Water Resources	32
3.2.5.1 Water Uses and Modifications	34
3.2.5.1.1 Water Rights	34
3.2.5.1.2 Dams	35
3.2.5.2 Water Quality	36
3.2.6 Fish and Wildlife	39
3.2.6.1 Overview of Fish and Wildlife of the Blackfoot Subbasin	39
3.2.6.2 Special Status Fish and Wildlife Species	39
3.2.6.3 Non-Native Aquatic Animal Species	45

3.2.7	Vegetation	47
3.2.7.1	Overview of Vegetation Types in the Blackfoot Subbasin	47
3.2.7.2	Special Status Plant Species	49
3.2.7.3	Non-Native Plant Species	55
3.2.8	Ecological Relationships	60
3.2.9	Socioeconomic and Land Use Characteristics	61
3.2.9.1	Settlement History	61
3.2.9.2	Population	62
3.2.9.3	Land Ownership	63
3.2.9.4	Land Use and Economy	66
3.2.9.5	Conservation Legacy	67
3.3	Conservation Targets	68
3.3.1	Conservation Target Selection Process	68
3.3.2	Assessing Conservation Target Viability	70
3.3.3	Conservation Target Descriptions and Viability Assessments	73
3.3.3.1	Native Salmonids	73
3.3.3.2	Herbaceous Wetlands	81
3.3.3.3	Moist Site and Riparian Vegetation	87
3.3.3.4	Native Grassland/Sagebrush Communities	91
3.3.3.5	Low Elevation Ponderosa Pine/Western Larch Forest	96
3.3.3.6	Mid to High Elevation Coniferous Forest	100
3.3.3.7	Grizzly Bear	105
3.3.3.8	Rural Way of Life	110
3.3.4	Summary of Viability	115
3.4	Threat Assessment	116
3.4.1	Overview	116
3.4.2	Conservation Target Threat Assessments	117
3.4.3	Summary of Threats	125
3.4.4	Description of Threats	128
3.4.4.1	Unplanned Residential and Resort Development	128
3.4.4.2	Climate Change	130
3.4.4.3	Invasive and/or Alien Species	132
3.4.4.4	Lack of Fire	136
3.4.4.5	Incompatible Forestry Practices	137
3.4.4.6	Physical Road Issues	138
3.4.4.7	Conversion to Agriculture	140
3.4.4.8	Mining	141
3.4.4.9	Motorized Vehicle Use (On and/or Off Road)	142

3.4.4.10 Incompatible Grazing	143
3.4.4.11 Drainage and Diversion Systems	144
3.4.4.12 Channel Alteration and Encroachment	146
3.4.4.13 Epidemic Levels of Native Insects and Pathogens	146
3.4.4.14 Non-Motorized Recreational Use	147
3.4.4.15 Existing Crop Production	148
3.4.4.16 Filling of Wetlands	148
3.4.4.17 Lack of Human Tolerance	149
3.4.4.18 Human-Caused Mortality	149
3.4.4.19 Altered Wildlife Use Patterns	150
3.4.4.20 Presence of Bear Attractants	151
3.4.5 External Threats	153
4.0 Inventory of Existing Programs and Activities	154
4.1 Background	154
4.2 Current Management Activities	154
4.2.1 Existing Protection	154
4.2.1.1 Federal Protection	154
4.2.1.2 State Protection	155
4.2.1.3 Other Special Designations and Projects	156
4.2.2 Existing Management Plans	157
4.2.2.1 Federal Plans	157
4.2.2.2 Tribal Plans	159
4.2.2.3 State Plans	159
4.2.2.4 County Plans	163
4.2.2.5 Other Plans	164
4.2.3 Management and Funding Programs	165
4.2.3.1 Federal Programs	165
4.2.3.2 State Programs	171
4.2.3.3 County Programs	173
4.2.3.4 Institutions, Non-Profit Organizations, and Private Funding	174
4.3 Restoration and Conservation Projects	176
4.3.1 BPA-Funded Restoration Projects in the Blackfoot Subbasin	176
4.3.2 Non-BPA-Funded Restoration Projects in the Blackfoot Subbasin	176
4.3.3 Ongoing and Potential Restoration Projects on TMDL Streams	176
4.4 Gap Assessment	191

5.0 Management Plan	198
5.1 Background	198
5.2 Subbasin Vision	198
5.3 Conservation Objectives and Strategic Actions	199
5.4 Monitoring, Evaluation, and Research Plan	224
5.5 Endangered Species Act and Clean Water Act Requirements	226
 6.0 References	 229

Tables

Table 2.1	Elements of a Subbasin Plan	17
Table 2.2	Overview of Conservation Action Planning	21
Table 3.1	Major Soil Units in the Nevada Creek Planning Area	26
Table 3.2	Major Soil Units in the Middle Blackfoot Planning Area	26
Table 3.3	Major Soil Units in the Lower Blackfoot Planning Area	27
Table 3.4	Aquatic Habitat Types in the Blackfoot Subbasin	33
Table 3.5	Animal Species of Concern in the Blackfoot Subbasin	41
Table 3.6	Plant Species of Concern in the Blackfoot Subbasin	50
Table 3.7	State-listed Noxious Weed Species Established in the Blackfoot Subbasin	55
Table 3.8	Noxious and Invasive Weeds with High Potential to Become Problem Plants in the Blackfoot Subbasin	57
Table 3.9	Alert List for Recently Invading or Less Well-Known Weeds and Risk Ratings for Blackfoot Subbasin Habitats	58
Table 3.10	Conservation Targets and Associated Nested Targets in the Blackfoot Subbasin	70
Table 3.11	Native Salmonid Viability Assessment	78
Table 3.12	Herbaceous Wetlands Viability Assessment	85
Table 3.13	Moist Site and Riparian Vegetation Viability Assessment	90
Table 3.14	Native Grassland/Sagebrush Communities Viability Assessment	95
Table 3.15	Low Elevation Ponderosa Pine/Western Larch Forest Viability Assessment	99
Table 3.16	Mid to High Elevation Coniferous Forest Viability Assessment	104
Table 3.17	Grizzly Bear Viability Assessment	108
Table 3.18	Viability Summary for Blackfoot Subbasin Conservation Targets	115
Table 3.19	Native Salmonids Threat Assessment	118

Table 3.20	Herbaceous Wetlands Threat Assessment	119
Table 3.21	Moist Site and Riparian Vegetation Threat Assessment	120
Table 3.22	Native Grasslands/Sagebrush Communities Threat Assessment	121
Table 3.23	Low Elevation Ponderosa Pine/Western Larch Forest Threat Assessment	122
Table 3.24	Mid to High Elevation Coniferous Forest Threat Assessment	123
Table 3.25	Grizzly Bear Threat Assessment	124
Table 3.26	Summary of Threats to Blackfoot Subbasin Conservation Targets	126
Table 4.1	Completed BPA-Funded CBWTP Projects in the Blackfoot Subbasin	177
Table 4.2	Completed Restoration Projects in the Blackfoot Subbasin	178
Table 4.3	Potential Restoration Projects on TMDL Streams in the Blackfoot Subbasin	182
Table 5.1	Strategy Development Reference Table	200
Table 5.2	Relationship of Blackfoot Subbasin Conservation Objectives to the ESA and CWA	227

Figures

Figure 3.1	Location of the Blackfoot Subbasin within the Columbia River Basin	23
Figure 3.2	Soils/Groundwater Profile	27
Figure 3.3	Farmland Soils	28
Figure 3.4	Precipitation Ranges across Blackfoot Subbasin	29
Figure 3.5	Thirty-Year Average Temperature and Precipitation at Four Sites across the Blackfoot Subbasin	30
Figure 3.6	Projected Changes in Average PNW Temperature – 21 st century	32
Figure 3.7	Major Rivers, Lakes, and Streams	33
Figure 3.8	Blackfoot River Discharge: Year 2000 Compared to Historic Mean	34
Figure 3.9	Impaired Streams	37
Figure 3.10	TMDL Planning Units	38
Figure 3.11	Land Cover	48
Figure 3.12	Communities and Counties	62
Figure 3.13	2000 Population Density	63
Figure 3.14	Land Ownership and Conservation Easements	65

Figure 3.15	Public Lands and Wilderness Areas	66
Figure 3.16	Generalized Distribution of Six Salmonids within the Blackfoot Subbasin	77
Figure 3.17	Herbaceous Wetlands	81
Figure 3.18	Moist Site and Riparian Vegetation	87
Figure 3.19	Bald Eagle Nesting Sites	89
Figure 3.20	Native Grassland/Sagebrush Communities	91
Figure 3.21	Ungulate Winter Range	94
Figure 3.22	Low Elevation Ponderosa Pine/Western Larch Forest	96
Figure 3.23	Mid to High Elevation Conifer Forest	100
Figure 3.24	Canada Lynx Habitat	102
Figure 3.25	Suitable and Occupied Habitat for Grizzly Bears	105
Figure 3.26	2008 Montana Wolf Pack Locations	107
Figure 3.27	Roads (1:100,000)	139
Figure 3.28	Dewatered Streams	145
Figure 3.29	Blackfoot Watershed Restoration Projects and Monitoring Locations	225
Figure 3.30	Blackfoot Watershed Status and Trends Monitoring Network	226

Appendices

Appendix A	Dewatered Stream List for the Blackfoot Subbasin	250
Appendix B	List of Wildlife species	252
Appendix C	Explanation of Montana Natural Heritage Program Ranks	262
Appendix D	Vascular Plant Species associated with Glacial Wetlands in the Ovando Valley	264
Appendix E	Native Salmonid Viability: Definitions of Key Attributes	266
Appendix F	Invertebrate Species of Concern and Potential Species of Concern Associated with Herbaceous Wetlands West of the Continental Divide	270
Appendix G	Montana State Noxious Weed List (3/27/08)	271
Appendix H	Blackfoot River Valley Conservation Area Monitoring Plan (DRAFT 2007)	272
Appendix I	Acronyms and Abbreviations	279

Executive Summary

1.1 Overview

The Blackfoot Subbasin has a strong history of locally-led conservation and restoration. Beginning in the mid 1970s, private landowners developed the Blackfoot River Recreation Corridor Agreement and established two Walk-In Hunting areas near the confluence of the Clearwater and Blackfoot Rivers. In that same timeframe, the first conservation easement in Montana was acquired in the Blackfoot Valley. Thanks to the vision of these landowners, an important foundation was established for public and private partners to work together on restoring and protecting habitat, fish and wildlife populations in the Blackfoot River basin.

Building on this legacy, the Blackfoot Challenge, Trout Unlimited and The Nature Conservancy began the process of developing a subbasin plan for the Blackfoot Watershed in fall 2007. The purpose of the subbasin plan is to create a comprehensive strategy for conserving, restoring and enhancing the natural resources and rural lifestyle of the Blackfoot Subbasin. The Blackfoot Subbasin Plan is one of more than 50 such plans that have been written for tributaries and mainstem segments of the Columbia River under the leadership of the Northwest Power and Conservation Council (NPCC 2000).

The Blackfoot Subbasin Plan was developed collaboratively by a wide range of stakeholders including private landowners and representatives from public agencies and non-government organizations working in the subbasin. This community-based approach to natural resource and conservation planning ensures a local voice and vision for land management and restoration activities in the Blackfoot Subbasin. It also provides opportunities to work across public and private boundaries and to coordinate technical and funding resources.

1.2 Subbasin Planning Process

Based on community, agency and partner interest, four technical work groups were formed in early 2008 to capture in the subbasin plan the local knowledge, professional expertise and on-the-ground experience of people living and working in the Blackfoot Subbasin. Technical work groups held regular meetings between March 2008 and May 2009.

The Blackfoot Subbasin Plan was developed following The Nature Conservancy's Conservation Action Planning process. Conservation Action Planning provides a framework for designing, implementing and evaluating conservation projects at any scale, from small sites to large landscapes such as the Blackfoot Subbasin. Technical work groups used this adaptive framework in the Blackfoot Subbasin to 1) identify key natural and community resources, 2) assess viability of the resources, 3) identify factors that threaten the health and viability of the resources, 4) develop conservation and management strategies to abate critical threats and ensure long-term viability of the resources and 5) incorporate quantitative measures to track effectiveness of the conservation strategies over time.

The Blackfoot Subbasin Plan integrates existing information contained in a variety of planning and management documents, including two key documents that have been cornerstones for conservation and restoration planning and action in the Blackfoot Subbasin: the Blackfoot River Valley Conservation Area Draft Plan (TNC and BC 2007) and A Basin-Wide Restoration Action Plan for the Blackfoot Watershed (BC 2005a).

1.3 Elements of the Blackfoot Subbasin Plan

1.3.1 Subbasin Assessment

The primary purpose of the Subbasin Assessment is to synthesize and evaluate the biological, physical and socioeconomic characteristics of the Blackfoot Subbasin, forming a scientific and technical foundation for prioritization of restoration and protection strategies for habitat and fish and wildlife populations. The Assessment begins with a broad overview of subbasin geography, geology, soils, climate, water resources, fish and wildlife, vegetation and socioeconomic and land use characteristics, followed by an examination of the subbasin in a regional context. The remainder of the Assessment focuses on the following eight key conservation targets considered by the subbasin technical work groups to be representative of the natural and cultural resources of the Blackfoot Subbasin:

- Native salmonids
- Herbaceous wetlands
- Moist site and riparian vegetation
- Native grassland/sagebrush communities
- Low elevation ponderosa pine/western larch forest
- Mid to high elevation coniferous forest
- Grizzly bears
- Rural way of life

Each conservation target includes one or more “nested targets” that are expected to benefit from conservation of the main targets. Conserving and/or restoring this set of targets will help to ensure the viability of the species, natural systems and rural way of life that make the Blackfoot Subbasin unique and that contribute to the larger-scale significance of the Crown of the Continent Ecosystem.

After selecting the representative list of focal conservation targets for the Blackfoot Subbasin, technical work groups conducted viability and threat assessments for each target. Viability indicates the ability of a conservation target to persist for many generations. All conservation targets within the Blackfoot Subbasin were determined to have a current viability rating of *good*, *fair* or *poor*, suggesting that each conservation target will require some degree of human intervention in order to persist under current conditions. In the subbasin threat assessment, technical work groups identified the most critical factors that currently impact or have the potential to impact target viability over the next ten years. Critical threats to subbasin conservation targets are:

1. Unplanned Residential and Resort Development
2. Climate Change
3. Exotic/Invasive Species
4. Lack of Fire
5. Incompatible Forestry Practices
6. Physical Road Issues
7. Conversion to Agriculture
8. Mining
9. Motorized Vehicle Use
10. Incompatible Grazing
11. Drainage and Diversion Systems
12. Channel Alteration
13. Epidemic Levels of Native Insects and Pathogens
14. Non-motorized Recreational Use
15. Existing Crop Production
16. Filling of Wetlands
17. Lack of Human Tolerance
18. Human-Caused Mortality
19. Altered Wildlife Use Patterns
20. Presence of Bear Attractants

In addition to this list of threats, there are external factors that impact fish and wildlife in the Blackfoot Subbasin including climate change, fish migration barriers, habitat conditions, land use in adjacent subbasins and human population growth at a regional scale. Of the Blackfoot Subbasin conservation targets, bull trout, westslope cutthroat trout and grizzly bears are all wide-ranging species that are particularly vulnerable to threats originating outside of the subbasin.

The cumulative impact of threats results in an overall subbasin threat rank of *very high*, indicating that all of the conservation targets face some threat of degradation or extirpation across portions of the subbasin over the next 10 years. A *very high* rating suggests that, without conservation action, the viability of conservation targets within the subbasin will decline. These threats are viewed both as challenges to sustaining natural and cultural resources in the Blackfoot Subbasin and as opportunities for collaboration and conservation action. Conservation objectives and strategic actions outlined in the Subbasin Management Plan are designed to abate the critical threats in the subbasin, thereby ensuring the long-term viability of conservation targets.

1.3.2 Inventory of Existing Programs and Activities

The purpose of the Subbasin Inventory is to summarize current fish, wildlife and habitat protection and restoration activities in the subbasin. The Inventory includes a description of 1) protected areas in the subbasin, 2) management plans, including endangered species recovery plans, 3) management and funding programs and 4) on-the-ground conservation and restoration projects that target fish, wildlife and habitat in the subbasin. To complete the Inventory, we

surveyed a large number of agencies, organizations and individuals involved directly or indirectly in fish and wildlife activities in the subbasin.

This review of existing protections and current management strategies enabled the subbasin planning team to evaluate and identify gaps in conservation and restoration activities in the subbasin, particularly in relation to the threats identified in the Blackfoot Subbasin Assessment. This gap assessment illustrates that, while most of the factors threatening the viability of subbasin conservation targets and associated nested targets have received some level of attention in an effort to abate them, the extent of actions varies widely. While conservation accomplishments in the subbasin have been significant, much work remains to be done.

1.3.3 Management Plan

The Management Plan is the heart of the Blackfoot Subbasin Plan. It consists of five elements: 1) a vision for the subbasin, 2) conservation objectives, 3) strategic actions, 4) research, monitoring and evaluation and 5) consistency with the Endangered Species Act and Clean Water Act. The Blackfoot Subbasin Management Plan is a living document that is based on a 10-15 year planning horizon. It reflects current knowledge of conditions in the Blackfoot Subbasin and will be updated through an adaptive management process as knowledge of ecological processes and socioeconomic conditions in the subbasin grows. The Blackfoot Subbasin Management Plan, which was developed collaboratively by a wide range of stakeholders, will serve as a guide for partners working to sustain the outstanding ecological, economic and cultural values and resources in the Blackfoot Subbasin.

The Management Plan includes a vision for the Blackfoot Subbasin that describes the desired future condition and incorporates the values and priorities of a wide spectrum of stakeholders. The Blackfoot Subbasin Vision will guide prioritization and implementation of conservation objectives and strategic actions to ensure the continued viability of ecological and human communities in the subbasin.

The vision for the Blackfoot Subbasin is for a place characterized by dynamic natural processes that create and sustain diverse and resilient communities of native fish and wildlife and the aquatic and terrestrial habitats on which they depend, thereby assuring substantial ecological, economic and cultural benefits. The efforts to conserve and enhance those natural resources will be implemented through a cooperative partnership between public and private interests that will seek to sustain not only those natural resources, but the rural way of life of the Blackfoot River Valley for present and future generations.

The core of the Blackfoot Subbasin Management Plan consists of a comprehensive set of conservation objectives and strategic actions designed to abate the critical threats to subbasin conservation targets, resulting in healthy, viable conservation targets. The ten conservation objectives included in the Management Plan are:

Conservation Objective 1 – Maintain the large, intact working landscapes that sustain the natural resources and rural way of life in the Blackfoot Subbasin through support to local communities, counties, and land conservation partners.

Conservation Objective 2a – Maintain and/or restore viable populations of bull trout within the three major population groups in the Blackfoot Subbasin.

Conservation Objective 2b – Maintain and/or restore viable populations of migratory (fluvial and adfluvial) westslope cutthroat trout within each of the three major population groups within the Blackfoot Subbasin.

Conservation Objective 2c – Maintain and/or restore viable populations of resident westslope cutthroat trout within each of the three major population groups within the Blackfoot Subbasin.

Conservation Objective 3 – Control existing noxious and invasive plant species abundance and distribution, and prevent establishment of all new noxious and invasive species in the Blackfoot Subbasin. Emphasis should be placed on protecting the highest quality habitats, which should be identified and prioritized by 2012.

Conservation Objective 4 – Maintain or restore the viability of priority herbaceous wetlands based on historic conditions across the Blackfoot Subbasin.

Conservation Objective 5 – Maintain or restore the viability of priority moist site and riparian vegetation based on historic conditions across the Blackfoot Subbasin.

Conservation Objective 6 – Maintain or restore the viability of priority native grassland and sagebrush communities based on historic conditions across the Blackfoot Subbasin.

Conservation Objective 7 – Maintain or restore the viability of low severity fire regime ponderosa pine and western larch forest communities based on historic stand conditions across the Blackfoot Subbasin.

Conservation Objective 8 – Maintain or restore the viability of mid to high elevation coniferous forest communities based on historic stand conditions across the Blackfoot Subbasin.

Conservation Objective 9a – Maintain functional connectivity for grizzly bears across biologically suitable habitats in the Blackfoot Subbasin.

Conservation Objective 9b – Reduce human-caused grizzly bear mortality in the Blackfoot Subbasin.

Conservation Objective 9c – Improve human acceptance of grizzly bears and wolves by building a community-supported conservation and management process that reflects the interests and values of residents and landowners throughout the Blackfoot Subbasin.

Conservation Objective 10 – Increase public awareness and education about conserving and enhancing the natural resources and rural way of life in the Blackfoot Subbasin.

The Management Plan concludes with a discussion of the Blackfoot Subbasin Monitoring and Evaluation Plan. This plan will be based on the draft monitoring plan contained in the Blackfoot River Valley Conservation Area Plan (TNC and BC 2007) and will incorporate the results of the Blackfoot Subbasin viability assessments that describe the current and desired viability ratings for a variety of indicators for each conservation target. The plan will also incorporate a conceptual plan for restoration effectiveness monitoring in the Blackfoot Watershed, contained in A Basin-Wide Restoration Action Plan for the Blackfoot Watershed (BC 2005).

Completion of the Blackfoot Subbasin Monitoring and Evaluation Plan will: 1) provide a framework for measuring conservation target viability over time, 2) ensure that strategic actions are abating the critical threats to conservation targets and 3) verify that the stresses and threats identified in the Subbasin Assessment are, in fact, the factors that are limiting the viability of each conservation target. Through this process, existing strategies will be modified and new strategies will be developed. The process will also generate a cooperative research agenda to address management uncertainties and fill information gaps related to subbasin objectives and strategies.

2.0 Introduction

2.1 What is a Subbasin Plan?

The Northwest Power and Conservation Council was created in 1980 by Congress to give the states of Idaho, Montana, Oregon, and Washington a voice in how the region plans for its energy needs, while at the same time mitigating the effects of the hydropower system on fish and wildlife in the Columbia River Basin. The Council's Columbia River Basin Fish and Wildlife Program organizes the Columbia River Basin into 11 ecological provinces. Within these provinces there are groups of adjacent subbasins with similar climate and geology; in all there are 62 subbasins. The subbasin planning process has resulted in separate subbasin plans for more than 50 tributaries and mainstem segments of the Columbia River (NPCC 2000).

Subbasin plans identify and prioritize restoration and protection strategies for habitat and fish and wildlife populations in the U.S. portion of the Columbia River Basin. Each year the Council reviews proposals for on-the-ground projects and research. Proposals meeting the highest standards are then recommended to the Bonneville Power Administration (BPA) for funding. Local subbasin plans are intended to guide the review, selection, and funding of projects that will protect, mitigate, and enhance fish and wildlife affected by the development and operation of the Columbia River hydropower system (NPCC 2000).

Subbasin plans are developed locally and in collaboration with public agencies, local planning groups, conservation groups, landowners, and other stakeholders (NPCC 2001). The subbasin planning process emphasizes broad participation from a wide range of constituents who contribute and review technical information and reach consensus on the elements of subbasin plans. In this way, subbasin plans adopted by the Council reflect a wide range of support from interested parties (NPCC 2000, 2001). The basic elements of a subbasin plan are outlined below.

Table 2.1 Elements of a Subbasin Plan (NPCC 2001).

Section	Description
Introduction	An introduction to the subbasin plan.
Subbasin Assessment	A technical analysis, including a detailed description of subbasin characteristics and conditions, to determine the biological potential of the subbasin and the opportunities for conservation and restoration.
Inventory of Existing Activities	A summary of existing conservation and restoration projects and programs in the subbasin.
Management Plan	The overall vision for the subbasin, conservation objectives and strategies, and a monitoring and evaluation plan for 10-15 years.
Technical Appendix	Data, references, maps, and other supporting documentation.

2.2 Purpose of the Blackfoot Subbasin Plan

The Blackfoot Subbasin has a strong history of locally-led conservation and restoration. Beginning in the mid-1970s, private landowners developed the Blackfoot River Recreation Corridor Agreement and established two Walk-In Hunting areas near the confluence of the Clearwater and Blackfoot Rivers. In that same timeframe, the first conservation easement in Montana was acquired in the Blackfoot Subbasin. Thanks to the vision of these landowners, an important foundation was established for public and private partners to work together on restoring and protecting habitat, fish and wildlife populations in the Blackfoot Subbasin.

Building on this legacy, the Blackfoot Challenge and Trout Unlimited began the process of developing a subbasin plan for the Blackfoot Subbasin in fall 2007. During development of the Blackfoot Subbasin Plan, a broad base of stakeholders assessed the viability of natural resources and the rural way of life in the Blackfoot Subbasin and designed proactive strategies for abating critical threats to these resources. The purpose of the Blackfoot Subbasin Plan is to describe these resources, document the viability and threat assessment processes, and outline the conservation objectives and strategic actions that will restore and protect natural and cultural resources in the subbasin. The plan is intended to support and strengthen conservation and restoration partnerships in the subbasin. The plan is an iterative document that will be adapted over time to incorporate new knowledge and changes in the biological, social and economic characteristics of the subbasin.

2.3 Overview of the Blackfoot Subbasin Planning Process

2.3.1 Subbasin Plan Partners

The Blackfoot Subbasin Plan was developed collaboratively by a wide range of stakeholders including private landowners and representatives from public agencies and non-government organizations working in the subbasin. This community-based approach to natural resource and conservation planning ensures a local voice and vision for land management and restoration activities in the Blackfoot Subbasin. It also provides opportunities to work across public and private boundaries and to coordinate technical and funding resources. The following organizations coordinated the planning process:

The Blackfoot Challenge (<http://www.blackfootchallenge.org>): The Blackfoot Challenge is a landowner-based group that coordinates management of the Blackfoot River, its tributaries and adjacent lands. The mission of the Blackfoot Challenge is to coordinate efforts that will enhance and conserve the natural resources and rural way of life in the Blackfoot River Valley for present and future generations. Its membership is composed of private landowners, federal and state land managers, local government officials, non-government organizations, corporate landowners and representatives of economic interests. It is organized locally and known nationally as a model for conserving the natural resources, rural character, and scenic beauty of the Blackfoot Watershed. The Blackfoot Challenge provided partial funding for the Blackfoot Subbasin Plan.

Trout Unlimited (<http://www.tu.org>): Funding for the Blackfoot Subbasin Plan was also provided by Trout Unlimited, a national organization working to conserve, protect, and

restore North America's coldwater fisheries and their watersheds. More than 150,000 volunteers organized into about 400 chapters from Maine to Montana to Alaska and a respected staff of lawyers, policy experts and scientists ensure that Trout Unlimited is at the forefront of fisheries restoration work at the local, state and national levels. The local chapter of Trout Unlimited, the Big Blackfoot Chapter, and the Blackfoot Challenge have a long history of partnering with private landowners, public agencies and nonprofit organizations to conserve, protect and restore tributaries of the Blackfoot River using a community-based approach to conservation.

The Nature Conservancy (<http://www.nature.org>): Staff from the Montana Chapter of The Nature Conservancy provided extensive technical assistance throughout the subbasin planning process. The Nature Conservancy's mission is to preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. The Nature Conservancy is a long-term member of and active participant in the Blackfoot Challenge.

Four technical work groups were formed to capture in the subbasin plan the local knowledge, professional expertise, and on-the-ground experience of people living and working in the Blackfoot Subbasin (see *List of Participants*, page 2). Technical work group members included local landowners and representatives from public agencies and non-government organizations. The Confederated Salish and Kootenai tribes were invited but declined to participate in the subbasin planning process. Technical work groups held regular meetings between March 2008 and May 2009 to assess the viability of key conservation targets in the Blackfoot Subbasin, identify critical threats to targets and develop conservation objectives and strategic actions to abate critical threats.

2.3.2 Integration with Related Planning Efforts in the Blackfoot Subbasin

The Blackfoot Subbasin Plan integrates two key documents that have been cornerstones for conservation and restoration planning and action in the Blackfoot Subbasin: the Blackfoot River Valley Conservation Area Draft Plan and A Basin-Wide Restoration Action Plan for the Blackfoot Watershed, both of which are described below. The Blackfoot Subbasin Plan also integrates existing information contained in a wide variety of other subbasin planning and management documents.

Blackfoot River Valley Conservation Area Draft Plan (TNC and BC 2007): In 2000, The Nature Conservancy published an assessment of the Blue Mountain-Middle Rockies Ecoregion that identified areas within the ecoregion important for the conservation of biodiversity. The Blackfoot Watershed was selected as a high priority site due to its biological diversity, habitat connectivity and feasibility of conservation action. A six-member planning team was convened to develop conservation strategies that would conserve and enhance the viability of significant ecological and social/economic components of the Blackfoot Watershed. The planning process resulted in a Blackfoot River Valley Conservation Area Draft Plan in January 2007. This Conservation Area Plan was developed with the intent of engaging a broader and more diverse set of stakeholders for future conservation action in the Blackfoot Watershed. Its methodology helped set the stage for designing the Blackfoot Subbasin Plan.

A Basin-Wide Restoration Action Plan for the Blackfoot Watershed (BC 2005a): This document defines strategies for prioritization, development, implementation, and monitoring of water quality, aquatic habitat, and fisheries restoration projects for impaired and dewatered streams in the Blackfoot Watershed. The Restoration Action Plan was developed collaboratively by restoration partners in the Blackfoot and serves to strengthen restoration partnerships and programs through pooling of resources, greater information sharing, and the creation of a restoration network. The Restoration Action Plan encompasses three established restoration programs currently operating in the Blackfoot Watershed: 1) native fish species management and recovery, led by Montana Fish, Wildlife and Parks (MFWP) and the Big Blackfoot Chapter of Trout Unlimited (BBCTU), 2) the Total Maximum Daily Load (TMDL) Program, led by the Montana Department of Environmental Quality (MDEQ) and the Blackfoot Challenge, and 3) water conservation and instream flow management, led by BBCTU and the Blackfoot Challenge. The Restoration Action Plan serves as a restoration guide for partners by identifying opportunities for cooperative restoration and monitoring efforts, promoting implementation of a variety of restoration strategies and monitoring to assess effectiveness and creating a tracking system for completed restoration projects and associated monitoring. To access the complete plan, please visit www.blackfootchallenge.org. Since completion of the Restoration Action Plan, updated data for streams in the Clearwater drainage have been made available in the MFWP report, *The Big Blackfoot River Fisheries and Restoration Investigations for 2006 and 2007* (Pierce et al. 2008).

2.3.3 Blackfoot Subbasin Planning Framework: Conservation Action Planning

The Blackfoot Subbasin Plan was developed following The Nature Conservancy's Conservation Action Planning process. Conservation Action Planning provides a framework for designing, implementing and evaluating conservation projects at any scale, from small sites to large landscapes such as the Blackfoot Subbasin (Low 2003). Technical work groups used this adaptive framework in the Blackfoot Subbasin to 1) identify key natural and community resources, 2) assess viability of the resources, 3) identify factors that threaten the health and viability of the resources, 4) develop conservation and management strategies to abate critical threats and ensure long-term viability of the resources and 5) incorporate quantitative measures to track effectiveness of the conservation strategies over time.

Conservation Action Planning is an iterative, adaptive process that is driven by data and expert opinion on the distribution and status of biodiversity, current and future threats to biodiversity and socioeconomic and political conditions within a project area. This information is used to develop strategies and actions of sufficient scope and scale to abate threats, maintain or restore biodiversity and strengthen capacity to ensure long-term results. The data used in Conservation Action Planning also provide a baseline for measuring the effectiveness of conservation strategies and adapting strategies over time (Low 2003, TNC 2006).

A brief overview of the Conservation Action Planning process is provided in the table below. Each step is discussed in greater detail in subsequent sections of the Blackfoot Subbasin Plan. More detailed information on Conservation Action Planning is available on the The Nature Conservancy's website at <http://conserveonline.org/workspaces/cbdgateway> and in *The Five-S*

Framework for Site Conservation: A Practitioner’s Handbook for Site Conservation Planning and Measuring Conservation Success (TNC 2003).

Table 2.2 Overview of Conservation Action Planning.

Step	Description
Define Conservation Targets	Select the specific species and natural systems that represent the overall biodiversity of the project area.
Assess Viability of Conservation Targets	Identify the key ecological attributes that maintain target viability, select indicators to measure each key ecological attribute, and determine the current and desired future status of each indicator.
Identify Stresses	Identify and rank the various factors that negatively impact each conservation target.
Identify Critical Threats (Sources of Stresses)	Identify the social, economic, political, and cultural factors contributing to each stress.
Develop Strategies	Develop specific and measurable conservation objectives and strategic actions to abate critical threats and enhance or restore target viability.
Establish Measures	Define specific, quantitative measures of target viability to assess progress in abating threats and improving overall biodiversity health of the project area.
Implement Strategies	Put the plan into action and monitor the outcomes.
Analyze, Learn, Adapt, & Share	Evaluate strategic actions, update and refine knowledge of conservation targets, and review the results available from monitoring data.

2.3.4 Public Involvement

Public involvement was instrumental in the Blackfoot Subbasin planning process. Members of the general public were invited to participate in technical work groups and were updated and solicited for feedback at various times throughout the two-year planning process. Public meetings were hosted in September 2007 (Lubrecht), November 2007 (Ovando), January 2008 (Lubrecht) and March 2009 (Ovando and Lubrecht). An update on the plan was given monthly to the Blackfoot Challenge Board of Directors and interested parties in the subbasin. Four semi-annual newsletters also gave over 700 members of the Blackfoot Challenge an update on the process. Between May and July 2009, portions of the plan were posted on the Blackfoot Challenge website for public comment. This public process is a requirement of the Northwest Power Act’s program amendment standards (NPCC 2000). Providing opportunities for public comment and participation is also integral to the Blackfoot Challenge’s mission and overall approach to conservation, restoration and natural resource management in the Blackfoot Subbasin. Implementation of the Blackfoot Subbasin Plan will continue to involve direct participation by local landowners and residents through committees, work groups, one-on-one discussions and website updates.

3.0 Subbasin Assessment

3.1 What is the Subbasin Assessment?

The primary purpose of the Subbasin Assessment is to synthesize and evaluate the biological, physical and socioeconomic characteristics of the Blackfoot Subbasin, forming a scientific and technical foundation for prioritization of restoration and protection strategies for habitat and fish and wildlife populations in the subbasin. The Assessment begins in Section 3.2 with a broad characterization of the subbasin environment and examination of the subbasin in a regional context. This overview provides the geographical, ecological, and cultural context for the remainder of the subbasin plan.

Section 3.3 and 3.4 focus on eight key conservation targets considered to be representative of the natural and cultural resources of the Blackfoot Subbasin. In these sections, we describe the conservation targets and provide an assessment of the viability, or ecological health, of each. We then focus on the stresses and threats (i.e., human impacts) that jeopardize the viability of conservation targets. This assessment of critical threats sets the stage for the development of conservation objectives and strategic actions presented in the Subbasin Management Plan (Section 5.0).

3.2 Blackfoot Subbasin Overview

3.2.1 Geography and Regional Context

The Blackfoot Subbasin encompasses 1.5 million acres (2,345 square miles) of biologically rich and diverse lands in portions of four northwest Montana counties: Lewis and Clark, Powell, Missoula and Granite. The Blackfoot Subbasin is bordered to the east by the Continental Divide, to the south by the Garnet Mountains, to the north by the Bob Marshall and Lincoln-Scapegoat Wilderness areas and to the west by the Rattlesnake Wilderness area. Elevations in the subbasin range from 9,202 feet on Scapegoat Peak to 3,280 feet near Bonner, Montana where the Blackfoot enters the Clark Fork River.

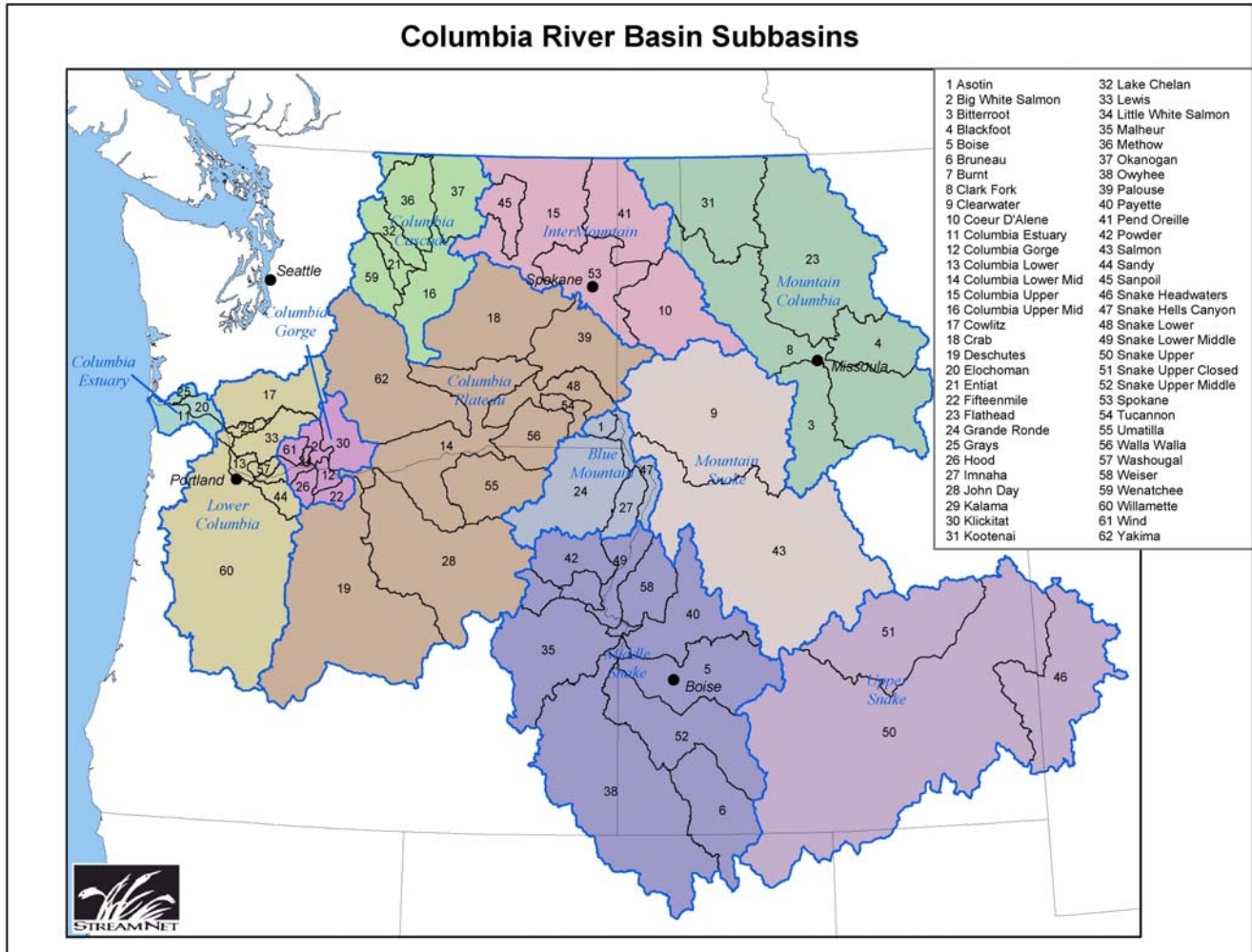
A tributary of the Columbia River, the free-flowing Blackfoot River flows 132 miles from its headwaters near Rogers Pass on the Continental Divide to its confluence with the Clark Fork River at Bonner. The subbasin is characterized by narrow headwater canyons opening to generally rolling terrain at the heart of the subbasin and ending in a narrow, incised, stream-cut canyon. The Blackfoot River is ranked as a Tier I Aquatic Conservation Focus Area in Montana's Comprehensive Fish and Wildlife Conservation Strategy. Tier I species, communities, and focus areas are considered by MFWP to be of the greatest conservation need in Montana (MFWP 2005).

The Blackfoot Subbasin is part of the Clark Fork-Pend Oreille River Basin and is identified by the U.S. Geological Survey (USGS) 8-digit HUC number 17010205.¹ The Blackfoot is one of

¹ HUC is the acronym for Hydrologic Unit Code (HUC). Every hydrologic unit is identified by a unique HUC consisting of two to eight digits based on the levels of classification in the hydrologic unit system. A hydrologic unit describes the area of land upstream from a specific point on the stream (generally the mouth or outlet) that

the easternmost subbasins within the Columbia River Basin (Figure 3.1). The Columbia River Basin Fish and Wildlife Program organizes the subbasins of the Columbia River Basin into 11 ecological provinces, or groups of adjoining subbasins with similar hydrology, climate, and geology. The Blackfoot Subbasin is part of the Mountain Columbia Ecological Province along with the Bitterroot, Clark Fork, Flathead, and Kootenai Subbasins (NPPC 2000). Although anadromous fisheries do not extend into the Blackfoot, the subbasin is significant as a headwaters drainage of the Columbia River system.

Figure 3.1 Location of the Blackfoot Subbasin within the Columbia River Basin.



The Blackfoot Subbasin is located at the southern edge of the Crown of the Continent Ecosystem (COCE), a ten million-acre area of the Northern Rocky Mountains that extends north into

contributes surface water runoff directly to this outlet point. Another term for this concept is drainage area. It is delineated by starting at a designated outlet point (usually the river mouth) and proceeding to follow the highest elevation of land that divides the direction of surface water flow (usually referred to as the ridge line). This boundary will follow the basin ridges until connected back at the outlet point. This federal interagency system conveys the hierarchical nature of the sizes and assemblages of typical natural hydrology.

Canada and includes Waterton-Glacier International Peace Park, Canada's Castle Wilderness, the Bob Marshall-Great Bear-Scapegoat Wilderness Complex, parts of the Flathead and Blackfoot Indian Reservations, Bureau of Land Management (BLM) lands and significant acreage of state and private lands. The COCE is one of the most intact ecosystems in North America. The Blackfoot Subbasin provides critical connections between the COCE and the Selway/Bitterroot Ecosystem to the south.

3.2.2 Geology

The Blackfoot Subbasin has a complex geologic history. The mountains near the Blackfoot River between Missoula and Rogers Pass consist mostly of Precambrian-age (1.5 billion-year-old) sedimentary rocks, including shale, siltstone, sandstone, and carbonate. These rocks, known collectively as the Belt Formation, formed as a result of almost 500 million years of deposition of sediments into a large inland sea referred to as the Belt Basin. These sedimentary deposits are remarkably consistent over large distances and have been measured locally to be over 40,000 feet thick. During the formation of the Rocky Mountains from 75 to 60 million years ago, Precambrian Belt rocks in the vicinity of the Blackfoot Subbasin were uplifted, folded, and thrust eastward over younger Paleozoic and Mesozoic Era (~543-65 million-year-old) sedimentary rocks. Between Lincoln and Rogers Pass, the Blackfoot is a narrow valley cut through this overthrust belt (Alt and Hyndman 1986).

Granitic intrusions were emplaced within the Belt rocks both before and after thrusting and resulted in the formation of mineral deposits (Alt and Hyndman 1986). Large portions of the subbasin were subsequently covered with volcanic deposits during the middle Tertiary Period (~40 million years ago). Remnants of these volcanic rocks are found primarily in the southern portion of the subbasin (Mudge et al. 1982, Lewis 1998). The Potomac Valley and the broad valley around Clearwater Junction are structural basins filled with deep sediment that deposited during the Tertiary Period, when the region had a dry climate. The two valleys were once one continuous basin until a fault raised Greenough Ridge to separate them (Alt and Hyndman 1986).

Glaciation strongly influenced the current subbasin landscape as evidenced by numerous moraines and associated hummocky topography, glacial pothole lakes and broad expanses of flat glacial outwash (Whipple et al. 1987, Cox et al. 1998). The Blackfoot Subbasin was subjected to two major periods of glaciation, the Bull Lake glaciation (~70,000 years ago) and the Pinedale glaciation (~15,000 years ago). During these periods, large continuous ice sheets extended from the mountains southward into the Blackfoot and Clearwater River valleys (Witkind and Weber 1982). During the latter part of the Pleistocene Era, the Blackfoot Valley was further shaped by the repeated filling and catastrophic draining of Glacial Lake Missoula, a massive lake formed by a series of ice dams that impounded the Clark Fork River downstream of Missoula. In the Blackfoot Valley, Glacial Lake Missoula extended upstream as far as Clearwater Junction (Alt and Hyndman 1986).

When the glaciers receded, large deposits of glacial till, glacial outwash, and glacial lakebed sediments were left behind. These deposits cover much of the Blackfoot Valley floor, shaping the topography of the valley and the geomorphology of the Blackfoot River and the lower reaches of most tributaries. Glacial features evident on the landscape today include moraines, outwash plains, kame terraces and glacial potholes. The landscape between Clearwater Junction

and Lincoln, for example, is characterized by alternating areas of glacial moraines and their associated outwash plains. In this area, ice pouring down from the mountains to the north spread out to form large ponds of nearly stagnant ice several miles across known as piedmont glaciers. Muddy meltwater draining from these piedmont glaciers spread sand and gravel across the ice-free parts of the valley floor to create large outwash plains. The town of Ovando sits on one of these smooth outwash plains (Alt and Hyndman 1986). Due to the highly permeable nature of coarse outwash sediments, streams generally lose water through infiltration and often go dry where they cross outwash plains. Such is the case with the Blackfoot River between the Landers Fork and the town of Lincoln. Since glaciation, the geomorphology of the lower elevation portions of the subbasin has been modified by alluvium originating from reworked glacial deposits. Alluvial deposits cover most drainage bottoms and reach depths of several hundred feet in portions of the Blackfoot Subbasin (MDEQ 2008a, 2008b, Tetra-tech 2004).

3.2.3 Soils

Soils in the Blackfoot Subbasin are extremely variable due to the diverse influences of climate, topography, and geology (Figures 3.2 and 3.3). In general, the soils are strongly related to the geologic substrates and landforms of the subbasin. The State Soil Geographic (STATSGO) database provides a consistent method of assessing generalized soil characteristics on a subbasin scale. Although generalized, the STATSGO database also provides information on the physical and chemical properties of soils. The majority of soil types present in the subbasin have similar surface textures, are moderately well to well drained, and have a depth to water table between three and six feet. These dominant soils are neither prime farmland nor hydric soils supporting wetlands. For the following soils characterization, the subbasin is divided into four sections: 1) Blackfoot Headwaters planning area, 2) Nevada Creek planning area, 3) Middle Blackfoot planning area and 4) Lower Blackfoot planning area. These sections correspond with the planning areas used for TMDL development in the subbasin (Section 3.2.5.2). The soils characterizations are taken from the four Blackfoot TMDL plans (MDEQ 2003, 2004, 2008a, 2008b).

Blackfoot Headwaters planning area

In the Blackfoot Headwaters Planning Area, Quaternary alluvium and glacial deposits cover much of the Blackfoot River and Landers Fork valley bottoms as well as much of the Beaver Creek, Stonewall Creek and Willow Creek sub-watersheds. The headwaters of the Landers Fork deeply down cut through this Quaternary glacial till, providing a significant natural source of fine sediment and coarse cobbles to the Landers Fork and ultimately, the Blackfoot River.

Nevada Creek planning area

Eight soil units are present in the Nevada Creek planning area. Of these, four collectively comprise 83% of the planning area (Table 3.1). Textures of the soil units closely reflect the geology of the area. Gravelly soils are typically found in areas covered by a veneer of glacial deposits. The textural term “channery” refers to flat rock fragments, most likely derived from sedimentary Precambrian Belt rocks. The majority of soil types present have similar surface textures, are moderately well to well drained, and have a depth to water table between three and six feet.

Table 3.1 Major Soil Units in the Nevada Creek Planning Area, Blackfoot Subbasin.

Soil Map Unit Name	Percent Area	Surface Texture
STEMPLE-MOCMONT-HELMVILLE (MT546)	30.4%	Very channery loam
BIGNELL-YOURAME-ROY (MT045)	22.0%	Gravelly clay loam
FERGUS-ROY-TETONVIEW (MT199)	18.7%	Loam
REPP-WHITORE-WINKLER (MT473)	12.1%	Very gravelly loam
WOROCK-GARLET-DANAHER (MT662)	9.2%	Gravelly loam
WINKLER-PERMA-BIGNELL (MT650)	3.0%	Gravelly loam
WARSING-VASTINE FAMILY-FLUVAQUENTIC HAPLAQUOLLS (MT665)	2.0%	Loam
LOBERG-DANAHER-WOROCK (MT342)	1.6%	Clay loam
OVANDO-ELKNER-SHADOW (MT436)	0.9%	Gravelly silty loam

Middle Blackfoot planning area

Thirty soil units are present in the Middle Blackfoot planning area, of which seven cover 75% of the planning area (Table 3.2). The majority of these seven soil units are gravelly loams and silty loams that correlate with the location of Quaternary alluvium and glacial deposits. The exception is the Worock-Garlet-Danaher Association, which appears to correlate with the location of coarser grained sedimentary Precambrian Belt rocks. The 23 minor soil units as a group correlate well with exposures of intrusive and extrusive igneous rocks as well as various Belt lithologies. The majority of soil types present have similar surface textures, are moderately well to well drained, and have a depth to water table between three and six feet.

Table 3.2 Major Soil Units in the Middle Blackfoot Planning Area, Blackfoot Subbasin.

Soil Map Unit Name	Percent Area	Surface Texture
WALDBILLIG-HOLLOWAY-BATA (MT610)	19.6%	Gravelly silty loam
WOROCK-GARLET-DANAHER (MT662)	11.6%	Gravelly loam
PERMA-QUIGLEY-WILDGEN (MT445)	9.0%	Gravelly loam
ROCK OUTCROP-COEROCK-PHILLCHER (MT483)	8.5%	Unweathered bedrock
STEMPLE-GARLET-COWOOD (MT139)	8.3%	Very channery loam
WILDGEN-WINFALL-RUMBLECREEK (MT634)	7.5%	Gravelly loam
TOTELAKE-WINFALL-YOURAME (MT579)	6.8%	Gravelly loam

Lower Blackfoot planning area

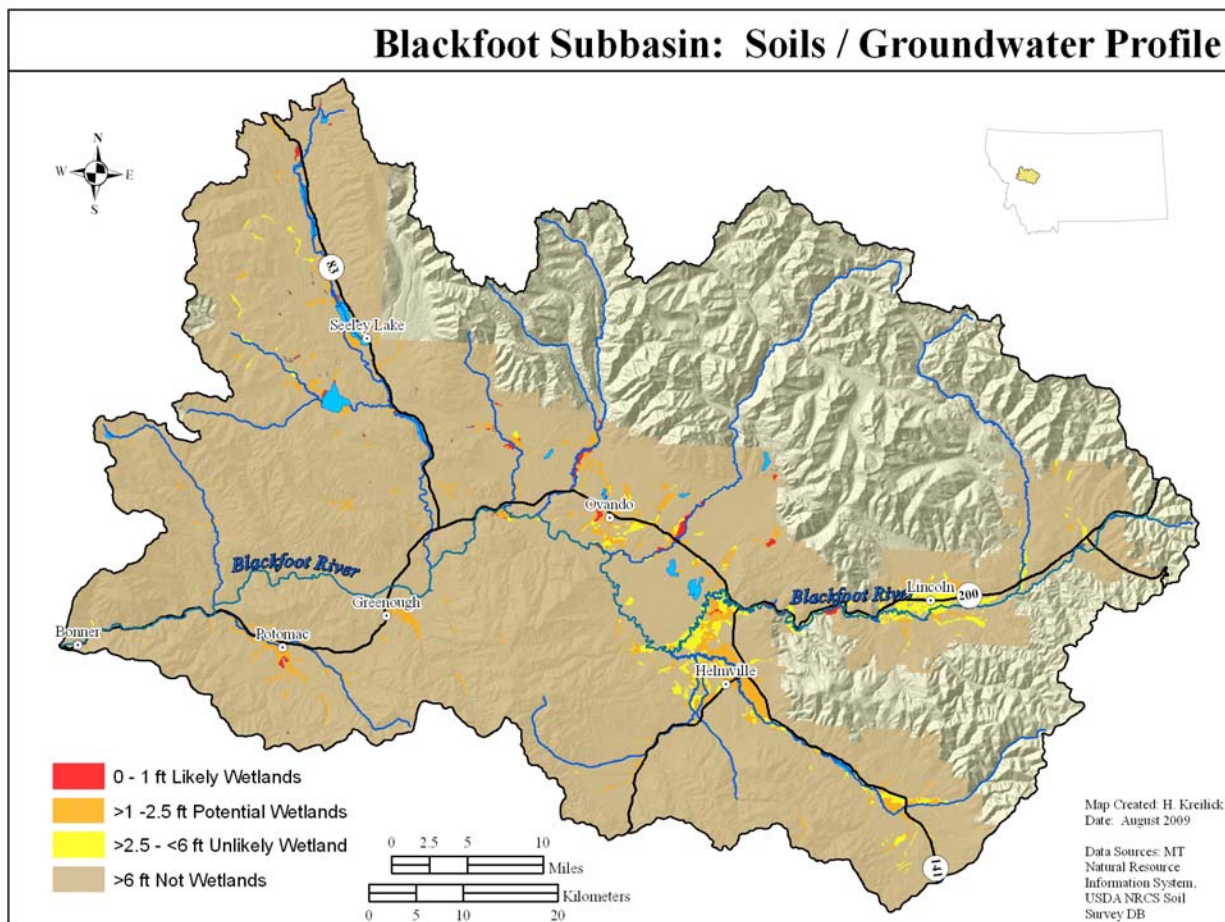
Fifteen soil units are present in the Lower Blackfoot planning area, five of which cover 76% of the planning area (Table 3.3). The most abundant five soil units are gravelly loams and correspond with the location of Quaternary alluvium and glacial deposits. The 10 minor soil units as a group correlate well with exposures of intrusive and extrusive igneous rocks as well as various Belt lithologies.

Table 3.3 Major Soil Units in the Lower Blackfoot Planning Area, Blackfoot Subbasin.

Soil Map Unit Name	Percent Area	Surface Texture
WINKLER-EVARO-ROCK OUTCROP (MT647)	25.5%	Gravelly sandy loam
WINKLER-EVARO-TEVIS (MT646)	20.8%	Gravelly loam
WALDBILLIG-HOLLOWAY-BATA (MT610)	13.5%	Gravelly silty loam
BIGNELL-WINKLER-CROW (MT046)	10.4%	Gravelly loam
HOLLOWAY-WINKLER-ROCK OUTCROP (MT283)	5.8%	Gravelly silty loam

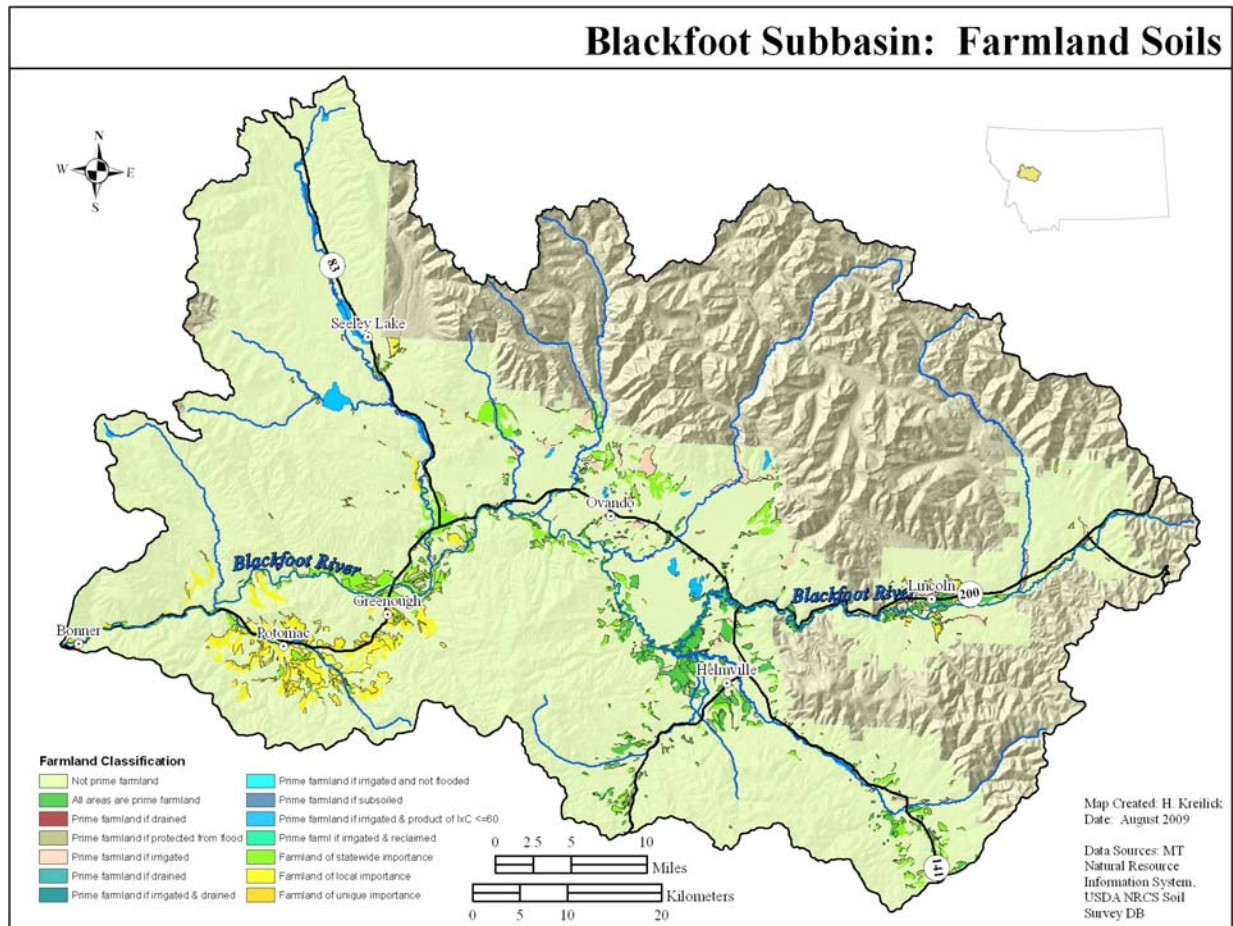
More detailed soils data are available in the Missoula, Powell, and Granite County Soil Survey Geographic (SSURGO) databases.² The U.S. Forest Service (USFS) Region 1 Land Type Association database, which covers national forest areas, is a good surrogate for detailed soil data and can assist with identification of soils that are sensitive to natural and human-caused disturbances.

Figure 3.2 Soils/Groundwater Profile.



² Information on the STATSGO and SSURGO soil geographic databases is available from the Natural Resources Conservation Service (www.nrcs.usda.gov).

Figure 3.3 Farmland Soils.



3.2.4 Climate

3.2.4.1 Blackfoot Subbasin Climate

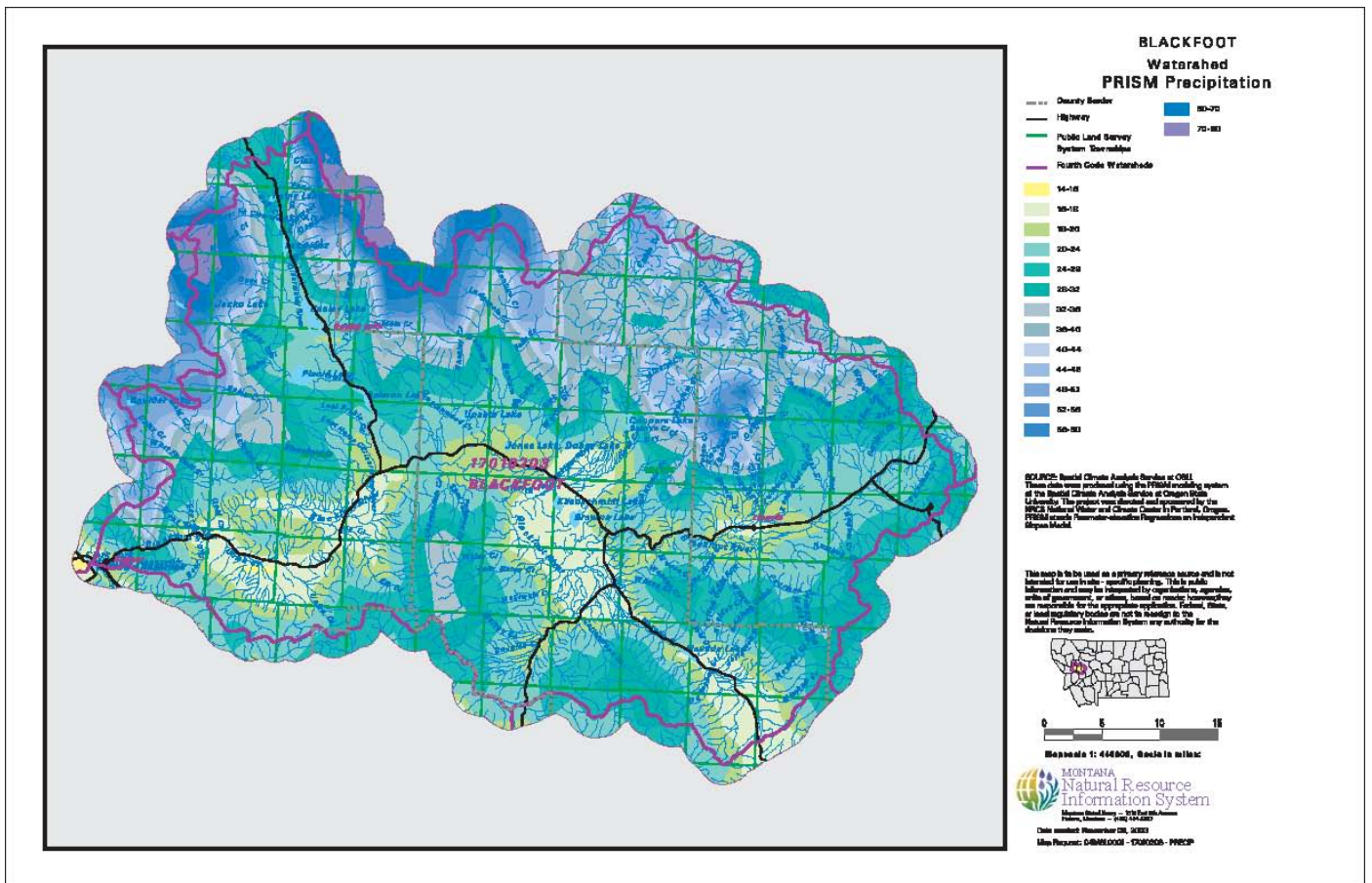
The Blackfoot Subbasin climate is dominated by Pacific maritime characteristics. Moderately moist and cool conditions prevail and cloudy weather is most frequent from late fall through early spring. Valley fog is common during the fall and winter months. The physiography of the nearby Continental Divide can generate extreme winter temperatures in the Blackfoot Subbasin that are more often associated with central Montana's continental climate. The coldest temperature (-70 °F) ever recorded in the lower 48 states occurred at Roger's Pass, approximately 40 miles east of Ovando (Caprio et al. (unknown date)). Occasionally, central Montana winter storm systems are powerful enough to breach the Continental Divide, resulting in strong east winds and blizzard conditions in the subbasin.

Average annual minimum temperatures in the subbasin range from 24 °F (Ovando) to 27 °F (Seeley Lake) and average annual maximum temperatures range from 54 °F (Ovando) to 56 °F (Potomac). Average total annual precipitation ranges from 15 inches (Potomac) to 21 inches (Seeley Lake) and average total annual snowfall ranges from 54 inches (Potomac) to 120 inches

(Seeley Lake). June is the wettest month and snowfall is greatest in January. Higher levels of precipitation and snowfall occur at higher elevations in the subbasin.³ Figure 3.4 displays precipitation ranges across the subbasin. Figure 3.5 displays 30-year average temperature and precipitation recorded by the Western Regional Climate Center at four sites across the Blackfoot Subbasin.

Recent trends in the Blackfoot Subbasin climate have been consistent with anticipated effects of global and regional climate change, including general warming, increased variability in total precipitation and drier summers. For example, peak runoff as measured in streamflow on the Blackfoot River at Bonner since 2000 has been one to three weeks earlier than the mean date of runoff over 72 years of record, indicating warmer spring temperatures.⁴ Such climatic changes could have important implications for both aquatic and terrestrial systems in the Blackfoot Subbasin. More information on climate change is provided in Sections 3.2.4.2 and 3.4.4.2.

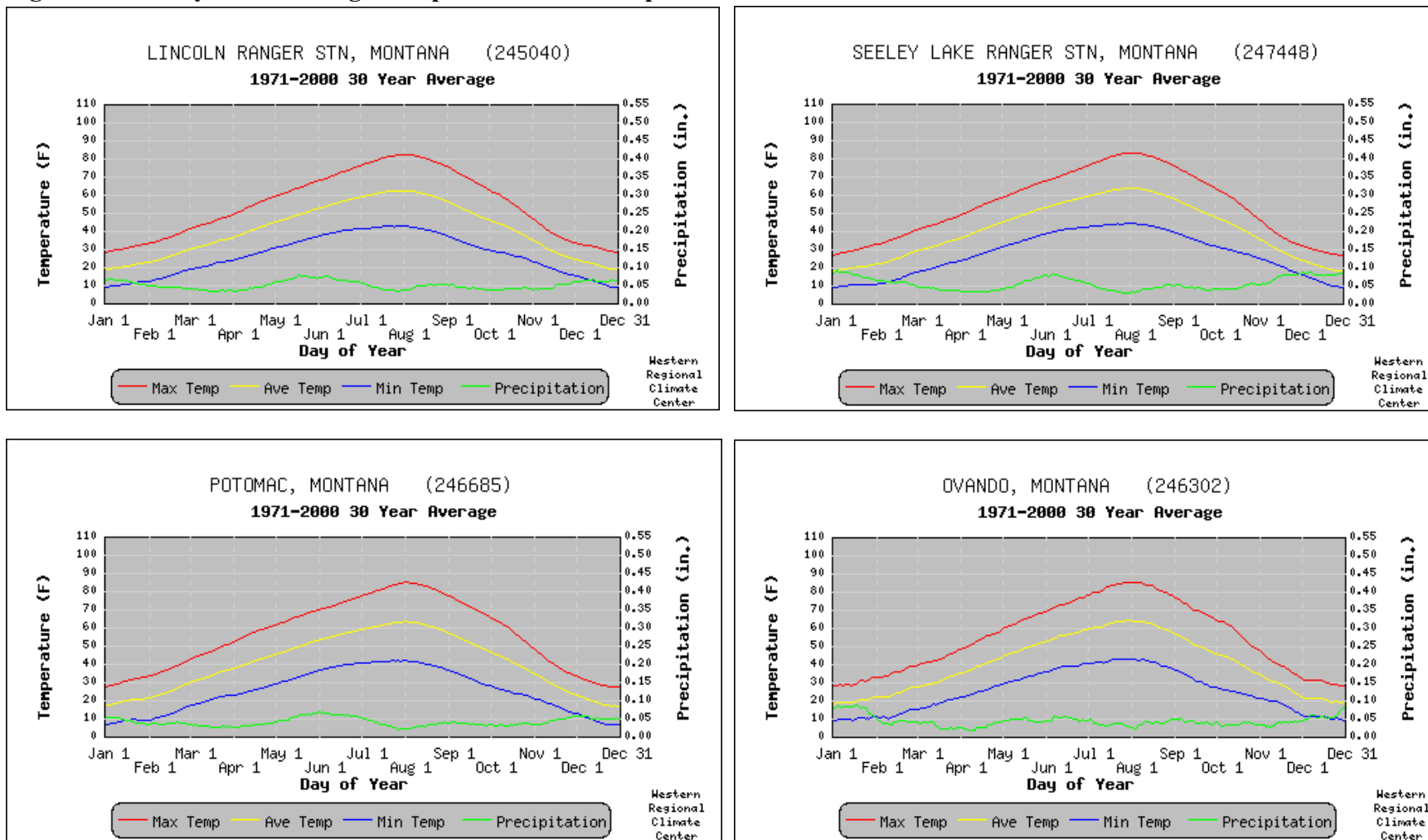
Figure 3.4 Precipitation Ranges across the Blackfoot Subbasin.



³ Climate data is from the Western Regional Climate Center website (<http://www.wrcc.dri.edu/>).

⁴ Data from the USGS National Water Information System website (<http://waterdata.usgs.gov>).

Figure 3.5. Thirty-Year Average Temperature and Precipitation at Four Sites across the Blackfoot Subbasin.



3.2.4.2 Macroclimate Trends

In this discussion, “macroclimate” is the climate occurring over a relatively large geographic area and over a relatively long period of time (i.e., 50 years), as opposed to the microclimate of the Blackfoot Subbasin. The years 1995-2006 rank among the 12 warmest years in the instrumental record of global surface temperature since 1850. The warming trend over the last 50 years is nearly twice that for the last 100 years. In the 20th century, the rate of warming in the northern hemisphere appears to be unprecedented in the past 2,000 years (ISAB 2007).

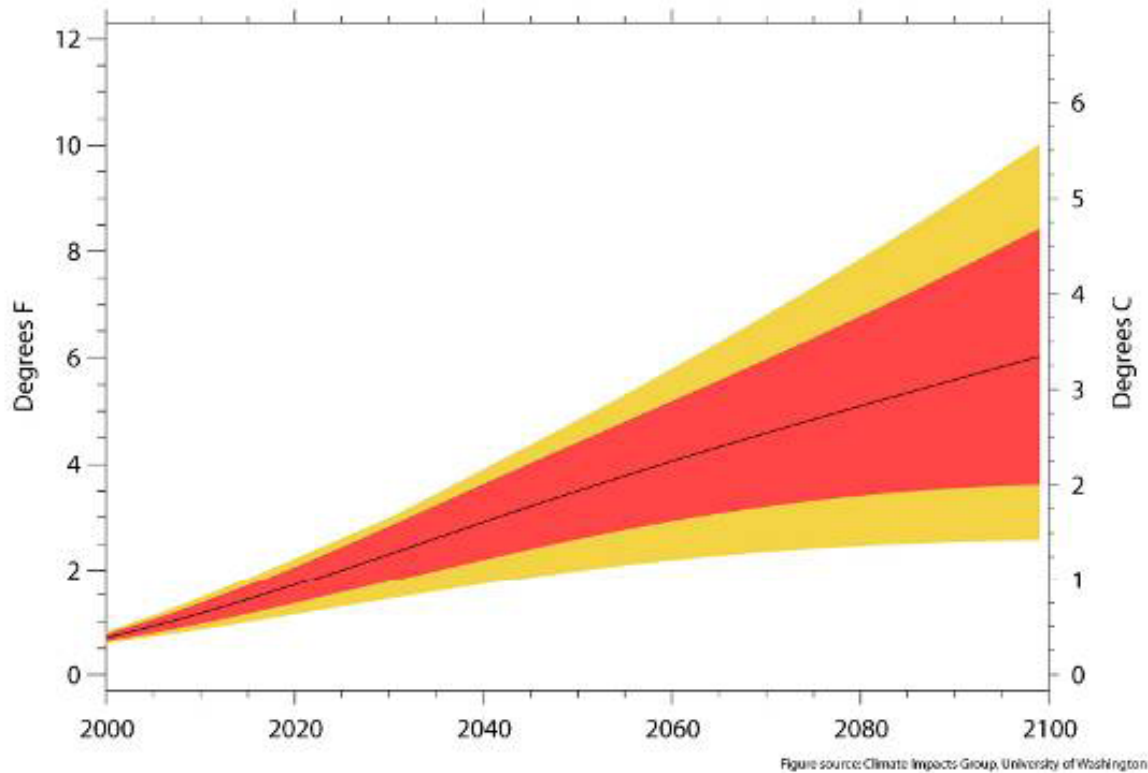
During the 20th century, the average annual temperature in the western United States rose by 1.7 °F, which is 70% more warming than the planet as a whole during the same time period (Kinsella 2008). Climate records show that the Pacific Northwest has warmed about 1.8 °F since 1900, or about 50% more than the global average warming over the same period. Regularly collected measurements indicate that springtime snow pack from the western Rockies to the Pacific coast and from the central Sierras in California to southern British Columbia declined substantially between 1950 and 1997 in part due to a reduction in precipitation and in part due to rising winter temperatures during this period (ISAB 2007).

Climate models predict continued hot and dry weather well into the future. Global climate models show that average annual temperatures could increase anywhere from 3 to 10 °F by 2100 if nothing is done to reduce carbon dioxide emissions, the primary cause of global warming. Regional average temperatures could be even higher, especially in higher latitudes where scientists predict the most dramatic climate changes will occur. Climate models specific to the northwest United States predict that warming will continue at a rate of 0.18-1.0 °F/decade, or in the range of 1.6-10.0 °F between 2010 and 2100 (Figure 3.6) (ISAB 2007). In the Columbia Basin this warming is likely to result in the following alterations (ISAB 2007):

- More precipitation will fall as rain rather than snow
- Snow pack will diminish and stream flow timing will be altered
- Peak river flows will increase
- Water temperatures will continue to rise

The potential impacts of climate change on aquatic and terrestrial ecosystems are widespread and include changes in hydrology, water temperature, plant community composition and distribution, susceptibility to invasive species invasion and wildfire frequency and severity. Further discussion of the impacts of climate change on Blackfoot Subbasin conservation targets is provided in Section 3.4.4.2.

Figure 3.6. Projected Changes in Average PNW Temperature – 21st Century.



3.2.5 Water Resources

The Blackfoot River is the key surface water feature in the Blackfoot Subbasin. The Blackfoot is a free-flowing river that flows southwest for 132 river miles from its headwaters at Rogers Pass to its confluence with the Clark Fork River at Bonner. This river system drains a 2,320-square mile watershed through a 3,700-mile stream network of which 1,900 miles are perennial streams capable of supporting fish (BC 2005a). There are several major tributaries to the Blackfoot River, including the Landers Fork, the North Fork of the Blackfoot River, Monture Creek and the Clearwater River in the northern part of the subbasin and Nevada Creek and Poorman Creek in the southern part of the subbasin (Figure 3.7). The subbasin is also home to numerous natural ponds and lakes including Kleinschmidt Lake, Browns Lake, Coopers Lake and the Clearwater chain of lakes (Lake Alva, Lake Inez, Placid Lake, Seeley Lake, and Salmon Lake) (Figure 3.7). Aquatic habitat types found in the Blackfoot Subbasin, according to Montana’s Comprehensive Fish and Wildlife Conservation Strategy (MFWP 2005), are listed in Table 3.4.

Figure 3.7 Major Rivers, Lakes and Streams.

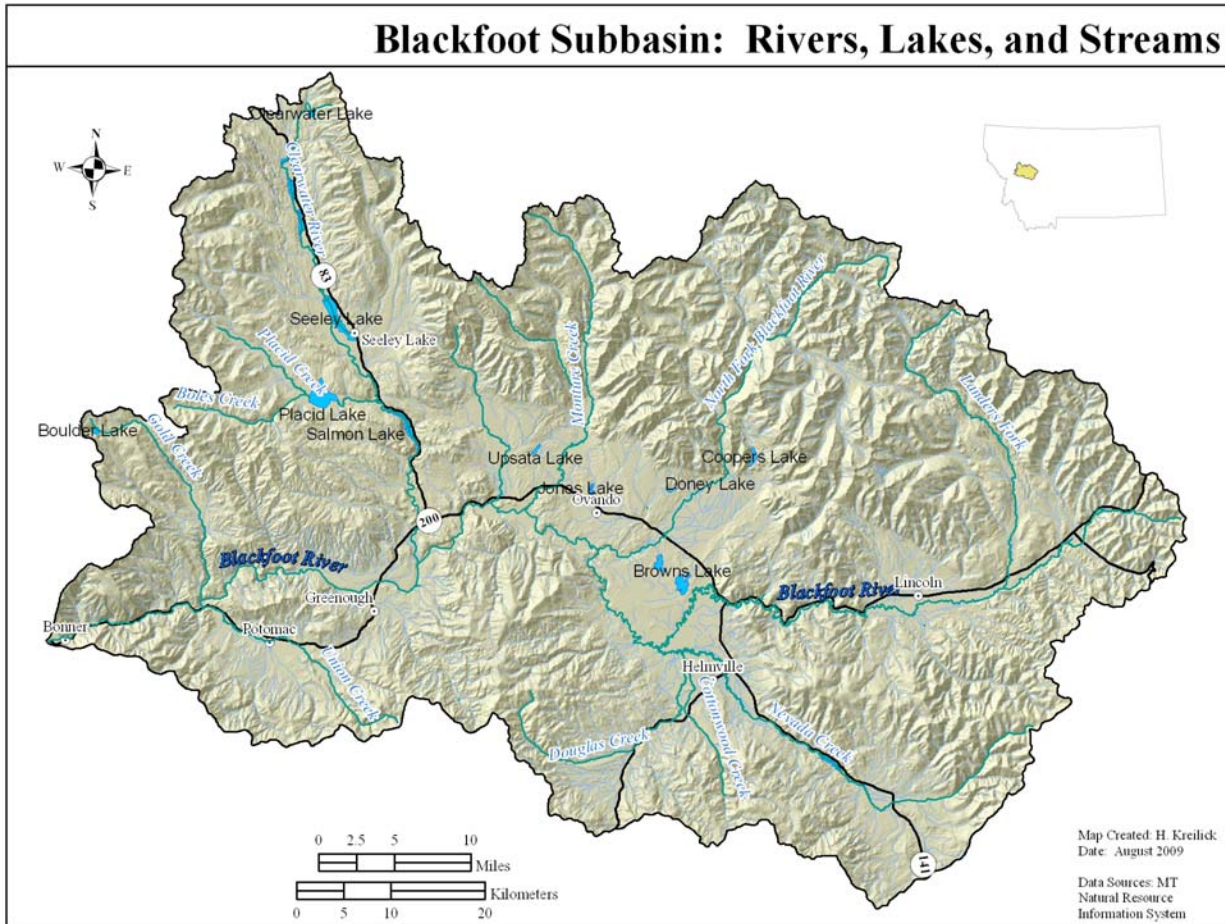


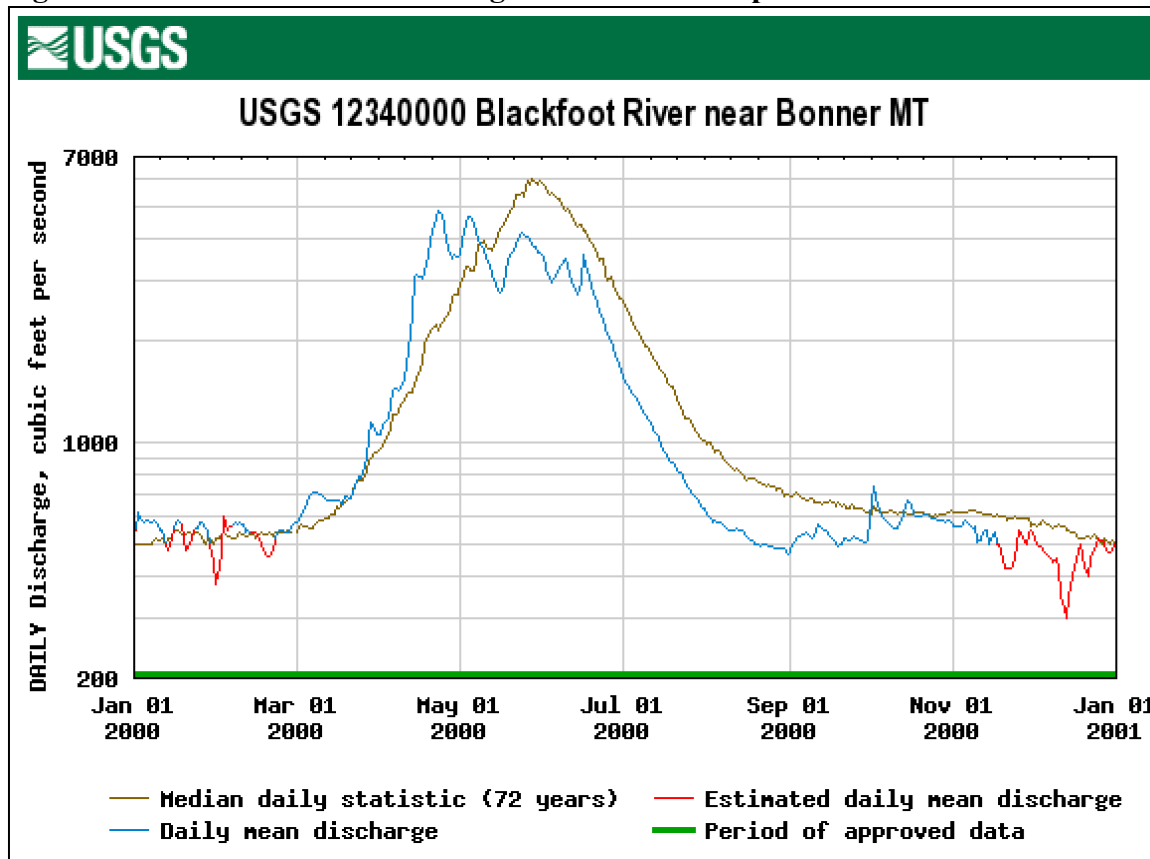
Table 3.4 Aquatic Habitat Types in the Blackfoot Subbasin.

Habitat Type	Acres/Miles
Intermountain Valley Rivers	127
Intermountain Valley Streams	316
Lowland Lakes	6,525
Lowland Reservoirs	390
Mountain Lakes	2,604
Mountain Reservoirs	5
Mountain Streams	3,207

Surface water hydrology in the Blackfoot River is driven by 1) winter snowpack accumulation, 2) spring snowmelt runoff and 3) late summer, fall and winter base flows. The historic (72-year) mean daily discharge in the Blackfoot River, measured at the Bonner USGS gage station, is 1,968 cubic feet per second (cfs); the mean peak flow is 6,070 cfs, and the mean low flow is 642 cfs. In 2000, a drought year, the mean daily discharge was 1,261 cfs, peak flow (April) was 4,860 cfs and low flow (September) was 466 cfs, all of which are

substantially below the historic means (Figure 3.8). This pattern has been replicated in most years since 2000. In addition, the annual hydrograph since 2000 has been characterized by peak flows occurring one to three weeks earlier and summer flows arriving earlier and dropping lower than the historic means.⁵

Figure 3.8. Blackfoot River Discharge: Year 2000 Compared to Historic Mean.



3.2.5.1 Water Uses and Modifications

3.2.5.1.1 Water Rights

There are 6,452 water rights in the Blackfoot Subbasin including 3,583 groundwater permits and 2,869 surface water permits. Over 50% of groundwater permits are for domestic uses. Groundwater is also used for stock water, irrigation, lawns and gardens. Although stock water represents the greatest number of surface water permits, the largest volume (65%) of water diverted and consumed is for irrigation. This volume of water covers almost 44,280 irrigated acres and, over the irrigation season, translates to a flow of about 730 cfs in diversions and 365 cfs consumed (CFTF 2004). Irrigation impacts and instream flow problems affect numerous streams and stream reaches in the Blackfoot Subbasin (Pierce et al. 2005). A discussion of stream dewatering in the subbasin is provided in the subbasin threat assessment (Section 3.4.4.11) and a list of dewatered streams in the subbasin is provided in Appendix A. Projected demand for future water use by irrigation depends on the amount of

⁵ Data from the USGS National Water Information System website (<http://waterdata.usgs.gov>).

irrigable lands that remain in the subbasin and the frequency of future droughts. Domestic and municipal demands for groundwater are limited in the Blackfoot Subbasin due to the relatively sparse population (CFTF 2004).

A number of legal and regulatory constraints and tools provide opportunities for addressing the various, potentially conflicting, demands for water in the subbasin. First, in recognition of over-appropriated water rights, the Upper Clark Fork Basin (including the Blackfoot Subbasin) is closed to permits for new surface water uses (Montana Code Annotated (MCA) §85-2-336). In addition, as of 2007, any applicant for a groundwater permit in a closed basin must assess the connectivity of ground and surface water, and if the proposed groundwater source is tributary to surface water, must provide a plan for offsetting any depletions to surface waters. The closure has the practical effect of dramatically reducing demand on ground and surface water supplies. An exemption for small groundwater permits (< 35 gallons/minute, 10 acre-feet) allows some development of groundwater without any assessment of its impact on either aquatic resources or senior water rights.

Another Montana law allows water rights to be severed from the land and changed from one purpose to another, as long as the change will not adversely affect other water users (MCA §85-2-402). The law also allows for temporary changes in water rights to instream uses for the benefit of fisheries (MCA §85-2-408 and 436). MFWP has a limited ability to permanently convert consumptive use rights to instream uses (MCA §85-2-436). Collectively, these legal and regulatory tools can assist in the resolution of future water management issues.

Despite this legal and regulatory framework, there are some specific challenges regarding municipal water use within the Blackfoot Subbasin. Specifically, the community of Seeley Lake faces potential water shortages in the future. As of 2009, Seeley Lake has water rights for up to 350 acre-feet per year, and currently uses about 250 acre-feet year. While Seeley Lake is in the midst of upgrading its infrastructure to improve water delivery to its customers, recent population projections suggest that by 2030, Seeley Lake could reach water demand levels that exceed its water rights (Petersen-Perlman and Shively 2009). Seeley Lake is part of the Upper Clark Fork Basin Closure that precludes issuance of new permits for surface water uses or for tributary groundwater use without mitigation for depletions. In addition, there are few, if any, significant existing surface water rights in the vicinity of Seeley Lake that could be secured and changed to municipal use. Increased water demand in Seeley Lake could, therefore, pose both legal and water management issues in the future.

3.2.5.1.2 Dams

The Mike Horse Dam, constructed in the 1940s across the mouth of Beartrap Creek just above its confluence with Mike Horse Creek in the Blackfoot River headwaters, was intended to contain metals-laced tailings from the Mike Horse Mine and other copper, zinc, and gold mines. The mine blew out in 1975, releasing heavy metals into the upper Blackfoot. The safety of the shored-up tailings dam continues to be a threat to water quality in the Blackfoot, and the USFS is moving forward with plans to remove the dam (CFC 2009).

The Milltown dam, a run-of-the-river hydroelectric facility located immediately below the Blackfoot - Clark Fork River confluence, has blocked upstream fish passage on the Clark Fork River and affected natural migrations between the Clark Fork and Blackfoot Rivers since 1907 (BC 2005a). The Milltown Dam has been removed.

A number of small dams in the Blackfoot Subbasin may be seasonal fish passage barriers, including a small dam at the Stimson Lumber Mill at the mouth of the Blackfoot River, the Nevada Creek Dam and dams on the Clearwater Lakes (Seeley Lake and Placid Lake). Fish passage barriers were installed at the outlets of Rainy Lake and Lake Inez in the 1960s in an attempt to control the reintroduction of nongame fish into these lakes following chemical rehabilitation. MFWP is researching the feasibility of removing these barriers (USFWS 2002).

3.2.5.2 Water Quality

The Blackfoot River and its tributaries provide critical fish and wildlife habitat, irrigation water for agricultural lands, water for domestic use and high quality recreational opportunities for the public—all beneficial uses dependent upon clean water. Naturally high sediment production, low stream flows and drought prone areas and other natural factors account for some impairment issues and compound problems when combined with human influences (BC 2005a).

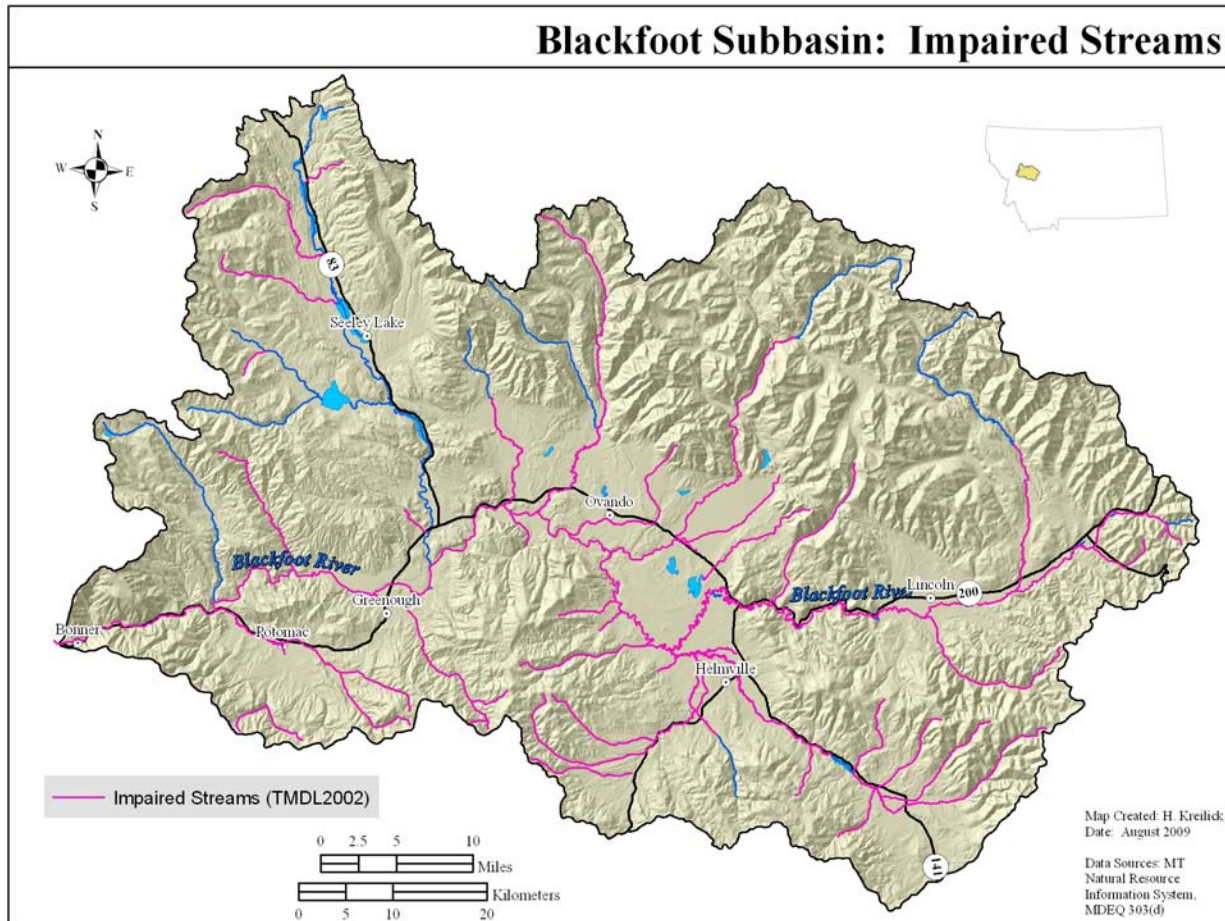
The major human-caused water quality issues identified in the Blackfoot Subbasin include excess sediment and siltation, instream and riparian habitat alterations, flow alterations, elevated water temperature and elevated nutrients and metals concentrations. Water quality impairment can result from a variety of land uses including mining, excessive timber harvest or grazing in riparian zones, excessive irrigation diversions, poorly designed roads and unplanned residential development. The impacts of poor water quality are most often reflected in the health of fisheries, which therefore provide a measure of overall watershed health. Impaired water quality can impact recreational uses, crop yields, wildlife health and livestock survival. In severe cases, poor water quality can limit drinking water availability (BC 2005a). Further discussion of water quality impacts in the Blackfoot Subbasin resulting from residential development, silvicultural activities, livestock grazing and mining is provided in the subbasin threat assessment (Section 3.4).

The primary vehicle for addressing water quality impairments in the Blackfoot Subbasin is the voluntary Total Maximum Daily Load (TMDL) planning process. Section 303(d) of the federal Clean Water Act (and related regulations) requires states to assess the condition of surface waters within their borders to identify water bodies that do not fully meet water quality standards. The resulting list of water quality impaired water bodies is known as the 303(d) list. In Montana, MDEQ is responsible for the development of TMDLs. Montana's approach is to develop TMDLs in the context of comprehensive water quality restoration plans. The goal of a TMDL and water quality restoration plan is to identify causes and sources of water quality impairment in water bodies on the 303(d) list, the level of water quality improvement necessary for a water body to fully support all intended beneficial uses and strategies for achieving restoration goals. To encourage water quality restoration efforts

in 303(d)-listed water bodies, various state and federal agencies offer funding in the form of grants and other programs to implement TMDL-identified restoration projects.

Since 1996, 56 water bodies in the Blackfoot Subbasin have been included on Montana's 303(d) list because they do not, according to MDEQ, fully support beneficial uses such as aquatic habitat, recreation and drinking water (Figure 3.9). The status of these water bodies is reassessed every two years by MDEQ.

Figure 3.9 Impaired Streams.

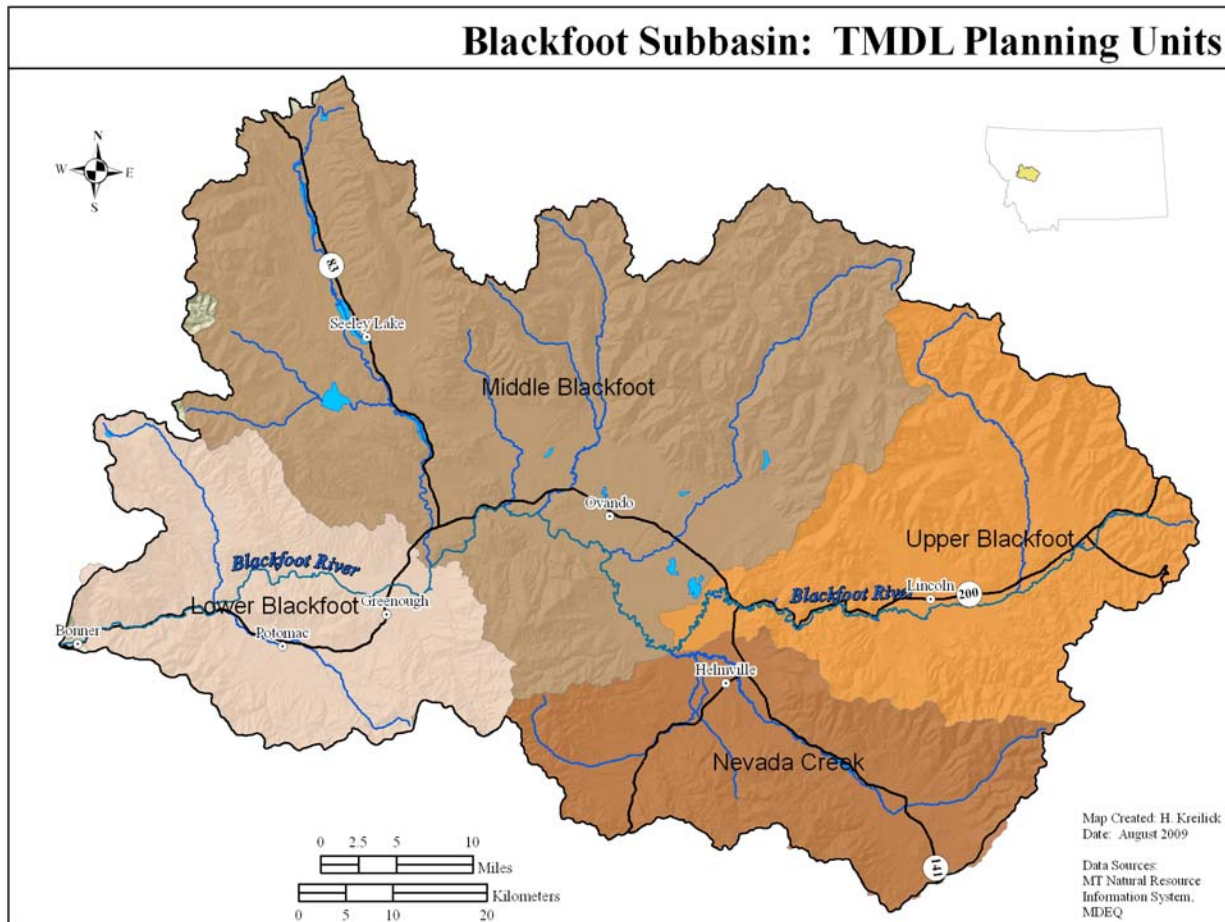


The Blackfoot Subbasin is divided into the following four planning areas for purposes of TMDL development (Figure 3.10):

1. *Blackfoot Headwaters Planning Area*, extending from the Blackfoot Headwaters to the confluence with Nevada Creek;
2. *Middle Blackfoot Planning Area*, including the Blackfoot River drainage from Nevada Creek to the confluence with the Clearwater River;
3. *Nevada Creek Planning Area*, including the Nevada Creek drainage from its headwaters to the confluence with the Blackfoot River; and

4. *Lower Blackfoot Planning Area*, extending from the Clearwater River downstream to the confluence with the Clark Fork River.

Figure 3.10 TMDL Planning Units.



In 2000, MDEQ partnered with the Blackfoot Challenge to develop TMDL plans in the Blackfoot Subbasin. TMDL development began in the Headwaters Planning Area in 2001. As of March 2009, TMDL plans have been completed for the Blackfoot Headwaters (MDEQ 2003, 2004) and Middle Blackfoot-Nevada Creek Planning Areas (MDEQ 2008a) and a plan is pending for the Lower Blackfoot Planning Area (MDEQ 2008b). These documents identify causes and sources of water quality impairments in 303(d)-listed water bodies and outline conceptual strategies for addressing identified causes and sources of impairment.

Since the 1990s, BBCTU, in cooperation with a variety of partners in the subbasin including the Blackfoot Challenge, the U.S. Fish and Wildlife Service (USFWS), MFWP, North Powell Conservation District, and others, has undertaken a suite of restoration projects that address the impairments identified in the TMDL planning process. See Table 4.2 in the Blackfoot Subbasin Inventory for a complete list of these projects. Water quality has improved in water bodies where restoration has occurred.

In addition to the TMDL effort described above, the Clearwater Resources Council coordinates a lake monitoring program on Seeley Lake, Salmon Lake, Placid Lake, Lake Alva, and Lake Inez. The purpose of this effort is to develop a long-term water quality database to better inform land management and community development decisions that may affect lake water quality (Rieman and Birzell 2008).

In 2010-2011, in partnership with MDEQ, partners will develop an implementation schedule with estimated costs, technical and financial assistance needed to implement restoration practices and management measures.

3.2.6 Fish and Wildlife

3.2.6.1 Overview of Fish and Wildlife of the Blackfoot Subbasin

The Blackfoot Subbasin is one of the most biologically diverse and intact landscapes in the western United States. The subbasin supports an estimated 250 species of birds, 63 species of mammals, five species of amphibians, six species of reptiles, and 25 species of fish (MTNHP 2009a). Because of its rural and largely intact nature, the Blackfoot Subbasin retains the full complement of large mammals, many of which have been extirpated from portions of their historic ranges. The subbasin provides excellent habitat for grizzly bear, black bear, elk, mule deer, white-tailed deer, mountain lion, Canada lynx, bobcat, gray wolf, coyote, wolverine, fisher and a wide variety of small mammals. The subbasin also provides high quality breeding, nesting, migratory and wintering habitat for a diversity of bird species, many of which are Species of Concern in Montana (see below). There are currently 12 native fish species and 13 non-native fish species in the Blackfoot Subbasin, as well as several hybrid salmonids (MFIS 2009).⁶ Maps characterizing critical fish and wildlife habitat are located in Section 3.3. A complete list of wildlife species found in the Blackfoot Subbasin is provided in Appendix B.

3.2.6.2 Special Status Fish and Wildlife Species

According to the Montana Natural Heritage Program database (MTNHP 2009a) there are 41 animal Species of Concern in the Blackfoot Subbasin (Table 3.5).⁷ These include invertebrates, birds, fish, mammals, reptiles and amphibians. Eight of the 14 bird species ranked by Montana Partners in Flight (PIF 2000) as Level I priority species in the state are found in the subbasin: Common Loon, Trumpeter Swan, Harlequin Duck, Columbian Sharp-tailed Grouse, Black-Backed Woodpecker, Flammulated Owl, Olive-sided Flycatcher and Brown Creeper.⁸

⁶ Detailed information on native and exotic fish species present in the Blackfoot Subbasin is provided in Sections 3.3.3.1 and 3.4.4.3.

⁷ Species of Concern are plants and animals considered by the Montana Natural Heritage Program to be at risk or potentially at risk. The Species of Concern list is updated as new population status/trend data is obtained (<http://www.mtnhp.org>).

⁸ Partners in Flight Level I priority species have declining population trends and/or high area importance. These are the species for which Montana has a clear obligation to implement conservation (PIF 2000).

Federally listed animal species found in the subbasin include the threatened bull trout, grizzly bear, and Canada lynx. The gray wolf, which was delisted from endangered status in March 2009, the Bald Eagle, which was delisted from threatened status in July 2007, and the fisher, which is a candidate for listing, also occur in the subbasin (USFWS 2009b). The relationship of the Blackfoot Subbasin to Endangered Species Act planning units is as follows:

Bull Trout: For listing purposes, the USFWS divided the range of bull trout into distinct population segments and 27 recovery units. The Blackfoot Subbasin falls within the Clark Fork River Recovery Unit and the Upper Clark Fork Recovery Subunit. Within this subunit, the Blackfoot has been identified as a core recovery area (USFWS 2002). The Blackfoot Subbasin has been proposed as critical habitat within the Clark Fork River drainage (USFWS 2002), although the current status of this designation is somewhat unclear. In 2005, the USFWS withdrew an earlier critical habitat rule proposal that included much of the Blackfoot as critical habitat, leaving only the mainstem Blackfoot and a small part of the Clearwater drainage listed as critical habitat. After an Inspector General's report disclosed improprieties at the highest levels of the USFWS in the designation of critical habitat, there has been some indication that the USFWS would revisit its critical habitat designation for bull trout. The designation of critical habitat confers a higher level of protection and scrutiny when federal agencies propose projects within designated critical habitat, in order to assure that there will be no adverse effect from those activities. The designation, however, does not provide protection for any non-federal activities. At the moment, none of the key spawning and rearing streams in the Blackfoot Subbasin have been designated as critical habitat (S. Bradshaw, pers. comm.).

Grizzly Bear: The Grizzly Bear Recovery Plan focuses on the six areas in Idaho, Montana, Washington and Wyoming that have habitat suitable for self-sustaining grizzly populations. The northern portion of the Blackfoot Subbasin (north of Highway 200) lies within the Northern Continental Divide Recovery Zone (USFWS 1993).

Northern Rocky Mountain Gray Wolf: The Northern Rocky Mountain Gray Wolf Recovery Plan established three recovery zones in Montana, Idaho and Wyoming. The Blackfoot Subbasin is in the Northwest Montana Recovery Area (USFWS 1987). In March 2009, the USFWS removed the gray wolf from the list of threatened and endangered species in the western Great Lakes, the northern Rocky Mountain states of Idaho and Montana and parts of Washington, Oregon and Utah (USFWS 2009b). The status of the gray wolf, however, is not yet resolved due to the likelihood of litigation over delisting.

Canada Lynx: The Canada Lynx Recovery Outline categorized lynx habitat and occurrence within the contiguous United States as 1) core areas, 2) secondary areas and 3) peripheral areas. Core areas are defined as the areas with the strongest long-term evidence of the persistence of lynx populations. Core areas have both persistent verified records of lynx occurrence over time and recent evidence of reproduction. Six core areas and one "provisional" core area are identified within the contiguous United States. The Blackfoot Subbasin is located within the Northwestern Montana/Northeastern Idaho Core Area (Ruediger et al 2000).

Table 3.5 Animal Species of Concern in the Blackfoot Subbasin.

Common Name	Scientific Name	MTNHP Rank ¹	PIF Priority Level ²	USFS Status	BLM Status	Notes
<i>BIRDS</i>						
American White Pelican	<i>Pelecanus erythrorhynchos</i>	G4 S3B	III			
Bald Eagle	<i>Haliaeetus leucocephalus</i>	G5 S3	II	Delisted threatened	Special status	Delisted from threatened status on July 9th, 2007. Now designated as Delisted Taxon-Recovered.
Black Tern	<i>Chlidonias niger</i>	G4 S3B	II		Sensitive	The largest known black tern colonies in Montana are at Freezout Lake WMA, Benton Lake NWR, Blackfoot WPA, and on the Blackfeet Reservation (PIF 2000).
Black-backed Woodpecker	<i>Picoides arcticus</i>	G5 S2	I	Sensitive	Sensitive	
Bobolink	<i>Dolichonyx oryzivorus</i>	G5 S2B	III			
Brewer's Sparrow	<i>Spizella breweri</i>	G5 S2B	II		Sensitive	
Brown Creeper	<i>Certhia americana</i>	G5 S3	I			
Caspian Tern	<i>Hydroprogne caspia</i>	G5 S2B	II			
Common Loon	<i>Gavia immer</i>	G5 S2B	I	Sensitive	Sensitive	
Common Tern	<i>Sterna hirundo</i>	G5 S3B	II			
Flammulated Owl	<i>Otus flammeolus</i>	G4 S3B	I	Sensitive	Sensitive	
Forster's Tern	<i>Sterna forsteri</i>	G5 S2B	II			
Franklin's Gull	<i>Leucophaeus pipixcan</i>	G4G5 S3B	II		Sensitive	
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	G5 S3B	II			
Gray-crowned Rosy-Finch	<i>Leucosticte tephrocotis</i>	G5 S2B, S5N				
Great Gray Owl	<i>Strix nebulosa</i>	G5 S3	III		Sensitive	

Table 3.5 (continued).

Common Name	Scientific Name	MTNHP Rank ¹	PIF Priority Level ²	USFS Status	BLM Status	Notes
<i>BIRDS (CONT.)</i>						
Harlequin Duck	<i>Histrionicus histrionicus</i>	G4 S2B	I	Sensitive	Sensitive	Harlequin ducks breed locally on mountain streams in the western part of Montana, including the Kootenai, Flathead, Clark Fork, and Blackfoot River drainages. Scattered breeding also occurs along the Rocky Mountain Front and the north edge of Yellowstone National Park (PIF 2000).
LeConte's Sparrow	<i>Ammodramus leconteii</i>	G4 S3B	III		Sensitive	Not documented by MTNHP in the Blackfoot Subbasin but likely to occur here according to Partners in Flight (PIF 2000).
Lewis's Woodpecker	<i>Melanerpes lewis</i>	G4 S2B	II			
Long-billed Curlew	<i>Numenius americanus</i>	G5 S2B	II		Sensitive	
Northern Goshawk	<i>Accipiter gentilis</i>	G5 S4	II	Sensitive	Sensitive	
Olive-sided Flycatcher	<i>Contopus cooperi</i>	G4 S3B	I			
Peregrine Falcon	<i>Falco peregrinus</i>	G4 S2B	II	Sensitive	Sensitive	Delisted from endangered status on August 25th, 1999. Now designated as Delisted Taxon-Recovered.
Sharp-tailed Grouse (Columbian)	<i>Tympanuchus phasianellus columbianus</i>	G4T3 S1	II			
Trumpeter Swan	<i>Cygnus buccinator</i>	G4 S2	I	Sensitive	Sensitive	
Veery	<i>Catharus fuscescens</i>	G5 S3B	II			
White-tailed Ptarmigan	<i>Lagopus leucura</i>	G5 S3	III			

Table 3.5 (continued).

Common Name	Scientific Name	MTNHP Rank ¹	USFS Status	BLM Status	Notes
<i>MAMMALS</i>					
Wolverine	<i>Gulo gulo</i>	G4 S3	Sensitive	Sensitive	
Canada Lynx	<i>Lynx canadensis</i>	G5 S3	Listed threatened	Special status	Listed as threatened on March 24th, 2000. Critical Habitat designated on September 9th, 2006.
Fisher	<i>Martes pennanti</i>	G5 S3	Sensitive	Sensitive	The West Coast Distinct Population Segment (DPS) of the fisher has been added to the candidate species list (Federal Register, 15 April 2004).
Gray Wolf	<i>Canis lupus</i>	G4 S3	Delisted endangered	Special status	In March 2009, removed from the list of threatened and endangered species in the western Great Lakes and the northern Rocky Mountain states of Idaho and Montana and parts of Washington, Oregon and Utah (USFWS 2009b).
Grizzly Bear	<i>Ursus arctos</i>	G4 S2S3	Listed threatened	Special status	On July 28th, 1975, the grizzly bear was designated as threatened in lower 48 states. In Montana, populations in the Cabinet/Yaak and Northern Continental Divide Recovery areas are listed as threatened.
Northern Bog Lemming	<i>Synaptomys borealis</i>	G4 S2	Sensitive		
Preble's Shrew	<i>Sorex preblei</i>	G4 S3			
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	G4 S2	Sensitive	Sensitive	
Fringed Myotis	<i>Myotis thysanodes</i>	G4G5 S3		Sensitive	

Table 3.5 (continued).

Common Name	Scientific Name	MTNHP Rank ¹	USFS Status	BLM Status	Notes
<i>FISH</i>					
Westslope Cutthroat Trout	<i>Oncorhynchus clarkii lewisi</i>	G4T3 S2	Sensitive	Sensitive	
Bull Trout	<i>Salvelinus confluentus</i>	G3 S2	Listed threatened	Special status	Listed as threatened on June 10th, 1998. Critical Habitat designated on September 26th, 2005.

<i>REPTILES and AMPHIBIANS</i>					
Western Skink	<i>Eumeces skiltonianus</i>	G5 S3			
Western Toad	<i>Bufo boreas</i>	G4 S2	Sensitive	Sensitive	

<i>INVERTEBRATES</i>					
Agapetus Caddisfly	<i>Agapetus montanus</i>	G3 S3			
Carinate Mountainsnail	<i>Oreohelix elrodi</i>	G1 S1			
Smoky Taildropper	<i>Prophysaon humile</i>	G3 S2S3			
Freshwater Sponge	<i>Ephydatia cooperensis</i>	G1G3 S1S3			
Gillette's Checkerspot	<i>Euphydryas gillettii</i>	G2G3 S2			
Lyre Mantleslug	<i>Udosarx lyrata</i>	G2 S1			
Magnum Mantleslug	<i>Magnipelta mycophaga</i>	G3 S2S3			
Millipede	<i>Austrotyla montani</i>	G1G3 S1S3			
Millipede	<i>Corypus cochlearis</i>	G1G3 S1S3			

¹ Montana Natural Heritage Program global (G) and state (S) ranks are explained in Appendix C.

² Partners in Flight Priority Ranks are as follows: Level I: Declining population trends and/or high area importance. These are the species for which Montana has a clear obligation to implement conservation. Level II: Species with lesser threat or stable/increasing populations in the state compared to Level I species. Montana has a high responsibility to monitor the status of these species and/or to design conservation actions. Level III: Species of local concern (often designated as such by one or more agencies) which rank lower, are not at imminent risk, or which are near obligates for high priority habitat. Presence of these species may serve as added criteria in the design and selection of conservation or monitoring strategies (PIF 2000).

3.2.6.3 Non-Native Aquatic Animal Species

In this section we focus on the non-native fish, invertebrates, and parasites that are currently found or have the potential to invade aquatic systems in the Blackfoot Subbasin. A brief description of these species is provided below. Further discussion of the threat these species pose to native species and aquatic systems in the subbasin is provided in Section 3.4.4.3.

Non-native fish species

Brook trout: Brook trout were brought to the inland American West from northeastern North America for sport fishing and subsistence between 1920 and 1950 (Benhke 2002, MFWP historic files). Resident brook trout are widely distributed in certain tributaries of the Blackfoot Subbasin. However, they are absent from many streams and they are considered rare in the mainstem Blackfoot River below the Landers Fork tributaries (Pierce et al. 2008). Bull trout are commonly misidentified and harvested as brook trout. To correct this problem, angling regulations have been adjusted to catch-and-release for both brook trout and bull trout in the mainstem Blackfoot River.

Brown trout: European brown trout, introduced to North America in the 1880s, rapidly became established and quickly replaced native trout in large rivers of the western United States. Brown trout now support popular sport fisheries in many rivers including the Blackfoot River. Brown trout inhabit stream reaches in the foothills and agricultural bottomlands of the Blackfoot Subbasin. They occupy an estimated 15% of the perennial stream network in the Blackfoot Subbasin, including 110 miles of the Blackfoot River mainstem and the lower reaches of many tributary streams (BC 2005a, USFWS 2002, Pierce et al. 2008). They are often a dominant fish in medium-sized, low-elevation tributaries that provide undercut banks and abundant cover. Brown trout co-exist with other salmonids in the larger river reaches where sufficient habitat complexity creates a diversity of niches. Spawning occurs in the upper mainstem Blackfoot River and lower tributary reaches (MFWP files).

Rainbow trout: Rainbow trout, a renowned sport fish, has been introduced into coldwater habitats around the world (Fausch et al. 2001). Rainbow trout were introduced to western Montana beginning in the late 1800s (Benhke 2002). Since the implementation of “wild trout management” in Montana in 1979, the distribution of rainbow trout in the Blackfoot Subbasin has diminished and the species is no longer present in the upper Blackfoot River (Spence 1975, Pierce et al. 2008). Stream-dwelling rainbow trout currently inhabit the lower mainstem Blackfoot River and reproduce in the lower portions of the larger tributaries (Pierce et al. 2009). They are also established in certain lakes, reservoirs and private ponds, although stocking programs have been reviewed and most lakes and private ponds that historically received hatchery rainbow trout have been converted to westslope cutthroat trout or triploid (sterile) rainbow trout. Currently, rainbow trout are stocked by MFWP in only a few lakes in the Blackfoot Subbasin where interactions with native species are not a concern.

Rainbow trout currently occupy an estimated 15% to 20% of the perennial streams in the lower elevation portions of the Blackfoot Subbasin. They are also present in the upper North Fork Basin portion of the Scapegoat Wilderness area in areas of historical lake plants (Pierce et al. 2008). Rainbow trout are highly susceptible to whirling disease (Bartholemew and Wilson 2002), which is expanding within the range of stream-dwelling rainbow trout in the Blackfoot Subbasin

(Pierce et al. 2008, 2009). The expansion of *Myxobolus cerebralis*, the causal agent of whirling disease, is thought to impact rainbow trout densities in the middle Blackfoot River (Pierce et al. 2009).

Asian carp: Four species of Asian carp are classified as Priority Class 1 Aquatic Nuisance Species (ANS)⁹ in Montana: bighead, black, grass, and silver carp. All four species were introduced to the United States from Asia and have spread accidentally and by deliberate release. Although not currently present in Montana, the Asian carp are considered a serious threat (E. Ryce, pers. comm.).

Other Fish: Other non-native fish species present in the subbasin include Yellowstone cutthroat trout, largemouth bass, white sucker, fathead minnow, arctic grayling, kokanee salmon, northern pike, yellow perch, walleye, brook stickleback, and pumpkinseed. Coho salmon, an Aquatic Nuisance Species, has been stocked in Browns Lake. The following fish species, although not yet documented in Montana, are considered Priority Class 1 Aquatic Nuisance Species that would pose a serious threat to native aquatic species and systems in the state: round goby, Eurasian ruffe, tench and zander.

Non-native invertebrates¹⁰

New Zealand mudsnail: Native to freshwater streams and lakes of New Zealand and adjacent small islands, the New Zealand mudsnail was first discovered in the United States in the Snake River in 1987. Since then, it has spread into many water bodies in the western United States and the Great Lakes. Although it is not present in the Blackfoot Subbasin, it has been found in Montana in the Madison River and several other rivers in and near Yellowstone National Park. The snail prefers littoral zones in lakes or slow streams but also survives in high flow environments by burrowing into sediment. It thrives in disturbed watersheds, tolerates siltation and benefits from high nutrient flows. The New Zealand mudsnail is a Priority Class 2 Aquatic Nuisance Species in Montana.¹¹ Densities and distribution throughout Montana are declining with the exception of the Bighorn River where densities are increasing.

⁹ Aquatic Nuisance Species (ANS) pose a serious threat to native aquatic species and aquatic systems. The federal Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, amended by the National Invasive Species Act of 1996, calls for the development of state and regional management plans to control aquatic nuisance species. The 2002 Montana ANS Management Plan addresses specific aquatic nuisance species, provides a management framework, and sets objectives and actions to prevent and reduce the impact of ANS in Montana. The Montana ANS Management Plan will be updated in 2010.

Priority Class 1 Aquatic Nuisance Species are currently not known to be present in Montana but have a high potential to invade. There are limited or no known management strategies for these species. Appropriate management for this class includes prevention of introductions and eradication of pioneering populations.

¹⁰ Information on non-native invertebrates, parasites, and pathogens is from the USGS Nonindigenous Aquatic Species fact sheets (<http://nas.er.usgs.gov>) and the Montana ANS website (<http://fwp.mt.gov/fishing/fishingmontana/ans>).

¹¹ Priority Class 2 Aquatic Nuisance Species are present and established in Montana and have the potential to spread further and there are limited or no known management strategies for these species. These species can be managed through actions that involve mitigation of impact, control of population size, and prevention of dispersal to other waterbodies.

Mud bithynia/faucet snail: Native to Europe, the mud bithynia was introduced to the Great Lakes Basin in the 1870s. It is now found in the Mid-Atlantic Region, Lake Champlain, across New York, the Potomac River in Virginia, and Chesapeake Bay. According to the USGS Nonindigenous Aquatic Species information system, it is also present in the Blackfoot Subbasin. The mud bithynia is commonly found in freshwater ponds, shallow lakes, and canals.

Zebra and quagga mussel: Native to Eastern Europe, zebra and quagga mussels were introduced to the Great Lakes Basin in the late 1980s in ballast water discharge from freighters. The zebra mussel is now found widely in the Mississippi River drainage and also in the western United States (Colorado, Utah and California). The quagga mussel has spread throughout the Great Lakes Basin and to numerous locations in the western United States including Lake Mead, Lake Havasu, Lake Mohave and numerous reservoirs in Colorado and California. Neither mussel has been documented in Montana. Zebra mussels are classified as a Priority Class 1 Aquatic Nuisance Species.

Other invertebrates: Other invertebrates classified as Priority Class 1 Aquatic Nuisance Species in Montana include rusty crayfish and spiny waterflea.

Non-native parasites/pathogens

Whirling disease: Whirling disease is a Priority Class 2 Aquatic Nuisance Species in Montana. Whirling disease is caused by an exotic parasite *Myxobolus cerebralis*. The parasite was introduced to the United States from Europe in the 1950s and has spread into drainages in 25 states, including over 95 water bodies in Montana. Severe infections in Montana occur in the Madison River, the Missouri River near Helena, Rock Creek near Missoula, the Big Blackfoot River, and many smaller wild trout streams. In the Blackfoot Subbasin, whirling disease was first detected in 1995 near Ovando and has since increased in distribution and intensity. It now affects the lower 122 miles of the mainstem of the Blackfoot River and at least 17 tributary streams and continues to expand in the lower reaches of certain tributaries (Pierce et al. 2008, Montana ANS Technical Committee 2002).

Other parasites/pathogens: Non-native parasites/pathogens which are not currently present in Montana but have the potential to invade include: heterosporosis (Priority Class 1 ANS), VHS virus, IHN Virus (Priority Class 1 ANS), and Asian Tapeworm (Priority Class 3 ANS).¹²

3.2.7 Vegetation

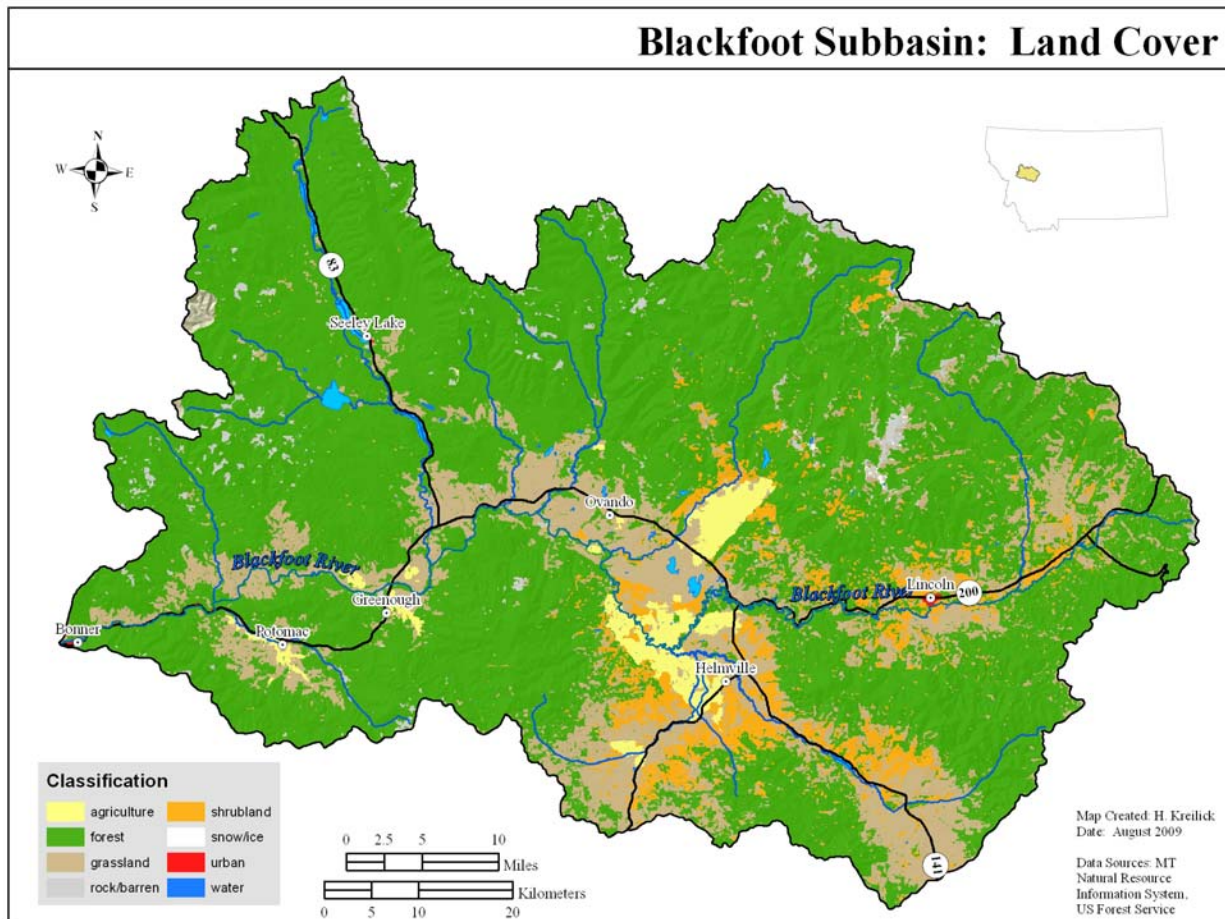
3.2.7.1 Overview of Vegetation Types in the Blackfoot Subbasin

Geologic, hydrologic and geographic features in the Blackfoot Subbasin combine to produce a diversity of vegetation communities including prairie grasslands, sagebrush steppe, coniferous forest and extensive wetland and riparian areas. Over 80% of the subbasin is covered with mixed species conifer forests dominated by ponderosa pine, lodgepole pine, Douglas-fir and western larch at the lower elevations and subalpine-fir and spruce in the higher regions, especially on cool, moist, northerly aspects. The remaining portions of the subbasin consist of native

¹² Priority Class 3 Aquatic Nuisance Species are not known to be established in Montana and have a high potential for invasion and appropriate management techniques are available. Appropriate management for this class includes prevention of introductions and eradication of pioneering populations.

bunchgrass prairie (10%), agricultural lands (5%), and a combination of shrublands, wetlands, lakes and streams (5%) (Figure 3.12). Less than 1% of the subbasin is developed (BC 2005b). The greatest source of biological diversity in the subbasin arises from wetland features such as glacial lakes, vernal ponds, fens, basin-fed creeks, spring creeks, marshes and riparian areas (USFWS 2009a). Lesica (1994) estimates that 600 vascular plant species occur within the subbasin, nearly 30% of which are associated with wetlands (Appendix D).

3.11 Land Cover Class.



The Blackfoot Subbasin supports a number of rare plant communities. The *three-tip sagebrush/rough fescue plant association* is common in the Ovando area, yet found nowhere else in the world. The *big sagebrush/rough fescue plant association*, endemic to west- and north-central Montana, is common in the Kleinschmidt Flat area (S. Cooper and S. Mincemoyer, pers. comm.). Expanses of the *Drummond's willow plant association* occur in riparian swamps along Monture Creek and mud sedge, sharp bulrush, mannagrass and fen peatland plant communities are unique to the area's glacial pothole wetlands (USFWS 2009a, MTNHP 2009b).

According to Montana Partners in Flight (PIF 2000), the Blackfoot Subbasin contains all of the highest priority habitats for bird conservation in Montana. These habitats include mixed grassland, sagebrush steppe, dry (ponderosa pine/Douglas-fir) forest, riparian deciduous forest and prairie pothole wetlands. The subbasin also contains four of the seven community types in

greatest need of conservation, according to Montana's Comprehensive Fish and Wildlife Conservation Strategy (MFWP 2005). These include grassland complexes, mixed shrub/grass associations, riparian and wetland communities and mountain streams.

3.2.7.2 Special Status Plant Species

Thirty plant Species of Concern have been documented by the Montana Natural Heritage Program in the Blackfoot Subbasin (Table 3.6) (MTNHP 2009a).¹³ While not documented from the Blackfoot, water howellia (*Howellia aquatilis*), a threatened species listed under the Endangered Species Act, is located immediately north of the subbasin in vernal wetlands in the Swan Valley (MTNHP 2009a).

¹³ Species of Concern are plants and animals considered by the Montana Natural Heritage Program to be at risk or potentially at risk. The Species of Concern list is updated as new population status/trend data is obtained (<http://www.mtnhp.org>).

Table 3.6 Plant Species of Concern in the Blackfoot Subbasin.

Common Name	Scientific Name	MTNHP Rank ¹	USFS Status	BLM Status	Notes
Austin's knotweed	<i>Polygonum austiniiae</i>	G5T4 S2S3	Sensitive		Sparsely distributed in mountainous areas of MT from the Rocky Mountain Front to the Madison and Gallatin Ranges. Sites are usually on open, gravelly, sparsely-vegetated slopes with shale-derived soils and as such are not generally impacted by human activity. Some sites however, are along forest roads and are susceptible to weed invasion and other disturbances. The probability of finding additional occurrences appears to be good since large areas of suitable habitat across western and central MT remain unsurveyed for the species.
beaked sedge	<i>Carex rostrata</i>	G5 S1	Sensitive		
Beck's water-marigold	<i>Bidens beckii</i>	G4G5 S2	Sensitive	Sensitive	Known from 10 occurrences in the western valleys of the state, including 6 moderate to large populations and 1 historical occurrence dating to 1937. However, the species may be more abundant in the state than what current data suggest. Threats and impacts to populations in MT include boating activity, lake shore development, aquatic weeds and use of aquatic herbicides.
blunt-leaved pondweed	<i>Potamogeton obtusifolius</i>	G5 S2	Sensitive		Known from approximately a dozen occurrences in northwest MT. Most occurrences are moderate to large populations and occur in valley and foothill locations in a variety of federal, state and private ownerships. A few populations are on lands managed specifically for their conservation value. Some populations are vulnerable to impacts associated with development, recreation and increased sediment and nutrient loads.
Chaffweed	<i>Centunculus minimus</i>	G5 S2		Sensitive	
cliff toothwort	<i>Cardamine rupicola</i>	G3 S3			State endemic known from 17 occurrences though many occurrences have not been surveyed for 30 or more years and many are based on a single herbarium specimen. However, the species grows at high elevations in rock and scree fields that generally are not subject to disturbance or other threats. Many populations also occur in designated Wilderness areas, which offer further protection. Additional occurrences likely exist across the known range of the species.

Table 3.6 (continued).

Common Name	Scientific Name	MTNHP Rank ¹	USFS Status	BLM Status	Notes
Crawe's sedge	<i>Carex crawei</i>	G5 S2		Sensitive	Known in MT from 8 occurrences, including 5 moderate to large populations.
creeping sedge	<i>Carex chordorrhiza</i>	G5 S2	Sensitive		
crested shieldfern	<i>Dryopteris cristata</i>	G5 S2	Sensitive		Known from approximately 24 extant occurrences in western MT, mostly on National Forest lands, though State Trust Lands and private lands also host significant populations. The species is vulnerable to hydrologic changes.
deer Indian paintbrush	<i>Castilleja cervina</i>	G4 SH			Known from 3 widely separated historic collections in MT.
dense-leaf draba	<i>Draba densifolia</i>	G5 S2			Distributed in the western half of MT in 4 moderate to large populations, 6 small occurrences and 9 historical or poorly documented occurrences. Occupied habitats are at moderate to high elevation, which helps to minimize disturbance. However, livestock grazing, invasive weeds and off-road ATV use impact some populations.
divide bladderpod	<i>Lesquerella klausii</i>	G3 S3			State endemic restricted to central-MT with the majority of populations occurring in the Big Belt Mountains and extending north to the southern end of the Rocky Mountain Front. Many large populations exist and the species typically occurs on gravelly slopes that are not usually subject to human disturbance.
English sundew	<i>Drosera anglica</i>	G5 S2S3	Sensitive		Known from over two dozen populations in the state, most of which are moderate to large-sized, healthy populations. Most occurrences are on federally managed lands with several in designated Wilderness areas, research natural areas or Glacier National Park which help to protect the occurrences from many potential threats. The species may be negatively impacted by fire. Plants are also sensitive to and negatively impacted by trampling of peat mats on which the species grow.

Table 3.6 (continued).

Common Name	Scientific Name	MTNHP Rank ¹	USFS Status	BLM Status	Notes
fringed bog moss	<i>Sphagnum fimbriatum</i>	G5 S1			
green-keeled cottonsedge	<i>Eriophorum viridicarinatum</i>	G5 S3			
Hall's rush	<i>Juncus hallii</i>	G4G5 S2	Sensitive		
Howell's gumweed	<i>Grindelia howellii</i>	G3 S2S3	Sensitive	Sensitive	Howell's gumweed occurs on vernal moist, lightly disturbed soil adjacent to ponds and marshes, as well as disturbed sites, such as roadsides and grazed pastures. It is a regional endemic known only from Missoula and Powell Counties, MT and Benewah County, ID and is considered globally threatened. It is known from over 60 mapped occurrences in MT, although most populations are small and many occur on roadsides or other similarly disturbed habitat. It is native to glacial wetlands in the subbasin. Occurrences may drift from place to place or from year to year and, as a result, many occurrences may be ephemeral. These attributes make determination of population numbers as well as the number of populations difficult. Invasive weeds are a threat to many occurrences, as the habitat occupied by <i>G. howellii</i> is also favorable for many weedy species. Application of herbicides to control these weeds, especially along roadsides may also have a direct, negative impact.
hutchinsia	<i>Hutchinsia procumbens</i>	G5 S1		Sensitive	
linear-leaved sundew	<i>Drosera linearis</i>	G4 S1	Sensitive		Only known from 4 populations in MT though all are moderate to large-sized occurrences that are located in either the Bob Marshall Wilderness or Indian Meadows Research Natural Area. These areas afford all known populations some protection from disturbance.

Table 3.6 (continued).

Common Name	Scientific Name	MTNHP Rank ¹	USFS Status	BLM Status	Notes
Missoula phlox	<i>Phlox kelseyi</i> <i>var. missoulensis</i>	G2 S2	Sensitive		A state endemic that occurs on open, exposed, limestone-derived slopes. Known from 16 occurrences, most of which are moderate to large-sized populations. Populations occur on a mix of ownerships, including private lands that host several occurrences. The Waterworks Hill population of Missoula is infested with several noxious weeds and heavy recreational trail use also occurs within the occupied habitat. Other populations appear to be at much less risk though some impacts from development, recreation and invasive weeds are likely.
moonwort	<i>Botrychium spp.</i>	G1G2G3 S1S3			This is a general record for <i>Botrychium</i> species tracked by MTNHP and not specific for any particular species. MTNHP tracks and maintains observation data for all <i>Botrychium</i> species in the state excluding <i>B. multifidum</i> and <i>B. virginianum</i> which are fairly common and readily identifiable from all other <i>Botrychium</i> species.
moss	<i>Tetraplodon mnioides</i>	G4 S1			
moss	<i>Scorpidium scorpioides</i>	G4G5 S2	Sensitive	Sensitive	
pale sedge	<i>Carex livida</i>	G5 S3			Listed as a <i>Species of Potential Concern</i> .
pygmy water-lily	<i>Nymphaea tetragona ssp. leibergii</i>	G5 S1			Known from 4 extant occurrences in western valleys and one historical collection from Salmon Lake. Populations are susceptible to impacts from development, recreation, siltation and aquatic weeds.
small yellow lady's-slipper	<i>Cypripedium parviflorum</i>	G5 S3	Sensitive	Sensitive	Listed as a <i>Species of Potential Concern</i> . Known from over 60 occurrences thought to be extant and an additional ~12 historical or poorly documented sites across the western half of MT. Many occurrences have small population numbers, though approximately two dozen occurrences are moderate to large populations. Populations occur on variety of federal, state and private ownerships with varied land uses and management. Appears to be tolerant to some disturbances at low levels and the number of populations scattered over a wide area reduces the risk to the species. A loss of populations or a significant decline in numbers may warrant a re-listing as a Species of Concern in MT. Moderate to large occurrences should be managed to maintain habitat and viable population numbers.

Table 3.6 (continued).

Common Name	Scientific Name	MTNHP Rank ¹	USFS Status	BLM Status	Notes
sphagnum	<i>Sphagnum riparium</i>	G5 S1			
water bulrush	<i>Scirpus subterminalis</i>	G4G5 S2	Sensitive		Over a dozen known occurrences in western MT, most of which are moderate to large-sized populations primarily on National Forest lands. Populations are potentially vulnerable to changes in water levels or increases in nutrient and sediment loads associated with development, agriculture or adjacent timber harvesting.
watershield	<i>Brasenia schreberi</i>	G5 S1S2	Sensitive		Restricted in MT to shallow waters in the valleys of the northwest corner of the state, where it is known from 8 occurrences, including 6 relatively high quality populations. Potential threats to the species include boating activity, aquatic weeds, and several populations are subject to runoff from adjacent agricultural fields, though it is uncertain if this has negatively impacted any populations.
Western Joepye-weed	<i>Eupatorium occidentale</i>	G4 S2	Sensitive	Sensitive	This peripheral species in MT is known from a handful of small to large populations in the extreme western part of the state. Minor impacts associated with a rock quarry at one location and rock climbing at another location are possible. Otherwise, few threats have been documented for the species in MT.

¹ Montana Natural Heritage Program global and state ranks are explained in Appendix C.

3.2.7.3 Non-Native Plant Species

One of the most challenging natural resource issues in the Blackfoot Subbasin is the spread of noxious and invasive plants. “Noxious weeds” are non-native species that can directly or indirectly injure agriculture, navigation, fish, wildlife, or public health (Montana Summit Steering Committee and Weed Management Task Force 2005). Landowners, managers and biologists are particularly concerned about the effects of noxious weeds on the structure, organization and function of ecosystems (Olson 1999). Noxious weeds impact the ecological and economic integrity of the Blackfoot Subbasin in a variety of ways (Olson 1999):

- Noxious weeds can outcompete and alter the relative abundance of native plant species by producing abundant seed, growing quickly and exploiting the soil profile for water and nutrients. A lack of natural predators furthers the competitive advantage of noxious weeds.
- Noxious weeds can contribute to soil erosion and alter soil properties by outcompeting native bunchgrasses that naturally bind the soil and producing secondary compounds that may hinder soil microfauna and microfauna from feeding on living roots.
- Noxious weeds impact wildlife by altering the native plant communities they depend on for survival.
- Noxious weed invasion can reduce carrying capacity for livestock, an important land use in the Blackfoot Subbasin. Noxious weeds reduce net returns by increasing operating expenses (for control measures), decreasing returns, or both.

Twenty out of 32 state listed noxious weeds are established in the Blackfoot Subbasin (Table 3.7). Twelve state listed noxious weeds have not yet been identified in the Blackfoot Subbasin, but are considered a high threat. “Invasive” plants, such as cheatgrass and common mullein, are non-native species that spread quickly and can be equally or more difficult to manage as noxious weeds.¹⁴

Table 3.7 State-Listed Noxious Weed Species Established in the Blackfoot Subbasin.¹

Common name	Scientific Name	Infestation Level
spotted knapweed	<i>Centaurea stoebe</i>	Widespread, well-established, infesting 25-50% of potential range
leafy spurge	<i>Euphorbia esula</i>	
yellow toadflax	<i>Linaria vulgaris</i>	
hound's-tongue	<i>Cynoglossum officinale</i>	
Canada thistle	<i>Cirsium arvense</i>	
oxeye daisy	<i>Leucanthemum vulgare</i>	

¹⁴ For more information on the distinction between noxious and invasive species, the State of Montana’s classification process and control recommendations, see <http://agr.mt.gov/weedpest/noxiousweeds.asp>.

Table 3.7 (continued).

Common name	Scientific Name	Infestation Level
St. Johnswort	<i>Hypericum perforatum</i>	Widespread, well-established, infesting 25-50% of potential range.
sulfur cinquefoil	<i>Potentilla recta</i>	
field bindweed	<i>Convolvulus arvensis</i>	
common tansy	<i>Tanacetum vulgare</i>	
Dalmatian toadflax	<i>Linaria dalmatica</i>	
yellowflag iris	<i>Iris pseudacorus</i>	Occur in isolated populations, infesting 10-25% of potential range.
meadow hawkweed	<i>Hieracium pretense, H. floribundum, H. piloselloides</i>	
orange hawkweed	<i>Hieracium aurantiacum</i>	
tall buttercup	<i>Ranunculus acris</i>	
diffuse knapweed	<i>Centaurea diffusa</i>	
hoary allysum	<i>Berteroa incana</i>	
Russian knapweed	<i>Acroptilon repens</i>	
purple loosestrife	<i>Lythrum salicaria and L. virgatum</i>	
blueweed	<i>Echium vulgare</i>	

Since 1994, the Blackfoot Challenge Weeds Committee has coordinated and implemented a holistic strategy for managing undesirable, invasive and noxious weeds in the subbasin. Combining action with education, the core of the program is the locally-led Weed Management Areas program, where neighbors work across property boundaries to manage weeds. Almost 475,000 acres are under active weed management with 380 private landowners participating in the project. Integrated weed management strategies include herbicides, biocontrol, revegetation, multi-species grazing, hand pulling, plowing, mowing, prevention and early detection rapid response.

In 1997, an INVADERS taskforce (Rice et al. 1997) identified non-native plant species that have the potential to become significant problem plants over the next five decades in the Blackfoot Subbasin. Table 3.8 includes a short list of eight well-known weeds that have been established in the northwestern United States since the 1930s and are well described in the weed management literature (Whitson et al. 2002). These species have a high potential to become significant problem plants unless new occurrences are detected early and eradicated. This list also includes well-known weeds that are relatively common but not presently classified as “noxious” in

Montana (although some of these species may be classified as noxious in the future). Table 3.9 includes an alert list of 22 recently invading or less well-known weeds that are not yet classified as noxious by the state of Montana but have high potential to become significant problem plants in the Blackfoot Subbasin during the next half century.

Table 3.8 Noxious and Invasive Weeds with a High Potential to Become Problem Plants in the Blackfoot Subbasin (Rice et al. 1997).

Common name	Scientific Name
absinth wormwood	<i>Artemisia absinthium</i>
yellow starthistle*	<i>Centaurea solstitialis</i>
rush skeletonweed*	<i>Chondrilla juncea</i>
poison hemlock	<i>Conium maculatum</i>
scotch broom*	<i>Cytisus scoparius</i>
common teasel	<i>Dipsacus fullonum</i>
dyer's woad*	<i>Isatis tinctoria</i>
tansy ragwort*	<i>Senecio jacobaea</i>
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Whitetop*	<i>Cardaria draba</i>
Japanese knotweed*	<i>Polygonum cuspidatum</i>

* State-listed noxious weed species.

The Nonindigenous Aquatic Species database maintained by the USGS (<http://nas.er.usgs.gov>) lists three non-native aquatic plants that are present in the Blackfoot Subbasin: yellow iris (mentioned above), flowering rush, and white water-lily. Although not currently present in the subbasin, the following aquatic plants have been identified by the Aquatic Nuisance Species Task Force (<http://www.anstaskforce.gov>) as potential invaders that would detrimentally impact aquatic systems in Montana: hydrilla, Brazilian elodea, egeria, Eurasian watermilfoil, curly pondweed, purple loosestrife and salt cedar. Of these potential invaders, Eurasian watermilfoil is the only species that is currently present in the state of Montana.

Table 3.9 Alert List for Recently Invading or Less Well-Known Weeds and Risk Ratings¹ for Blackfoot Subbasin Habitats (Rice et al. 1997).

Plant Name		Risk Rating by Habitat Type					
Common Name	Scientific Name	Agriculture	Grassland	Forest	Riparian	Wetland	Disturbed areas
velvetleaf*	<i>Abutilon theophrasti</i>	possible	possible	possible			High
jointed goatgrass*	<i>Aegilops cylindrica</i>	possible	possible				High
bishop's goutweed	<i>Aegopodium podagraria</i>	Uncertain					
small bugloss*	<i>Anchusa arvensis</i>	possible	possible	possible			High
common bugloss	<i>Anchusa officinalis</i>	possible	possible	possible			High
weedy orache*	<i>Atriplex heterosperma</i>	Uncertain					
white bryony	<i>Bryonia alba</i>			possible	possible		Possible
plumeless thistle	<i>Carduus acanthoides</i>	high	high	possible	high		High
dwarf snapdragon*	<i>Chaenorrhinum minus</i>	possible	possible	possible			High
trailing crownvetch	<i>Coronilla varia</i>	possible	possible	possible	possible		High
sand rocket	<i>Diploaxis muralis</i>	Uncertain					
Russian olive	<i>Elaeagnus angustifolia</i>				limited	limited	
babysbreath	<i>Gypsophila paniculata</i>	possible	possible	possible	possible		High
bluebuttons	<i>Knautia arvensis</i>	possible	possible	possible			High
malcolm stock*	<i>Malcolmia africana</i>	possible	possible				High
scentless chamomile	<i>Matricaria maritima</i>	high	possible		possible		High
cultivated knotweed	<i>Polygonum polystachyum</i>	possible			high		High

Table 3.9 (continued).

Plant Name		Risk Rating by Habitat Type					
Common Name	Scientific Name	Agriculture	Grassland	Forest	Riparian	Wetland	Disturbed areas
sakhalin knotweed	<i>Polygonum sachalinense</i>	possible			high		High
European buckthorn	<i>Rhamnus cathartica</i>	limited		limited	limited		Limited
self salsify*	<i>Scorzonera laciniata</i>	Uncertain					
puncturevine	<i>Tribulus terrestris</i>	possible	possible	possible			High
syrian beancaper	<i>Zygophyllum fabago</i>	possible	possible				High

* An asterisk following the common name indicates species which grow primarily as annuals

¹The ratings are: **High** - the species has high potential to become an important weed in this environment within the Blackfoot River drainage. **Possible** - initial indications are that the species could become a weed of this environment, but current information is limited for specific conditions within the Blackfoot drainage. Further analysis may be warranted. **Limited** - the species is not expected to affect extensive areas of the Blackfoot drainage in the near future, but could become a localized weed under certain conditions. **Uncertain** - current information is inadequate to assess risk. Further analysis may be warranted.

3.2.8 Ecological Relationships

In the preceding sections, we described the aquatic and terrestrial resources that characterize the Blackfoot Subbasin. Ecological function in the subbasin is shaped by the innumerable relationships between species and ecological communities and the biological and physical processes that support and sustain them. Ecological relationships between aquatic and terrestrial species and communities are particularly relevant to subbasin planning in the Blackfoot. The Blackfoot Subbasin contains an extensive network of lakes, ponds, herbaceous wetlands and perennial and intermittent streams that exist within a matrix of grassland, shrubland and forest communities. As such, the aquatic and terrestrial environments in the Blackfoot Subbasin are inextricably linked. Many, if not most, subbasin wildlife species use a combination of aquatic, riparian, wetland and upland habitats. Riparian and wetland areas, which represent the interface between aquatic and terrestrial environments, are the most productive wildlife habitats in the subbasin. In western Montana, 59% of land bird species use riparian and wetland habitats for breeding purposes, and 36% of those breed only in riparian or wetland areas (Mosconi and Hutto 1982).

Research conducted in a variety of locations around the world shows that streams and their adjacent riparian zones are connected by “reciprocal flows” of materials, energy, and organisms (Baxter et al. 2005). Stream systems are subsidized by influxes of organic litter (e.g., leaves), woody debris, nutrients, and invertebrates from adjacent riparian and terrestrial environments. Terrestrial invertebrates can provide a substantial and even dominant portion of the annual energy budget for drift-feeding fishes, such as salmonids. Likewise, riparian and terrestrial systems are subsidized by streams through the emergence of adult insects and energy and nutrients imported by migrating fish. Birds, bats, lizards, spiders and other riparian consumers benefit from this export greatly: prey originating instream contributes 25% to 100% of the energy (carbon) to some terrestrial species (Baxter et al. 2005). Similar stream-terrestrial connections undoubtedly exist in the Blackfoot Subbasin, although these relationships have not been explored in this system.

Stream ecosystems are also tied to the ecological characteristics of upland terrestrial ecosystems well beyond the riparian zone. The structure, composition, and patterns in forest communities directly influence hydrologic process such as the amount and timing of stream flows. Forests are the source of woody debris that can be routed to streams through landslides, avalanches and debris flows. Wildfire, timber harvest and other natural disturbance and land use activities that alter forest structure and composition can have profound effects on the dynamics and quality of stream habitats. Considerable interest is now focused on the restoration of more natural patterns, processes and disturbances such as wildfire in forest ecosystems because of the potential significance for aquatic ecosystems (e.g., Bisson et al. 1995, Naiman and Turner 2000).

Instream relationships among native and non-native fish can factor into the structure of food webs and the availability of terrestrial prey to native salmonids. Research in northern Japan demonstrates that changes in the relative abundance of native (Dolly Varden) and non-native (rainbow trout) salmonids impact the availability of terrestrial invertebrate prey to the native fish. In this study, rainbow trout usurped the terrestrial prey subsidy previously available to Dolly Varden, causing a more than 75% decrease in the biomass of terrestrial invertebrates in Dolly Varden diets and causing them to shift to foraging for insects on the stream bottom (Baxter et al.

2007). Similar changes might be expected with changes in the relative abundance of native and non-native salmonids in the Blackfoot Subbasin.

Relationships between bears and fish have been documented in the Blackfoot Subbasin. MFWP has documented black bear fishing activity at Big Sky Lake near Woodworth, where the primary food source is an introduced run of rainbow trout. MFWP has also documented bears fishing on Monture Creek at bull trout redd sites. There are unverified reports of bear fishing activity in Chamberlin Creek and at the inlet of Browns Lake (J. Jonkel, pers. comm.).

Evidence of the types of relationships described above helps to shape a more holistic view of aquatic and terrestrial ecosystems. To a large extent, the health of aquatic habitats in the subbasin is contingent upon sustainable land use in riparian, wetland, and upland habitats. Incompatible forestry and agricultural practices, unplanned development, and other land uses in terrestrial environments can degrade aquatic habitats by altering runoff patterns, rates of sedimentation, stream morphology, water chemistry, and water temperature. Similarly, aquatic habitat function and quality can impact terrestrial habitats and species. By focusing conservation and restoration efforts in the Blackfoot Subbasin on a range of aquatic and terrestrial species and ecological communities, (see Blackfoot Subbasin Management Plan, Section 5.0), we are intending to provide an umbrella of protection for the myriad ecological processes and relationships, both documented and undocumented, that sustain the overall ecological health of the subbasin.

3.2.9 Socioeconomic & Land Use Characteristics

3.2.9.1 Settlement History

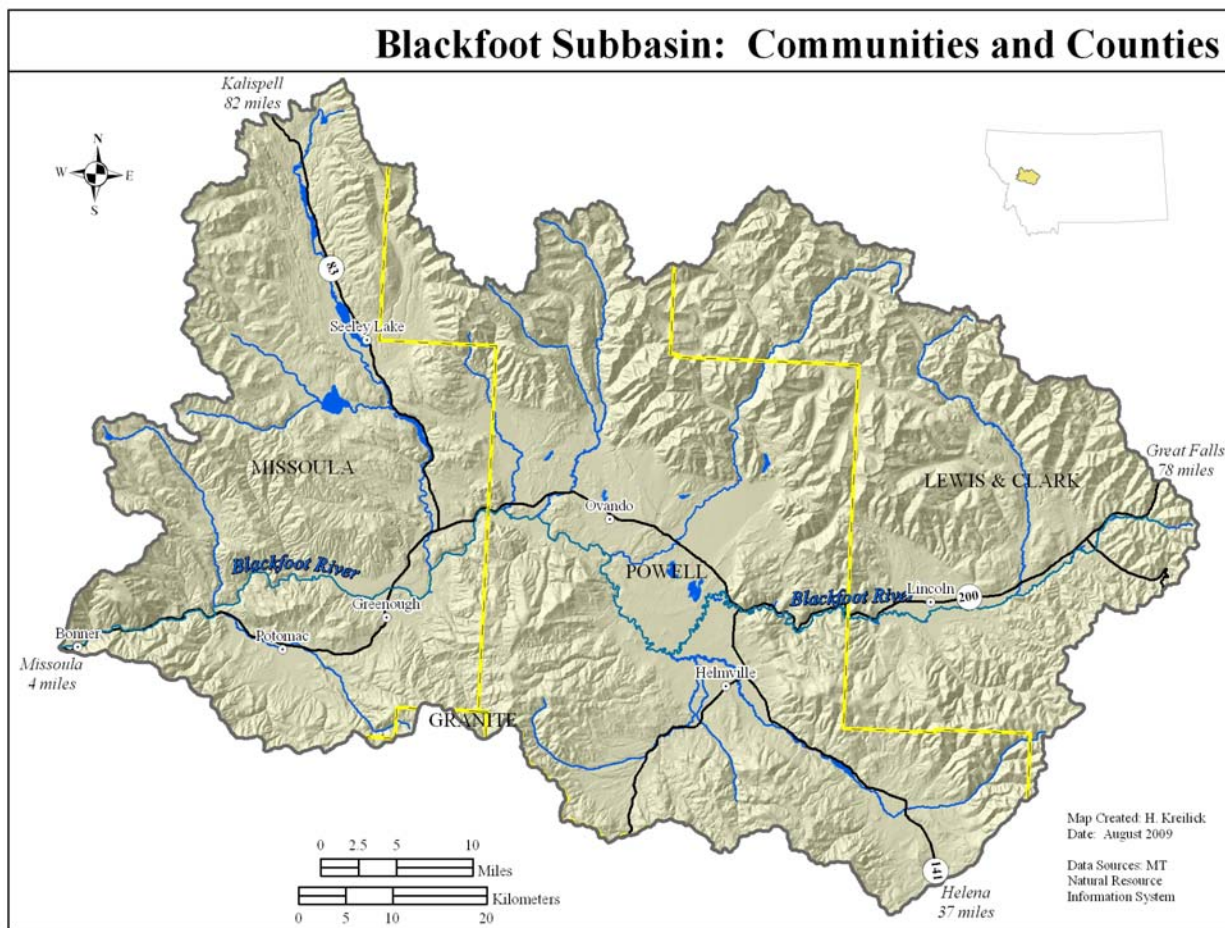
Prior to the arrival of white settlers in the 1800s, the Blackfoot Valley was occupied by the indigenous peoples of western Montana for thousands of years. The Kootenai, Salish, Nez Perce, Shoshone, Blackfeet and Crow tribes utilized the valley, known as *Cokahlahishkit* or the “Road to the Buffalo,” for its plant, animal stone, and mineral resources and for cultural ceremonies. The importance of the Ovando area is documented both in Pend d’Oreille and Salish oral histories and in the archaeological record. The trail up the Blackfoot River was used by the Pend d’Oreille and Salish to access the Rocky Mountain Front for buffalo hunting at least twice a year. Trails led north to what is now the Bob Marshall Wilderness and south to the Clark Fork Valley. Just before the western movement of settlers, many groups of Pend d’Oreille and Salish occupied these valleys year-round. The open valleys of the Ovando area had sufficient resources to sustain a large group and were vital for camping, horse grazing, plant collection, hunting, and other activities (BCCA Council and BC 2008).

White settlers arrived in the Blackfoot in the 1800s. The Blackfoot landscape provided opportunities for ranching, farming, logging, hunting, and food and firewood gathering. By 1885, Montana’s first large-scale logging operation began in the Blackfoot Valley. Gold was discovered in the area in the 1890s and massive mining operations, including the Mike Horse Mine, were set up to retrieve the valuable metal. In the following decades, miners staked claims to more than 150 gold, silver and copper mines and ranchers grazed their cattle on the valley’s lush native grass. Heavy logging continued not only to support mining operations, but also to aid in the construction of the Transcontinental Railroad (BCCA Council and BC 2008, Curtis 2005).

3.2.9.2 Population

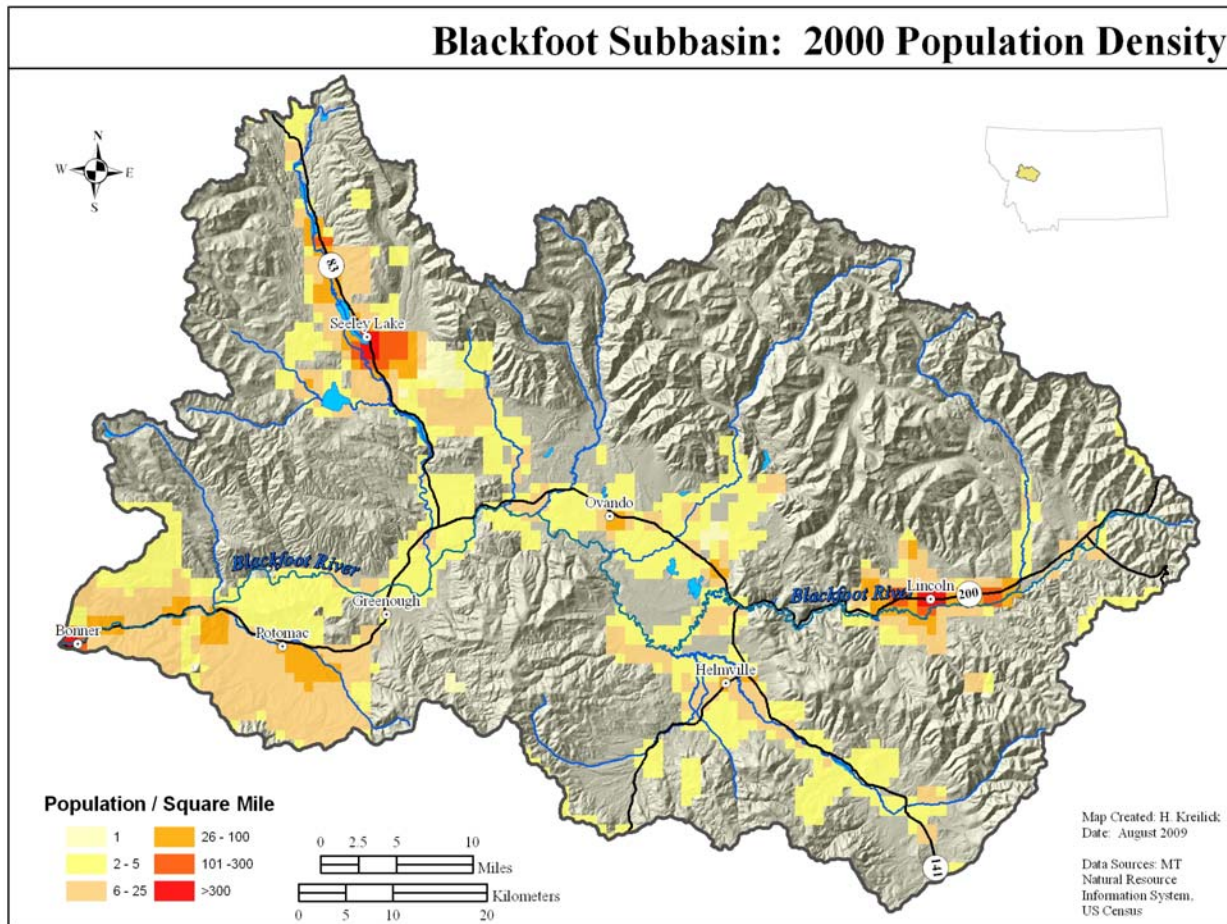
The Blackfoot Subbasin includes the communities of Lincoln, Helmville, Ovando, Seeley Lake, Greenough, Potomac, and Bonner and spans portions of Missoula, Powell, and Lewis & Clark Counties (Figure 3.13). There are approximately 8,100 people and 2,500 households in the subbasin. In this 1.5 million-acre subbasin, this amounts to less than one person per square mile (Figure 3.14). The population is spread throughout the valley, with population densities reaching 300 people per square mile in Seeley Lake, Potomac, and Bonner. The middle and high elevation portions of the subbasin remain largely undeveloped. In 1995, between 8% and 18% of the current residents of the Blackfoot Subbasin had their primary residence located out of state (BC 2005b).

Figure 3.12 Communities and Counties.



While many western Montana valleys experience rapid population growth, the rate of population growth in the Blackfoot Subbasin remains modest. The population in the subbasin is projected to increase to approximately 8,680 by 2010 (BC 2005b). Much of the population increase in the Blackfoot is attributable to in-migration from other states. New residents are attracted to the Blackfoot because of its outstanding scenic beauty, intact landscapes, abundance of wildlife, recreational opportunities, rural character and proximity to the urban centers of Missoula and Helena.

Figure 3.13 2000 Population Density.



3.2.9.3 Land Ownership

Land ownership in the Blackfoot Subbasin is 54% federal (USFS, USFWS, BLM), 10% state (DNRC, MFWP, University of Montana), 31% private and 5% corporate timber company (Figure 3.15). Most of the middle and high elevation forested lands within the subbasin are administered by the USFS. Private lands are concentrated in the low elevation portions of the subbasin. Land ownership patterns in the Blackfoot Subbasin have changed in recent years due to large-scale transfers of Plum Creek Timber Company (PCTC) lands. In 2003, the Blackfoot Challenge and The Nature Conservancy initiated the Blackfoot Community Project, which involved the purchase and re-sale of 89,215 acres of PCTC lands based on a community-driven disposition plan.¹⁵ The lands encompassed all PCTC lands from the Blackfoot River headwaters near Rogers Pass to the Clearwater drainage. Approximately 75% of the lands have been or will be transferred into federal or state ownership and 25% into private ownership. In 2008, The Nature Conservancy and The Trust for Public Land entered into another agreement with PCTC,

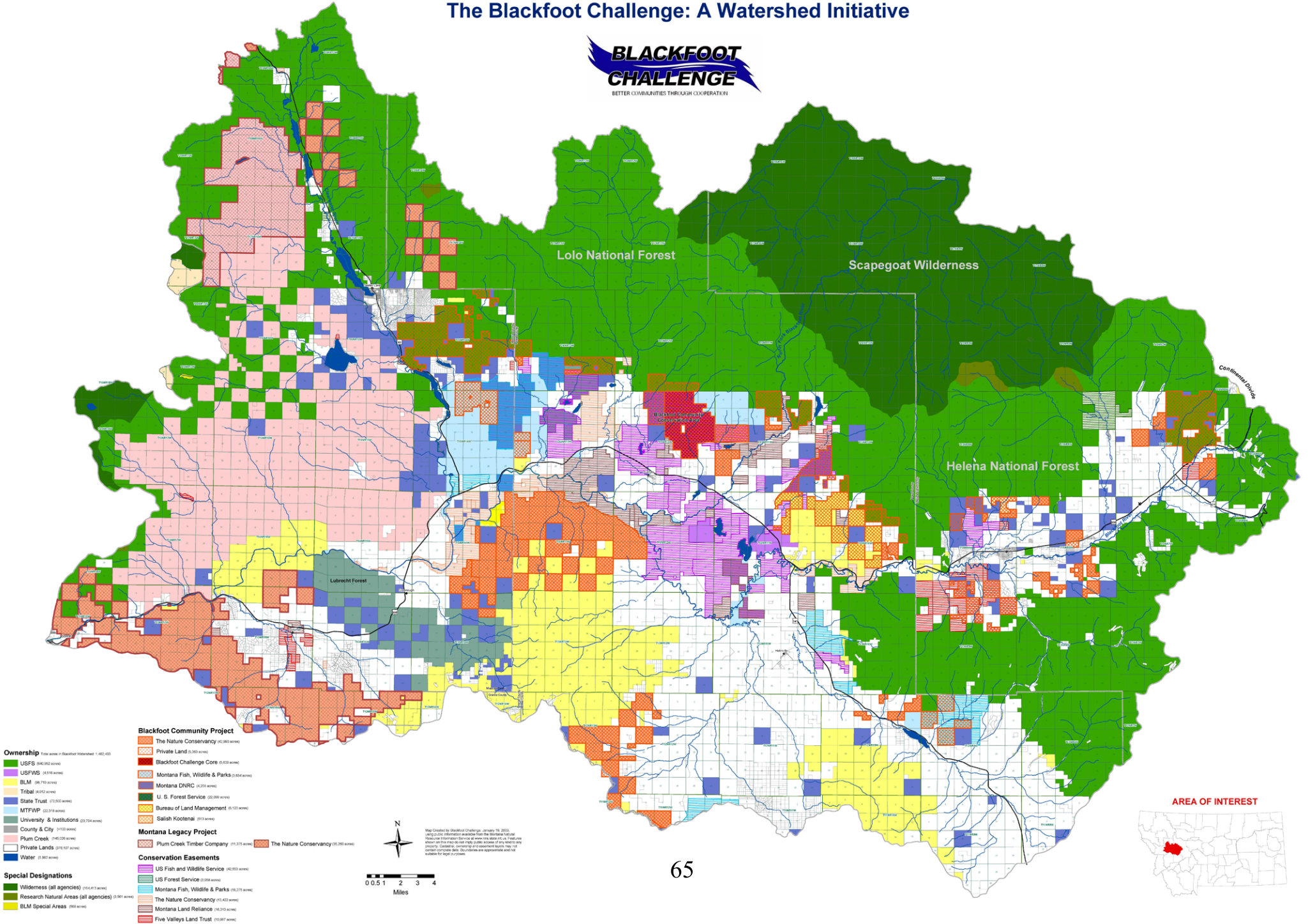
¹⁵ See the Blackfoot Challenge website (www.blackfootchallenge.org) for more information on the Blackfoot Community Project.

the Montana Legacy Project, to purchase 312,500 acres of timberland in western Montana.¹⁶ As part of the Legacy Project, a total of 71,754 acres in the Clearwater and Potomac valleys of the Blackfoot Subbasin will be purchased and resold to public agencies and/or private buyers. The majority these lands are intended to be re-sold to the USFS and DNRC.

¹⁶ See the Montana Legacy Project website (see www.themontanalegacyproject.org) for more information.

Figure 3.14 Land Ownership and Conservation Easements

The Blackfoot Challenge: A Watershed Initiative

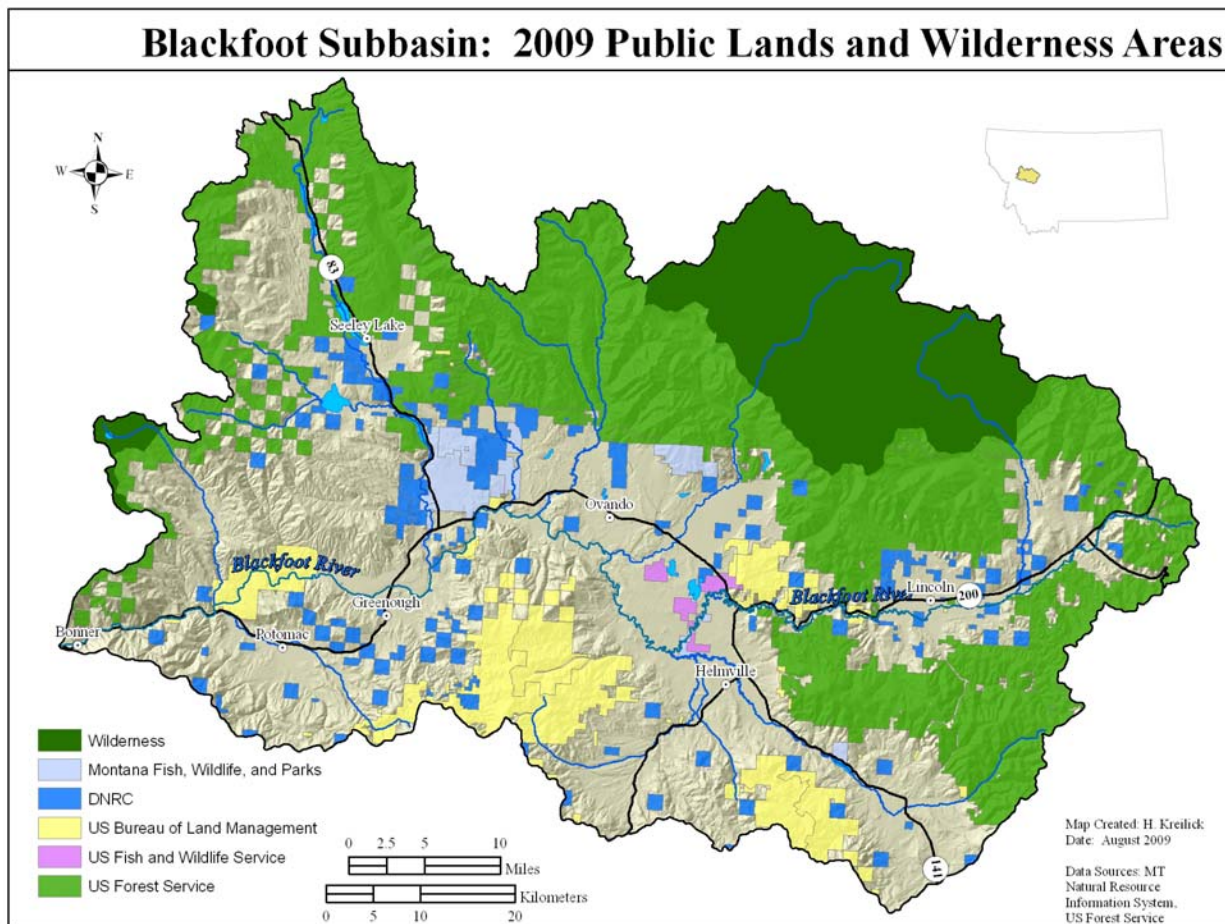


3.2.9.4 Land Use and Economy

Land use and land use change within the Blackfoot Subbasin is the result of complex interactions between geographic, socioeconomic and legal (ownership) characteristics of the subbasin. Consistent with its largely rural nature, dominant land uses in the subbasin include agriculture, timber harvest and recreation. A finer scale assessment, however, particularly within subbasin communities, reveals a range of land uses including residential and commercial development, transportation, communication and utilities, institutional and government facilities and public and private outdoor recreation (e.g., golf courses, resorts, and parks).

The majority of private land in the subbasin is located on the valley floor, where ranching remains the principle land use. Approximately 14.5% of the total acreage in the subbasin is used for agriculture. The subbasin supports 44,280 irrigated acres and 180,283 grazing acres (BC 2005b). Public lands in the subbasin are mixed-use areas for recreation, wildlife habitat, grazing, timber management and research. The Blackfoot is home to the Scapegoat Wilderness area and the eastern edge of the Rattlesnake Wilderness area that together cover 164,400 acres (11%) of the 1.5 million-acre subbasin (Figure 3.16). The Scapegoat Wilderness is adjacent to the Bob Marshall Wilderness Complex. Together, the Scapegoat and Bob Marshall cover about 1.5 million acres of federally protected lands.

Figure 3.15 Public Lands and Wilderness.



The presence of expansive open space in the subbasin provides an abundance of outdoor recreational opportunities, from hunting and fishing to hiking and snowmobiling. Public access to streams, lakes and public lands is highly valued. There are 25 state stream-side and lake-side Fishing Access Sites, 789 miles in the groomed snowmobile system, and 20 campgrounds on state and federal lands in the subbasin. In 2008, 36 ranches in the Blackfoot representing 68,668 acres were enrolled in the MFWP Block Management Program, providing public access for big game hunting. The river itself, a world-renowned native trout fishery, is used for angling, summer camping, and floating. MFWP is in the process of drafting a recreation management plan for the Blackfoot River and the North Fork of the Blackfoot River that will guide recreation management now and into the future (MFWP 2009). The proposed plan is based on the recommendations of the River Recreation Advisory for Tomorrow (RRAFT) Citizen Advisory Committee.

Timber harvest on public lands has declined substantially in the past three decades. Although production from private timberlands has remained relatively constant over that same period of time (BC 2005b), recent market-driven fluctuations continue to impact the amount of timber harvest in the subbasin. In 2008, the Stimson Mill in Bonner ceased operations, laying off over 100 employees. The mill had been active since 1886, when the first logs were floated down the Blackfoot River. Owned by the Anaconda Company for nearly 40 years, it was reputed to be one of the oldest continuously operating mills in the country. In Seeley Lake, Pyramid Mountain Lumber continues to operate but faces the same lumber market pressures as other mills across the northwest.

Mining has historically been a major land use in the Blackfoot Subbasin. Today, there are several abandoned mining sites where reclamation is vital to the long-term health of the watershed. Like many rural communities, the traditional resource extraction economy in the Blackfoot Subbasin is being augmented, and in some places replaced, by a “new economy” based on services, particularly recreation, tourism, and new businesses made possible due to advances in telecommunications. The Blackfoot continues to attract retired professionals, providing transfer and investment income components to the subbasin economy (see *Rural Way of Life*, Section 3.3.3.8).

3.2.9.5 Conservation Legacy

The Blackfoot Subbasin has a history of pioneering innovative land management strategies to support working landscapes and the fish and wildlife that depend on them. Recognizing the strong tie between land and livelihood, private landowners have played a key role in conservation projects for over three decades. One of the earliest efforts involved developing Montana’s enabling legislation for conservation easements, with the first conservation easement in Montana signed in the Blackfoot Valley in 1976.

In 1992, the Blackfoot River was listed as one of the ten most endangered rivers in the United States due to a century of unsustainable practices including mining, livestock grazing and timber harvest. The impacts to water quality and fisheries of the Blackfoot associated with these land uses generated interest in river management and enforcement via top-down, agency-led planning and decision-making. Housing development, increased recreational use and the spread of noxious weeds were also beginning to impact the overall health of the river. A few key

landowners responded with a non-regulatory approach to conservation on the Blackfoot River by developing a recreation corridor and an innovative walk-in hunter program on private lands, demonstrating the effectiveness of community-based conservation and creative solutions that meet both public and private land management objectives.

Due to public-private partnerships and the legacy of cooperation, the Blackfoot has seen limited residential subdivision or unplanned development, unlike many other valleys in western Montana. In Powell County, located in the heart of the Blackfoot Subbasin, development regulations divide the county into four Agricultural Districts. Each of these districts has minimum lot sizes and specified allowable uses, creating what is essentially county-wide zoning. Agricultural District 3, which encompasses Powell County in the Blackfoot Subbasin, has minimum lot sizes of 160 acres. This District was established out of concern from the community over the rate at which family farms were being sold and converted to second homes.

Many working cattle ranches in the subbasin are still intact and over 24% of private lands (108,000 acres) in the subbasin are permanently protected from subdivision and residential development by conservation easements (Figure 3.15). Many Blackfoot landowners also protect habitat and wildlife values through land and water stewardship practices, including sustainable grazing management, stream and wetland protection and restoration, water conservation measures and sustainable resource use (BC 2005b). As a result of large, working ranches, extensive public land, development regulations and conservation easements in the Blackfoot Subbasin, habitat fragmentation has been limited and the biological diversity of the subbasin has been largely maintained (TNC and BC 2007).

At the landscape level, new strategies are being developed to work across political boundaries and leverage financial and technical resources. As part of the Blackfoot Community Project, for example, partners developed the 41,000-acre Blackfoot Community Conservation Area (BCCA) that involves community forest ownership of 5,609 acres and cooperative ecosystem management across public and private lands. As a multiple-use demonstration area, this project will pilot innovative access, land stewardship and restoration practices through management by a 15 member community-based council.

3.3 Conservation Targets

In this section we outline the process used by subbasin technical work groups to select and assess the viability of the eight focal conservation targets in the Blackfoot Subbasin. We then provide background information on each conservation target and present the results of each conservation target viability assessment.

3.3.1 Conservation Target Selection Process

The subbasin planning process in the Blackfoot began with identification of priority conservation targets. Conservation targets, which may include ecological systems, ecological communities, species or other important natural or cultural resources, represent the overall biodiversity of a landscape and the reasons why it is important for conservation (Low 2003). Identifying the right set of conservation targets is the foundation for all subsequent steps in the subbasin planning

process. The targets selected ultimately determine the conservation objectives and strategic actions implemented in the subbasin—in other words, which critical threats must be abated and what types of conservation and ecological restoration must be performed.¹⁷ In the Blackfoot Subbasin, conservation targets fall into the following three categories (adapted from Low 2003):

- 1. Ecological Communities:** Ecological communities are groupings of co-occurring species, including natural vegetation associations and alliances, which share common ecological attributes or conservation requirements. Ecological community targets may have special conservation or management requirements due to distinct locations, ecological process or threats. Examples include *herbaceous wetlands* or *low elevation ponderosa pine/western larch forest*. Ecological communities provide the “coarse filter” for conserving the representative array of species and natural communities at a landscape scale. These are referred to as “nested targets.” Often, conserving an ecological community will lead to conserving a rare species or natural community that is embedded within the system.
- 2. Species:** Species targets have ecological attributes or conservation requirements not adequately captured within the ecological community targets. Types of species targets may include:
 - globally imperiled and endangered native species (e.g., species ranked G1 to G3 by natural heritage inventories);
 - species of special concern due to vulnerability, declining trends, disjunct distributions, or endemism;
 - focal species, including keystone species, wide-ranging regional species and umbrella species (e.g., grizzly bear);
 - major groupings of targeted species that co-occur on the landscape, share common ecological processes, share similar threats or have similar conservation requirements (e.g., native salmonids); or
 - globally significant examples of species aggregations, such as a migratory shorebird stopover area aggregation.
- 3. Other Significant Resources:** Beyond the biodiversity targets described above, there may be other natural or cultural resources—such as groundwater supplies, productive farmland, Wilderness areas or cultural features—that are important to partners engaged in conserving an area.

The Blackfoot Subbasin technical work groups identified eight conservation targets within the subbasin (Table 3.10). Of these, five are ecological community targets, two are species targets and one is a cultural resource target. All of the targets include nested targets that are expected to benefit from conservation of the main targets. These eight conservation targets were selected not only because of their individual value and concern, but also because they, together with the nested targets, represent a high percentage of the total biodiversity and conservation value in the Blackfoot Subbasin. Conserving and/or restoring these targets will help to ensure the viability of

¹⁷ Appendix B in *Landscape-Scale Conservation: A Practitioner’s Guide* (Low 2003) provides a one-page decision support tool for selecting conservation targets.

the species, natural systems and rural way of life that make the Blackfoot Subbasin unique and that contribute to the larger-scale significance of the Crown of the Continent Ecosystem. Detailed target and nested target descriptions are provided in Section 3.3.3.

Table 3.10 Conservation Targets and Associated Nested Targets in the Blackfoot Subbasin.

Conservation Target	Nested Targets
Native salmonids	westslope cutthroat trout; bull trout; western pearlshell mussel
Herbaceous wetlands	herbaceous wetland-associated bird, plant, amphibian and invertebrate Species of Concern
Moist site and riparian vegetation	riparian-dependent birds
Native grassland/sagebrush communities	grassland/sagebrush-associated bird and plant Species of Concern; ungulate winter range
Low elevation ponderosa pine/western larch forest	low elevation ponderosa pine/western larch forest-associated birds; ungulate winter range
Mid to high elevation coniferous forest	Mid to high elevation coniferous forest-associated birds; forest carnivores; whitebark pine
Grizzly bears	Habitat connectivity for wildlife
Rural way of life	Sustainable natural resource-based livelihoods; healthy/resilient communities

3.3.2 Assessing Conservation Target Viability

The purpose of the Blackfoot Subbasin Plan is to develop strategies for conserving *viable* occurrences of native species and ecological systems across the subbasin. Viability indicates the ability of a conservation target to persist for many generations. After selecting a representative list of focal conservation targets for the Blackfoot Subbasin, the subbasin technical work groups conducted a viability assessment for each target. The viability assessment process, including definitions of terms, is outlined below (adapted from Low 2003).¹⁸

Step 1. Identify Key Ecological Attributes

Key ecological attributes are factors that are critical for the long-term viability of a conservation target. These are factors that, if degraded, would seriously jeopardize the target’s ability to persist for a century or longer. Although there are many attributes that could describe all the characteristics of a target, the goal of the viability assessment is to identify a small set of ecological attributes that are critical to each target’s long-term viability. Key ecological attributes are identified based on ecological models, the scientific literature, local scientific data and/or

¹⁸ For more information on assessing conservation target viability, see *Landscape-Scale Conservation: A Practitioner’s Guide* (Low 2003).

comparative data from other areas or similar types of targets and expert opinion. Key ecological attributes fall under the following three categories:

- *Size* is a measure of the area or abundance of the conservation target's occurrence. For ecological systems and communities, size is simply a measure of the occurrence's patch size or geographic coverage. For animal and plant species, size takes into account the area of occupancy and number of individuals. Minimum dynamic area, or the area needed to ensure survival or re-establishment of a target after natural disturbance, is another aspect of size.
- *Condition* is an integrated measure of the composition, structure and biotic interactions that characterize the occurrence. This includes attributes such as reproduction, age structure, biological composition (e.g., presence of native versus exotic species; presence of characteristic patch types for ecological systems), structure (e.g., canopy, understory, and ground cover in a forested community) and biotic interactions (e.g., levels of competition, predation, and disease).
- *Landscape context* includes two factors: ecological processes and connectivity. Ecological processes that maintain a target may include hydrologic regimes (e.g., flooding), fire regimes and many kinds of natural disturbance. Connectivity includes such factors as species targets having access to habitats and resources needed for life cycle completion, fragmentation of ecological communities and systems and the ability of a target to respond to environmental change through dispersal, migration or re-colonization.

Step 2. Select Indicators to Measure Each Key Ecological Attribute

In order for each key ecological attribute to be assessed, the basis for its measurement must be established. These measures are called *indicators*. Indicators must be measurable and therefore frequently involve some type of quantitative assessment—such as number of acres, recruitment, age classes, percent of cover or frequency of fire regime. Other indicators may involve measurable elements that are not numerical, such as the seasonality of fire or flooding regime. Indicators form the basis for monitoring changes in conservation target viability over time. They should therefore be efficient and affordable to measure.

Step 3. Rate the Current Status of Each Indicator

The next step in assessing viability of conservation targets involves determining the current health of each key ecological attribute. This is accomplished by using a simple grading scale to rate the status of each indicator selected in Step 2. This four-part grading scale provides a sufficient degree of distinction among the four scores and allows for a reasonable confidence level, while recognizing the tremendous lack of information and research that would be needed to provide more precise grades for most targets. A description of the ratings follows:

<i>Very Good</i>	The indicator is functioning within an ecologically desirable status, requiring little human intervention for maintenance within the natural range of variation (i.e., is as close to “natural” as possible and has little chance of being degraded by some random event).
<i>Good</i>	The indicator is functioning within its range of acceptable variation, although it may require some human intervention for maintenance.
<i>Fair</i>	The indicator lies outside of its range of acceptable variation and requires human intervention. If unchecked, the target will be vulnerable to serious degradation.
<i>Poor</i>	Allowing the indicator to remain in this condition for an extended period will make restoration or preventing extirpation practically impossible (i.e., it will be too complicated, costly, and/or uncertain to reverse the alteration).

Ideally, over time, a set of quantitative benchmarks should be established for each of these four ratings for each key ecological attribute. These benchmarks should state clearly where the indicator being measured would fall within each level. However, the scientific information needed to establish these benchmarks is often lacking or inadequate. In these cases, well-informed expert opinion is used to determine a credible first iteration of the benchmarks and assessment of the current rating. Benchmarks and ratings will be modified as new information is available.

Step 4. Determine the Desired Status of Each Indicator

The final step in assessing viability is to determine a desired future rating for each indicator. The gap between the current and desired future indicator ratings helps technical work groups determine which conservation targets are in need of the most immediate attention, and drives the development of conservation objectives and strategic actions outlined in the Blackfoot Subbasin Management Plan (Section 5.0). The benchmarks used to quantify the ratings also provide a mechanism for measuring changes in conservation target viability over time as strategic actions are implemented in the subbasin. Assessing the ecological health of conservation targets in this way is an iterative process; key ecological attributes, indicators and ratings will all be refined over time.

3.3.3 Conservation Target Descriptions and Viability Assessments

3.3.3.1 Native salmonids

Nested Targets: westslope cutthroat trout; bull trout; western pearlshell mussel

The Blackfoot River and its tributaries support native westslope cutthroat trout and bull trout, both of which are Species of Concern in Montana (MTNHP 2009b, Shepard et al. 2005). Bull trout is federally listed as threatened under the Endangered Species Act (USFWS 2002). Abundance and distribution of native trout in the Blackfoot River and its tributaries vary greatly (Pierce et al. 2008). This variation can be explained by variation in life-history forms, natural geological/environmental conditions, human influences (such as environmental degradation and historic fishery exploitation), hybridization and interspecific competition among non-native fishes (Swanberg 1997, Schmetterling 2001, Pierce et al. 2007, 2008). With the general exception of high mountain lakes, these species are widely distributed across the broad gradients found in streams, rivers and lakes and represent the range of aquatic environments in the Blackfoot Subbasin. Because westslope cutthroat trout and bull trout are sensitive to changes in water quality (e.g., temperature and sediment) and other physical habitat characteristics (Behnke 2002, Shepard et al. 2005, MBTRT 2000), they are excellent indicators of the overall health of the Blackfoot River ecosystem. Conservation and restoration of these target species and their habitats will provide secondary benefits to other native fishes and aquatic organisms found throughout the subbasin.

Factors that impact native salmonid viability in the Blackfoot Subbasin include non-native fish introductions (USFWS 2002, Shepard et al. 2005), metals and other chemical contamination (Stratus Consulting 2007), elevated temperatures, nutrient inputs, stream dewatering (Pierce et al. 2005), stream and riparian habitat alteration (Marler 1997, Pierce et al. 1998), incompatible grazing management (Fitzgerald 1997, BC 2005a), sub-standard road crossings and other migration barriers into tributaries (Pierce et al. 2007, 2008). Within the Blackfoot Subbasin, the majority of inventoried streams exhibit some level of physical and/or biological impairment (BC 2005a, Pierce et al. 1997, 2005, 2008). The level of impairment varies substantially within and among streams. A detailed discussion of water quality in the subbasin is provided in Section 3.2.5.2.

While functional tributaries play an essential role in the life stages (migration, spawning and rearing) of all fluvial Blackfoot River fish (Swanberg 1997, Schmetterling 2001, Pierce et al. 2007), altered and degraded tributaries generally inhibit movement and reduce spawning and rearing success, contributing to suppressed populations and inadequate recruitment of multiple species over large areas of the river (Peters 1990, Pierce et al. 1997, 2008). Since 1990, restoration partners in the Blackfoot Subbasin have undertaken cooperative habitat restoration tied to fisheries recovery, with over 700 projects completed to date involving more than 200 individual landowners (BC 2005a, Pierce et al. 2008). Because tributaries provide critical spawning and rearing areas, restoration of degraded tributaries has become the primary method of restoring river populations (BC 2005a, Pierce et al. 1997, 2008). Protective harvest regulations

that began in 1990 and changes in non-native fish stocking programs have also helped to increase densities of Blackfoot native salmonids in the mainstem Blackfoot River (Pierce et al. 1997). Much work, however, remains in order to recover and stabilize these species, particularly across tributary environments (Pierce and Podner, 2006, Pierce et. al, 2008).

Nested target: bull trout

In Montana, bull trout are native to rivers, streams and lakes in the Columbia River (Kootenai, Clark Fork, Bitterroot, Blackfoot, Flathead, and Swan drainages) and Saskatchewan River (St. Mary and Belly drainages) basins (MBTRT 2000). The bull trout is a long-lived species, generally believed to reach sexual maturity between five and seven years of age (Thomas 1992). It spawns in small to intermediate size (second to fourth-order) streams between late August and early October, building nests, or redds, in which it buries its eggs. Bull trout spawning redds are commonly constructed in alluvial stream reaches where upwelling groundwater is available to aerate and thermally protect the buried eggs from severe icing (Swanberg 1997, Pierce and Podner, 2006, Pierce et. al, 2008). The hatched fry do not emerge from the redds until the following spring (Thomas 1992, MBTRT 2000).

The life histories of Montana bull trout include both resident and migratory strategies. Resident bull trout spend their entire lives in (or near) their small natal streams. In the Blackfoot Subbasin, most bull trout exhibit migratory life histories. This strategy involves an out-migration to larger rivers (fluvial) or lakes (adfluvial) where fish grow to maturity before returning to their natal tributaries to spawn. Migratory bull trout of the Blackfoot Subbasin commonly move long distances (> 70 miles) in response to environmental changes (e.g., river warming) or for spawning (Swanberg 1997, Pierce et al. 2004). Fluvial bull trout currently inhabit at least 16 Blackfoot River tributary streams. The three major bull trout population groups in the Blackfoot Subbasin are 1) Upper Blackfoot Basin upstream of Nevada Creek (mostly fluvial stocks), 2) Clearwater River Basin (mostly adfluvial stocks), and 3) Lower Blackfoot Basin (outside of the Clearwater) below Nevada Creek (mostly fluvial stocks). Figure 3.17 shows generalized distribution of bull trout in the Blackfoot Subbasin.

Bull trout abundance and distribution in the Blackfoot Subbasin has declined from historic levels (MBTRT 2000, USFWS 2002). This decline is attributable to a variety of factors, including habitat loss and degradation from land and water management practices; population isolation and fragmentation from dams and other fish passage barriers; competition, predation and hybridization with introduced, non-native fish species (e.g., lake trout, brook trout and others); historical overharvest; and poaching (Pierce et al. 1997). Within the subbasin, bull trout densities are very low in the upper Blackfoot River but increase downstream of the North Fork. Including the Clearwater subbasin, bull trout occupy about 25% of the Blackfoot Subbasin, or about 400 total miles of stream and all mainstem lakes interconnected with the Clearwater River (Pierce et al. 2008, L. Knotek, pers. comm.).

Streams that appear to be particularly important for the spawning of migratory bull trout include Monture Creek, the North Fork Blackfoot River, Copper Creek, Gold Creek, Dunham Creek, Morrell Creek, the West Fork Clearwater River and the East Fork Clearwater River. Bull trout spawner abundance is indexed by the number of identifiable female bull trout nesting areas (redds). Data indicate that Monture Creek has an upward trend from 10 redds in 1989 to an

average of 51 redds in subsequent years (Pierce et al. 2008). The North Fork also shows an upward trend from eight redds in 1989 to an average of 58 redds between 1989 and 2008. The Copper Creek drainage (including Snowbank Creek) has experienced a resurgence of bull trout redds—from 18 in 2003 to 117 in 2008— since the 2003 Snow Talon Fire. The total number of redds counted in these three streams (Monture Creek, North Fork, and Copper Creek) increased from 39 in 1989 to 217 in 2000. With the onset of drought, bull trout redd counts then declined to 147 in 2008. These changes are attributed to protective regulations first enacted in 1990, restoration actions in spawning streams during the 1990s and a period of sustained drought between 2000 and the present (Pierce et al. 2008).

Nested target: westslope cutthroat trout

In Montana, the historical range of westslope cutthroat trout included all of Montana west of the Continental Divide as well as the upper Missouri River drainage (Shepard et al. 2005). Westslope cutthroat trout are distributed throughout the Blackfoot Subbasin, inhabiting the mainstem and about 90% (> 150) of headwater tributaries (Pierce et al. 2008). The three major westslope cutthroat population groups in the Blackfoot Subbasin are 1) Upper Blackfoot Basin upstream of Nevada Creek, 2) Clearwater River Basin, and 3) Lower Blackfoot Basin (outside of the Clearwater) below Nevada Creek. Figure 3.17 shows generalized distribution of westslope cutthroat trout in the Blackfoot Subbasin.

Westslope cutthroat trout have three life history forms similar to bull trout: adfluvial (lake dwelling), fluvial (river dwelling), and resident (stream dwelling). While resident fish spend their entire lives in tributary streams, migratory cutthroat trout will migrate >70 miles between wintering areas in rivers and spawning areas in tributary streams (Schmetterling 2001, Schmetterling 2003, Pierce et al. 2007). Westslope cutthroat spawning and rearing streams are small to intermediate in size (first through fourth-order), where large wood sorts gravel and diversifies spawning habitat conditions (Schmetterling 2000). Migratory juvenile cutthroat trout inhabit small tributaries for two to three years before moving downstream to mature in a river environment (Behnke 1992). At about five years of age, fluvial fish then return to their natal streams to spawn (Schmetterling 2001, Pierce et al. 2007). Juvenile cutthroat trout commonly overwinter in the interstitial spaces of larger substrate, though larger fish also aggregate in deep pools. In the Blackfoot River, adult cutthroat trout occupy deep and slow moving pools during winter (Schmetterling 2001, Pierce et al. 2007).

Westslope cutthroat trout have declined over much of their historic range within the last century (Behnke 1992, Shepard et al. 2003, 2005). Westslope cutthroat trout historically occupied about 56,500 miles of habitat within the United States. The species currently occupies an estimated 33,500 miles, or 59%, of historically occupied habitats (Shepard et al. 2003). In general, densities in tributaries decline in the downstream direction because of habitat degradation, historic fishery exploitation, and interactions with non-native trout (Shepard et al. 2005, USFWS 2009a). Despite this rangewide trend, the Blackfoot Subbasin supports a nearly basin-wide distribution of westslope cutthroat trout with ~90% of their historic range occupied compared with ~39% statewide (Pierce et al. 2008). Westslope cutthroat trout densities in the lower mainstem of the Blackfoot River have generally increased between 1989 and 2008, despite an increase in angler pressure in recent years (MFWP angler pressure estimates 1989-2007). Like bull trout, increasing densities of westslope cutthroat trout relate to protective angling regulations

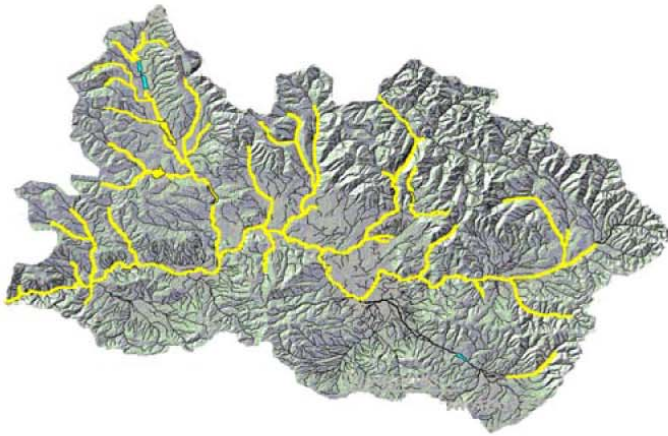
enacted in 1990 and restoration actions targeting important spawning and rearing streams. Westslope cutthroat trout habitat restoration has occurred in Monture, Chamberlain, Gold, Dunham, McCabe, Morrell, Cottonwood, Pearson, Wasson, Arrastra, Poorman, Spring, and Snowbank Creeks and in the North Fork of the Blackfoot River.

Hybridization and other interactions with non-native fish remain serious threats to westslope cutthroat trout viability (Muhlfeld et al. 2009). Rangelwide, genetically unaltered westslope cutthroat trout occupy between 13% and 35% of currently occupied habitats (Shepard et al. 2003). In the Blackfoot, about 40% of the current westslope cutthroat trout population has tested as genetically pure (Pierce et al. 2008). The upper Blackfoot basin upstream of the Nevada Creek confluence is a region of high genetic purity.

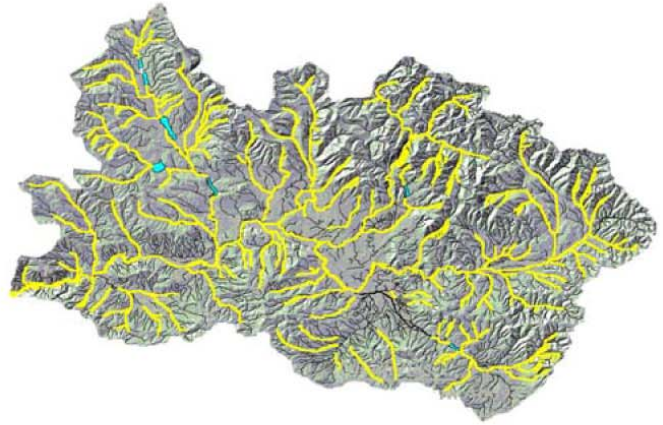
Nested target: western pearlshell mussel

The western pearlshell mussel, a Species of Concern in Montana, is Montana's only coldwater stream mussel and the only native mussel found on the west side of the state. This mussel species appears to have crossed the continental divide in Montana from west to east with its salmonid host, the westslope cutthroat trout. Montana's populations of western pearlshell mussel may be significantly declining and becoming less viable due to decreased stream flows, stream warming, eutrophication due to agricultural runoff and siltation from incompatible land uses. Impoundments and diversions are also continued threats in many of the rivers in this species' range. Previously reported western pearlshell mussel beds in the larger rivers (e.g., Blackfoot, Big Hole, Bitterroot, Clark Fork) are extirpated from those drainages or are at such low densities that long-term viability is unlikely (MFWP 2005, MTNHP 2009b).

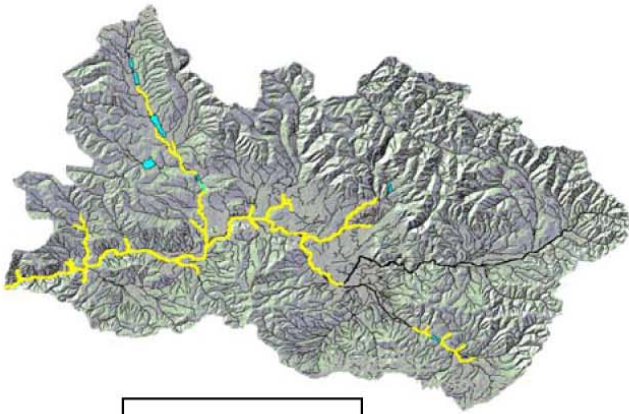
Figure 3.16 Distribution of Six Salmonids within the Blackfoot Subbasin.



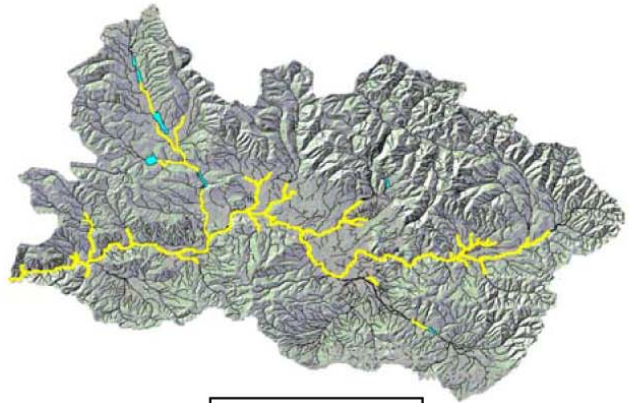
BULL TROUT



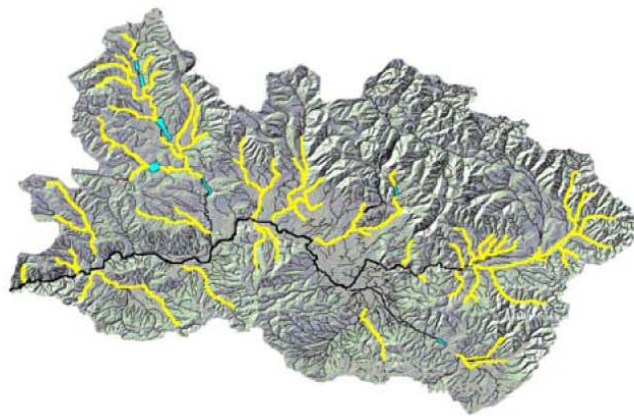
WESTSLOPE CUTTHROAT TROUT



RAINBOW TROUT



BROWN TROUT



BROOK TROUT

Table 3.11 Native Salmonid Viability Assessment. ¹

Key Attribute ²	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Condition: <i>Abundance</i>	Redd counts or population estimates (extrapolated to adults)	Spawning adults occur only occasionally, or adult members are unknown	Spawning adults low or highly variable (average < 10 or vary substantially between < and > 10; but are consistently present)	Spawning adults common (average > 10 but < 100)	Spawning adults consistently abundant (average > 100)	To be determined	To be determined	This element of condition is a bull trout population demographic characteristic influencing the risk of local extinction.
Condition: <i>Life History Expression</i>	Number of migratory forms expressed	No migratory life histories. Local population is isolated by permanent impassible barrier; OR life history expression unknown	Migratory life history occurs, but relative abundance is low or adult access is blocked or limited during typical migration periods	Migratory life history occurs, but access through corridors or to rearing areas occasionally limited	All potential migratory life histories are abundant or dominant	To be determined	To be determined	This element of condition is a bull trout population demographic characteristic influencing the risk of local extinction.
Condition: <i>Genetic Integrity</i>	Genetic data (applicable to westslope cutthroat trout only)	< 90% pure	90-98% pure	Some hybridization, 98-99.9% pure	Unaltered/pure	To be determined	To be determined	This element of condition is a bull trout population demographic characteristic influencing the risk of local extinction. Available information indicates hybridization is primarily limited to F1. When post F1 hybridization does occur, it does not appear to progress to full introgression.

Table 3.11 (continued).

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Condition: <i>Resilience</i>	Trends in population growth or survival	Population is declining and or habitat is in poor condition and non-natives are abundant or dominate the community OR nothing is known about resilience	Population is stable at low to moderate abundance and or habitat is degraded, but not destroyed. Non-natives may be relatively abundant, but not dominant	Population is stable at moderate abundance or growing slowly. When reduced in abundance population slowly rebuilds. Habitat is in good condition and non-natives are not present or rare.	Population is stable and moderate-high abundance, or when reduced has the capacity to rebuild quickly. Habitat is in excellent condition and expected to stay that way. Non-native salmonids are not important.	To be determined	To be determined	This element of condition is a bull trout population demographic characteristic influencing the risk of local extinction.
Size: <i>Extent of habitat networks within the 6th code</i>	Length of suitable spawning/ rearing habitat	Length of the interconnected stream network supporting spawning and rearing habitat is < 3 km.	Length of the interconnected stream network supporting spawning and rearing habitat is between 3 and 10 km.	Length of the interconnected stream network supporting spawning and rearing habitat is between 10 and 20 km	Length of the interconnected stream network supporting spawning and rearing habitat is > 20 km	To be determined	To be determined	
Landscape Context: <i>Water Quality</i>	Temperature, sediment and chemical contaminants	One or more elements is functioning at unacceptable risk	Two or more elements are functioning at risk, none at unacceptable risk	Two elements are functioning acceptably, one is functioning at risk	All three elements are considered functioning acceptably	To be determined	To be determined	This would be based on the USFS Assessment for change in peak/base flows and drainage network increase encompassing 6 th code (subwatershed). Additional data on water diversion may be used to consider condition & FWP Dewatered Stream list/Minimum instream flow model.

Table 3.11 (continued).

		Indicator Ratings						
Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Rating	Desired Rating	Comments
Landscape Context: <i>Habitat Structure</i>	Large wood, width-depth, floodplain connectivity, stream bank conditions	One or more elements is functioning at unacceptable risk	Two or more elements are functioning at risk, none at unacceptable risk	Three elements are functioning acceptably, one is functioning at risk	All four elements are considered functioning acceptably	To be determined	To be determined	Based on USFS Assessment encompassing 6 th codes. These are only some of the elements in habitat and channel condition. Substrate, pools and off channel habitat are presumably correlated or represented.
Landscape Context: <i>Hydrology</i>	Flow and hydrology	One or more elements is functioning at unacceptable risk	Two or more elements are functioning at risk	One is functioning acceptable and one is functioning at risk	Both elements are considered functioning acceptably	To be determined	To be determined	Based on USFS Assessment for change in peak/base flows and drainage network increase encompassing 6 th code.
Landscape Context: <i>Barriers</i>	Physical barriers	Permanent barriers exclude adult movement to spawning habitat in > 75% of the 6 th code spawning habitat.	Temporary or partial impediments or barriers may exist for juvenile and adult movements; or permanent barriers may exist that exclude adult migrants from 25%-75% of the 6 th code spawning habitat.	No barriers to adult movement, or they exclude < 25% of the 6 th code spawning habitat. Temporary or partial impediments or barriers may occasionally exist for juvenile movement.	There are no barriers or impediments to fish migration from the 6 th code to the lake or river environment where migratory life histories could be expected to rear or stage.	To be determined	To be determined	Presumably would be based on USFS inventory of fish passage barriers.

¹ Based on local populations, not across entire subbasin. The native salmonids technical work group configured this table to assess viability down to the 6th code HUC. After acquiring the maps that describe the basin to the 6th code, the work group will apply this viability assessment to streams at that level.

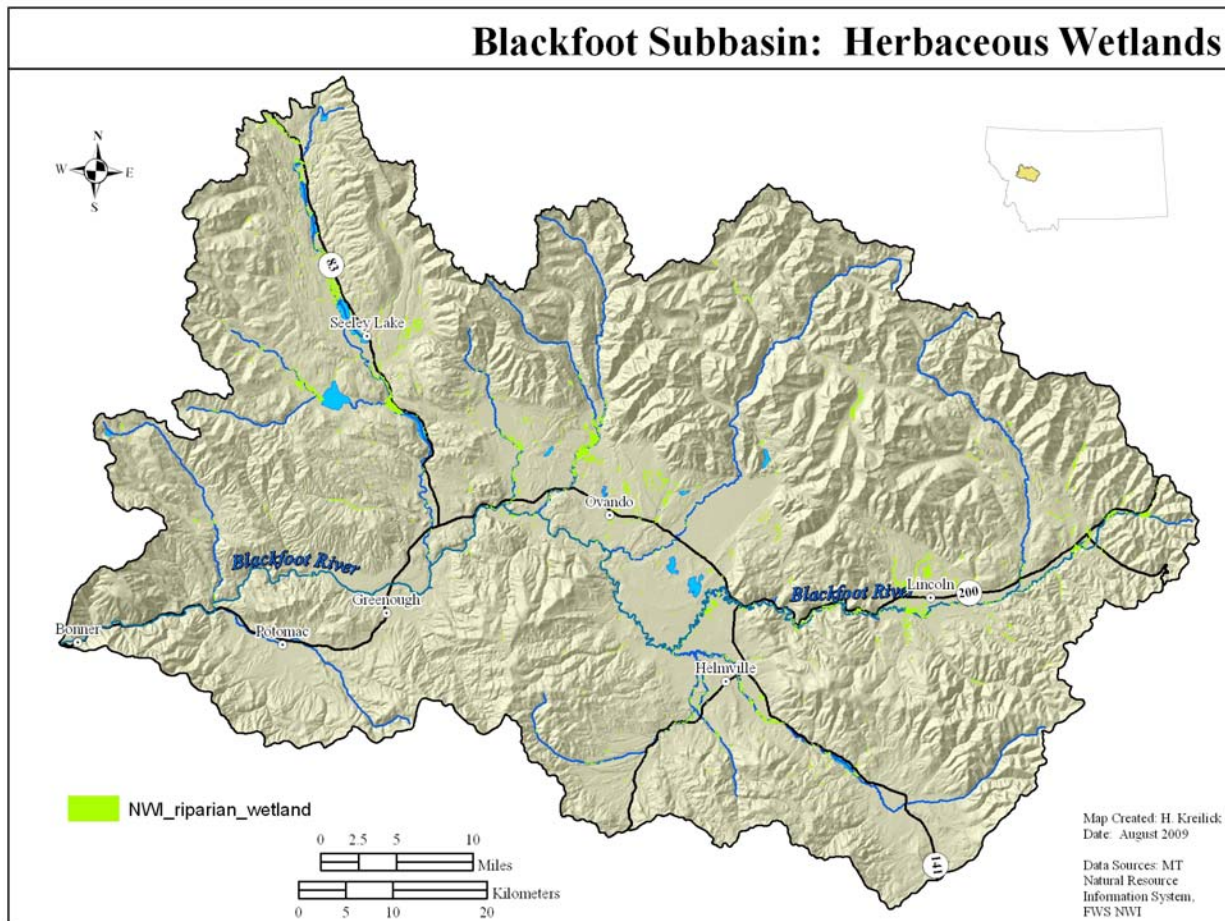
² See Appendix E for definitions of key attributes used in this assessment.

3.3.3.2 Herbaceous wetlands

Nested Targets: herbaceous wetland-associated bird, plant, amphibian and invertebrate Species of Concern

Hundreds of seasonal and permanent wetlands dot the Blackfoot Subbasin landscape (Figure 3.18). Wetland densities may exceed 100 distinct wetlands per square mile throughout portions of the subbasin. Herbaceous wetlands mainly occur on private land in the prairie-dominated valley bottom. As a result of their location, many of these wetlands are vulnerable to a variety of human impacts such as ditching, draining and plowing.

Figure 3.17 Herbaceous Wetlands.



Herbaceous wetland density in the Blackfoot is due in large part to glaciers and remnant chunks of glacial ice that formed hundreds of depressions, or glacial potholes, across the Blackfoot Valley floor. Glacial pothole wetlands are isolated wetlands that fill from winter snow melt, spring rains and/or groundwater springs. Many dry out completely or in part by the end of summer, although the larger ponds and lakes are maintained year-round by springs. Many of these glacial potholes are lined with fine silts and clays that restrict water drainage, creating

marshes, fens, wet meadows and other wetland communities dominated by herbaceous vegetation. Salinity in pothole wetlands varies greatly, creating unique associations between water and vegetation. In the Ovando Valley, for example, wetlands occurring near the northern forested communities contain relatively fresh water, while southern wetlands are more alkaline. Fen peatlands are a rare alkaline wetland type in Montana that occur in glacial potholes in the middle Blackfoot. The Potomac Valley, bisected by Union Creek, supports a large, low-gradient fen/grassland association. Herbaceous wetlands also occur throughout the Clearwater and Lincoln Valleys of the Blackfoot Subbasin.

Herbaceous wetlands are a great source of biological diversity in the Blackfoot Subbasin. It is estimated that 600 vascular plant species occur within the subbasin, nearly 30% of which are associated with wetlands (Lesica 1994). Herbaceous wetlands also provide important habitat for a range of vertebrate and invertebrate species. Herbaceous wetlands are, for example, an important component of grizzly and black bear habitat in the subbasin (BCCA Council and BC 2008).

Nested target: herbaceous wetland-associated bird Species of Concern

Glacial pothole wetland complexes in the subbasin are of particular importance to breeding and migratory birds including several state Species of Concern (USFWS 2009a, MTNHP 2009b). Brief descriptions of three of these species are provided below.

Black Tern: Breeding Black Terns have been documented in 12 Montana counties (MFWP 2005). Although breeding Black Tern colonies are located throughout many areas of Montana, these locations are scattered and limited to sites with appropriate habitat, size and vegetative composition. Little information is known about Black Tern migratory patterns in Montana. Black Tern breeding habitat in Montana consists mostly of wetlands, marshes, prairie potholes and small ponds (MFWP 2005). Over 100 nesting pairs of Black Terns have been documented in the Blackfoot Subbasin (G. Neudecker, pers. comm.). One of the known Black Tern colonies in Montana is on the Blackfoot Waterfowl Production Area (MTNHP 2009b).

Common Loon: Northwestern Montana supports the highest density of nesting Common Loons in the western United States. A Montana Partners in Flight Level I Priority Species (PIF 2000), the Common Loon occurs throughout Montana during migration.¹⁹ Breeding, however, is restricted to the northwestern corner of the state (Lenard et al. 2003). Most breeding occurs on glacial lakes > 13 acres in size and < 5,000 feet in elevation. Small islands or herbaceous shoreline areas are used for nesting and sheltered, shallow coves with abundant insects and small fish are used as nursery areas (Skaar 1990). Most lakes inhabited by loons are relatively oligotrophic and have not undergone significant siltation or other hydrological changes. The loon population of northwest Montana is limited primarily by the quantity and quality of nesting habitat (PIF 2000). During the nesting period, human caused disturbance can cause loons to leave the nest, resulting in nest failure. For this reason, relatively remote and undisturbed lakes are considered important for loon populations to

¹⁹ Ecological and management information on this and other bird species mentioned in the Blackfoot Subbasin Plan is available in the Partners in Flight Bird Conservation Plan Montana (PIF 2000) and Montana's Comprehensive Fish and Wildlife Strategy (MFWP 2005).

persist. The Blackfoot Subbasin, with numerous undisturbed lakes and ponds, provides nesting habitat for loons. Successful reproduction in the subbasin is documented each year through monitoring of known nesting pairs (BC 2005b).

Sandhill Crane: Although not ranked as a Species of Concern by MTNHP, the Sandhill Crane is a species of note in the Blackfoot Subbasin. Herbaceous wetlands and open grasslands in the subbasin provide excellent habitat for Sandhill Cranes. In the Ovando Valley, the Sandhill Crane population has grown from ~100 birds in 1988 to over 514 birds in 2003. The Potomac Valley also supports a large, breeding Sandhill Crane population (G. Neudecker, pers. comm., MTNHP 2009b).

Trumpeter Swan: The Trumpeter Swan is also a Montana Partners in Flight Level I Priority Species (PIF 2000). The breeding range of Trumpeter Swans in Montana includes the extreme southwestern corner of the state (Beaverhead County), along the Rocky Mountain Front (Lewis and Clark County), and the Flathead Indian Reservation (USFWS 1995, MTNHP 2009b). Trumpeter Swan breeding habitat includes lakes and ponds and adjacent marshes containing sufficient water to maintain submergent and emergent vegetation through the nesting season (MTNHP 2009b, Mitchell 1994). In an effort to restore a breeding Trumpeter Swan population to the Blackfoot Subbasin, the Blackfoot Challenge, working cooperatively with USWFS and MFWP, has released 112 Trumpeter Swans in the subbasin between 2005 and 2009. Twenty-two (20%) of these birds are known to be dead. Eight appear to have died from severe intestinal parasitism and emaciation; three died from power line strikes; three died from legal hunting; two were illegally shot; four died of unknown causes; and two were killed by predators. Thirty-six (32%) birds were seen alive in 2009. The remainder of the release birds were not observed in 2009 and their status is unknown (E. Caton and G. Neudecker, pers. comm.).

Nested target: herbaceous wetland-associated plant Species of Concern

Seven plants listed as Montana Species of Concern are associated with wetlands of the Blackfoot Subbasin: Beck's water marigold, watershield, small yellow lady's-slipper, crested shieldfern, pygmy water-lily, blunt-leaved pondweed and Howell's gumweed (MTNHP 2009a). More information on these species is provided in Table 3.6.

Nested target: herbaceous wetland-associated amphibian Species of Concern

The western toad, a Species of Concern in Montana (MTNHP 2009b), has been documented in the Blackfoot Subbasin. Habitats used by western toads in Montana include low elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows and marshes, as well as high elevation ponds, fens, and tarns. Surveys conducted since the early 1990s indicate that the western toad has undergone regional population declines in Montana and elsewhere in the western United States. Limiting livestock access to known breeding sites and avoiding use of fertilizers, herbicides, and pesticides within at least 100 meters of breeding sites can reduce impacts on this species (MTNHP 2009b).

Nested target: herbaceous wetland-associated invertebrate Species of Concern

Although invertebrates are not well studied in the Blackfoot Subbasin, there are a number of invertebrate Species of Concern and Potential Species of Concern associated with herbaceous

wetlands west of the Continental Divide. Data on these species are maintained by the Montana Natural Heritage Program and provided in Appendix F.

Table 3.12 Herbaceous Wetlands Viability Assessment.

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Size (Areal extent): Number, distribution and size of wetlands by wetland type	Number, distribution and size of wetlands by wetland type compared to HRV ^{1, 2}	< 80% intact	80-90% intact	90-95% intact	> 95% intact	good	very good	Use ASCS flyover data; NWI/aerial photo interpretation. Baseline inventory is needed to determine accuracy of these indicator ratings.
Landscape Context (Functional Hydrologic Regime): Intactness of wetland hydrology	Areal extent of filled or drained wetlands by wetland type	< 80% intact	80-90% intact	90-95% intact	> 95% intact	good	very good	NRCS SSURGO soils database may be used to determine historical extent of hydric soils.
Condition (Intactness): Lack of human-caused disturbance	Percent of physically disturbed wetlands by wetland type	< 25% intact	25 to 50% intact	50 to 75% intact	> 75% intact	fair	good	“Disturbance” includes physical and physiological impacts from human activities (e.g., grazing recreational use, draining, filling).
Condition (Native vegetation community intactness)	Extent and proportion of exotic invasive species	< 25% intact	25 to 50% intact	50 to 75% intact	> 75% intact	fair	good	This indicator rating scale is for individual wetlands. Includes exotic pasture grasses and annual grasses.
Condition (Reproductive Success of Common Loons)	Territory occupancy and fledging rate of loons	< 10 occupied territories; < 0.4 chicks per pair fledged	10-12 occupied territories: 0.4-0.5 chicks per pair fledged	12-15 occupied territories: 0.5-0.6 chicks per pair fledged	> 15 occupied territories: > 0.6 chicks per pair fledged	good	very good	This indicator is a measure of <i>disturbance</i> by humans and other factors. Rating numbers developed from Common Loon monitoring data (Hammond 2009). Ratings apply to herbaceous wetlands <i>and</i> to larger lakes used for loon nesting.

Table 3.12 (continued).

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Condition (<i>Reproductive Success of Trumpeter Swans</i>)	Nesting and fledging rate of Trumpeter Swans	< 2 nests; < 1 chick fledged per nest	2-4 nests; 1-1.5 chicks fledged per nest	5-7 nests; 1.5-2 chicks fledged per nest	> 7 nests; > 2 chicks fledged per nest	poor	very good	This indicator is a measure of <i>disturbance</i> by humans and other factors. Rating numbers developed from Trumpeter Swan monitoring data (UM Watershed Health Clinic and USFWS 2005). Ratings apply to herbaceous wetlands <i>and</i> to larger lakes used for swan nesting.

¹ HRV refers to “historic range of variability,” or the range of critical ecological processes and conditions that have characterized particular ecosystems over specified time periods (i.e., 100-1,000 years ago) and under varying degrees of human influences. An understanding of HRV allows managers to understand the dynamic nature of ecosystems, the processes that sustain and change ecosystems, the current state of the ecosystem in relationship to the past and the possible ranges of conditions that are feasible to maintain. HRV is a useful tool for determining a range of desired future conditions and for establishing the limits of acceptable change. Best available science and on the ground expertise are used to determine HRV. Once the HRV is established for an area, it can be compared to existing vegetative conditions to determine departures from HRV. This information can aid conservation and resource management planning.

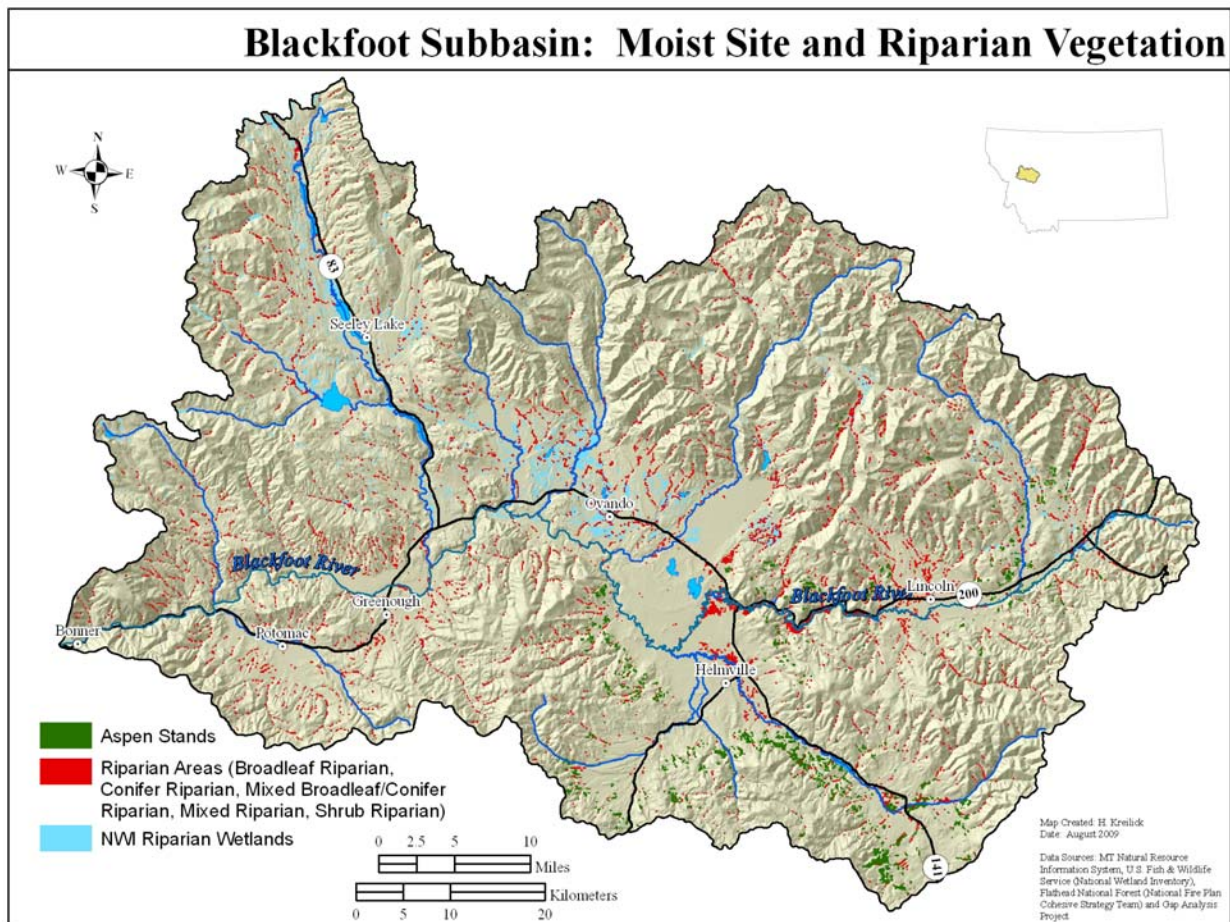
² In this case, HRV refers to the historic number, distribution and size of wetlands by wetland type in the subbasin. Collecting this baseline information is a high priority strategic action listed under conservation objectives 4-8 in the Blackfoot Subbasin Management Plan (Section 5.0).

3.3.3.3 Moist site and riparian vegetation

Nested Targets: riparian-dependent birds

Riparian communities occur along 1,900 miles of creeks, streams, and rivers in the Blackfoot Subbasin (Figure 3.19). Vegetation is typically dominated by black cottonwood, aspen, Engelmann spruce, and/or shrub (willow, birch, alder and dogwood) plant communities. Large willow swamps, for example, occur along Cottonwood and Monture Creeks and riparian cottonwood forests occur along the North Fork and the mainstem of the Blackfoot River. Riparian cottonwood forests develop in river and stream corridors on alluvial bars created by dynamic flows of spring runoff and mature into forests that eventually alter the direction of water flow. These forests keep waters cool in summer and support a variety wildlife species (MFWP 2005). Riparian and wetland communities support the greatest concentration of plants and animals in Montana and serve as a unique transition zone between aquatic and the terrestrial environments (MFWP 2005). Riparian communities provide crucial wildlife habitat in the Blackfoot Subbasin as well as important stream stability and fishery functions.

Figure 3.18 Moist Site and Riparian Vegetation.



Intact riparian vegetation helps to filter sediment, prevent erosion and stabilize streambanks, store water and recharge aquifers and dissipate stream energy (Karr and Schlosser 1978, Platts 1979, Marlow and Pogacnik 1985).

Moist site vegetation in the subbasin includes aspen groves and cottonwood, willow, alder and other woody plant communities not directly associated with surface water systems. Large aspen groves found throughout the subbasin provide essential habitat for a variety of wildlife species including elk, mule deer, and cavity-nesting birds. These communities are located at all elevations but make up the greatest aerial extent within the prairie-dominated valley bottoms and draws where groundwater is at or near the surface for at least a portion of the growing season (Figure 3.19). Aspen communities, like riparian and wetland communities, are highly productive habitat for wildlife and plants in the Rocky Mountain region.

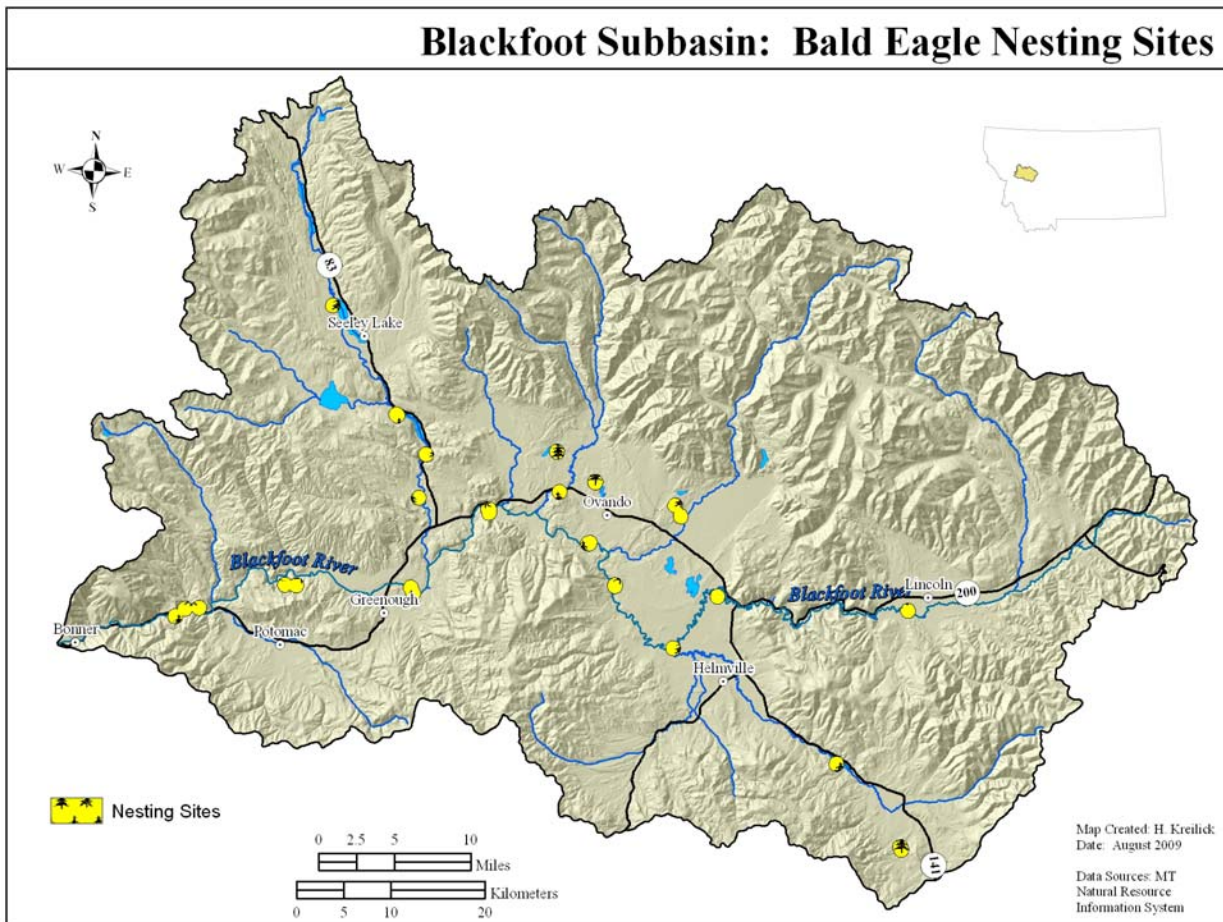
All of the woody plant dominated wetland types encountered in the Blackfoot Subbasin have been subjected to a variety of human impacts since European settlement (ca. 1880) including flood control, clearing, ditching, beaver control, fire control and grazing pressure. These disturbances have resulted in a subbasin-wide reduction in coverage and health of these community types.

Nested target: riparian-dependent birds

Riparian and wetland areas typically support more species of breeding and migratory birds than any other habitat in the West, even though they account for less than 1% of the landscape. In addition, a large proportion of declining bird species and Species of Concern are dependent upon riparian and wetland habitats. Bird communities can serve as indicators of ecosystem health because they reflect an integration of a broad array of ecological conditions, including water quality, productivity, landscape integrity and vegetation structure and composition. Species that indicate intact riparian systems in the Blackfoot Subbasin include Veery, Red-eyed Vireo, Bullock's Oriole, American Redstart, Bald Eagle, Osprey and American Dipper. Riparian zones along small-order streams support different species than riparian bottomlands (e.g., Willow Flycatcher, Wilson's Warbler). Brief descriptions of Bald Eagle and Veery, both Species of Concern in Montana (MTNHP 2009b), are provided below.

Bald Eagle: After serious population declines in the late 1960s and 1970s, the Bald Eagle was listed as a threatened species in the Rocky Mountain states. The species was delisted from threatened status in July 2007 (USFWS 2009b). Bald Eagles prefer late successional forests and shorelines adjacent to open water lakes and rivers. The Montana Bald Eagle Working Group characterized quality habitat as mature forest stands of low to moderate canopy closure consisting of cottonwood, Douglas-fir, ponderosa pine or mixed conifers. Forest stands with nest sites should be 20 acres or larger and be located within one mile of open water. Stands should contain at least two suitable nest trees and more than three perch trees (MBEWG 1991). The Blackfoot River provides year round habitat for Bald Eagles, including a number of nest sites (Figure 3.20).

Figure 3.19 Bald Eagle Nesting Sites.



Veery: Veerys breed in moist, low elevation deciduous forests with a dense understory. They are also found in thick and wide willow or alder riparian habitat (PIF 2000). Veerys have a strong preference for deciduous riparian habitats in many areas (Moskoff 1995). Although Veery populations have increased in the northern Rockies, its preference for large riparian stands with dense understories and its susceptibility to Brown-headed Cowbird nest parasitism make it a vulnerable species (PIF 2000). Mosconi and Hutto (1982) found a negative response to grazing when comparing heavy versus light grazing intensity.

Table 3.13 Moist Site and Riparian Vegetation Viability Assessment.

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Landscape Context <i>(Functioning natural disturbance regime):</i> Fire, flooding, browsing, beaver	Composition and structure of native plant community	< 25% of HRV ¹	25-50% of HRV	51-75% of HRV	> 75% of HRV	fair	good	HRV refers here to historic composition and structure of native plant community.
Condition <i>(Intactness):</i> Lack of human disturbance	Percent physically disturbed	< 25% intact	25 to 50% intact	51 to 75% intact	> 75% intact	fair	good	“Human disturbances” include grazing, bank alteration, draining, chemical use, etc.
Condition <i>(Native vegetation community not invaded by exotic plants)</i>	Extent and proportion of exotic invasive species	< 25% intact native plant community	26 to 50% intact native plant community	51 to 75% intact native plant community	> 75% intact native plant community	fair	good	Use USFS Region 1 noxious weed risk assessment (Mantas 2003).
Size <i>(Aerial Extent):</i> Number, size, or area of moist site and riparian vegetation	Miles/acres of current moist site and riparian vegetation relative to HRV	< 25% of HRV	25-50% of HRV	51-75% of HRV	> 75% of HRV	fair	good	HRV refers here to historic extent (miles/acres).

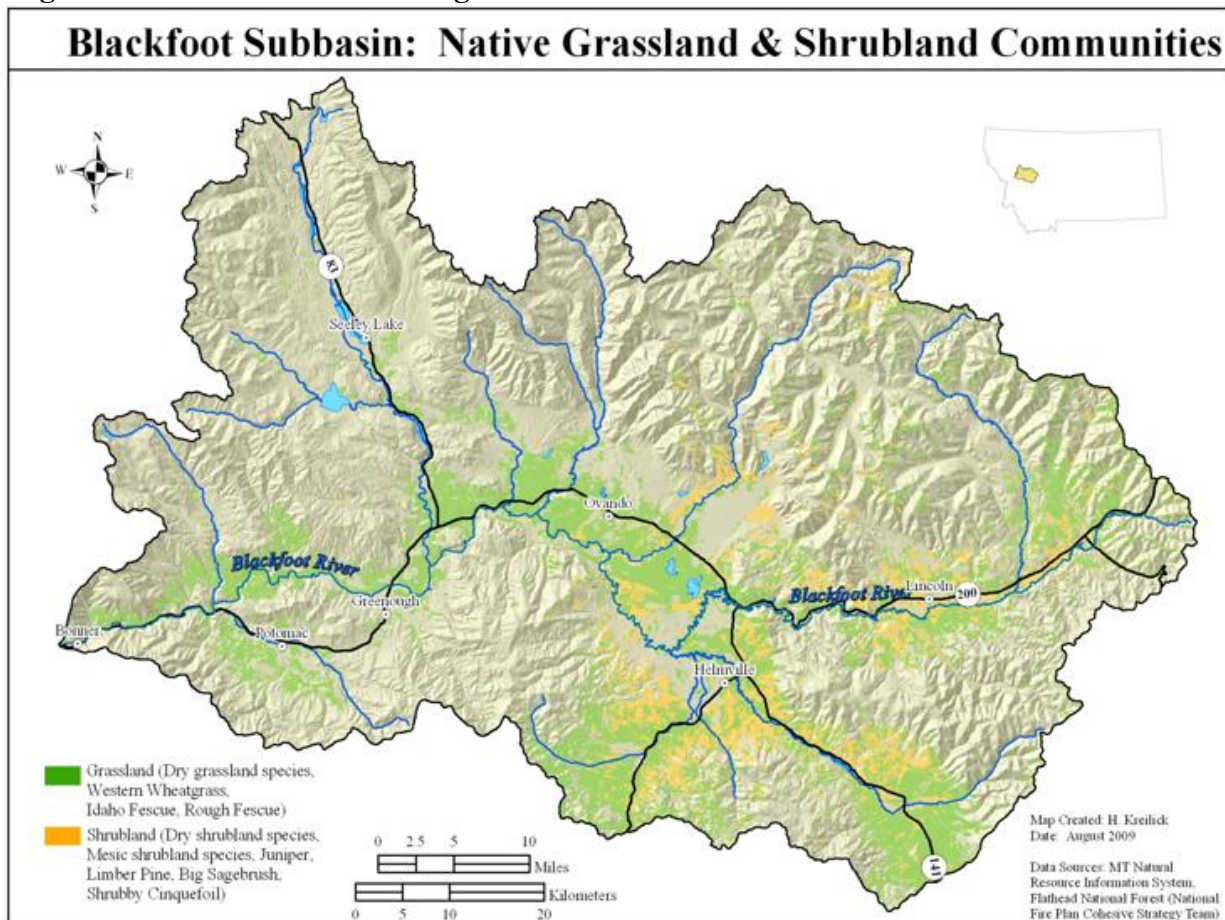
¹ HRV refers to “historic range of variability.” A definition of HRV is provided in Table 3.12

3.3.3.4 Native grassland/sagebrush communities

Nested Targets: grassland/sagebrush-associated bird and plant Species of Concern; ungulate winter range

Sweeping expanses of native bunchgrass prairie are one of the most striking visual elements of the Blackfoot Subbasin. Sagebrush and grassland areas in the subbasin were targeted by early European settlers for grazing and farm lands. Today, the majority of native grassland/sagebrush communities are located on private land in the subbasin (Figure 3.21). Large bunchgrass prairies occur throughout the valley bottoms. The dominant bunchgrass is rough fescue; other common native grasses include bluebunch wheatgrass, Idaho fescue, prairie junegrass and several species of needle grass. The big sagebrush-dominated plant community type is most prevalent in the middle Blackfoot Valley south of the Blackfoot River. Native grassland and sagebrush communities often occur in a matrix throughout the valley. Grassland complexes are associated with more terrestrial species in greatest need of conservation than any other community type in Montana (MFWP 2005). Information on rare grassland/sagebrush communities known to occur in the Blackfoot Subbasin is provided in Section 3.2.7.1.

Figure 3.20 Native Grassland/Sagebrush Communities.



Fire is critical to maintaining native grassland/sagebrush communities. The historic fire regime in rough fescue communities, for example, was characterized by frequent return-interval (five to ten years), low severity fires. The historic fire regime in sagebrush communities was characterized by longer return-interval (>25 years), stand-replacing fires. The exclusion of fire from these communities has resulted in the encroachment of tree seedlings that eventually shade out and eliminate native bunchgrasses. In native grasslands, a longer fire return interval has resulted in an increase in sagebrush cover in some portions of the subbasin.

Nested target: grassland/sagebrush-associated bird Species of Concern

Grassland bird populations are declining throughout North America. Factors contributing to the decline include habitat loss and conversion (PIF 2000). A variety of Montana bird Species of Concern are associated with native grassland/sagebrush communities in the Blackfoot Subbasin. A brief description of five of these species follows.

Columbian Sharp-tailed Grouse: Native grassland/sagebrush communities in the Blackfoot Subbasin provide habitat for Columbian Sharp-tailed Grouse, a Montana Partners in Flight Level I Priority Species (PIF 2000). A Sharp-Tailed Grouse subspecies, the Columbian Sharp-tailed Grouse has undergone significant rangewide decline. Historically, they ranged in suitable habitats from British Columbia south through eastern Oregon and Washington, Idaho, western Montana, Wyoming, and Colorado, and northern Utah, Nevada, and California. They have now been extirpated from Oregon, California and Nevada and currently occupy less than 10% of their historic range. Remaining populations are small and widely separated from other populations. Idaho has the best remaining populations, which include 75% of the remaining birds. In Montana, there are two known remnant populations: 1) in the Tobacco Valley near Eureka and 2) in the Blackfoot Valley near Helmsville. A self-sustaining population of Columbian Sharp-tailed Grouse needs thousands of acres of suitable habitat (Ulliman et al. 1998). Neither of the two remnant populations in Montana, however, currently has enough contiguous habitat to support viable populations over the long term. The conversion of native grassland and shrub/grass communities to agriculture and other incompatible land uses has been primarily responsible for the reduction in Columbian Sharp-tailed Grouse populations. Much of the remaining historical habitat that has not been converted to other uses has been degraded by fire (too much in some areas; not enough in other areas), invasion of non-native annual vegetation and excessive grazing by livestock (Ulliman et al. 1998, PIF 2000).

Long-billed Curlew: The Long-billed Curlew is one of the most threatened shorebird species on the continent (National Audubon Society 2007). It is a Species of Concern in Montana (MTNHP 2009b) and is included on the National Audubon Society's Watch List (National Audubon Society 2007). North America's largest shorebird, the Long-billed Curlew is found throughout the northwestern states where sufficient native grassland remains for nesting sites. In Montana, Long-billed Curlews breed and migrate throughout the state but do not overwinter here. Long-billed Curlews prefer well-drained native grasslands, sagebrush and agricultural land with gently rolling topography (PIF 2000). They use their long, curved bills to feed on grasshoppers and other insects. They seem to require large blocks of grasslands: Bicak et al. (1982) found that territories averaged 35 acres in size. The North American Long-billed Curlew population has declined as suitable nesting habitat has been converted to

incompatible land uses (PIF 2000, Lenard et al. 2003). In Montana, much of the suitable Long-billed Curlew breeding habitat is fragmented and unprotected (Redmond in Clark et al. 1989). Small population size and negative population trends, combined with threats of habitat degradation on both breeding and wintering grounds, make the Long-billed Curlew a high conservation priority (National Audubon Society 2007).

Brewer's Sparrow: Brewer's Sparrows are characteristic of native grassland/sagebrush habitat and nest in large, living sagebrush, mainly using shrubs >20 inches tall (Peterson and Best 1985). Their nests are near the ground, and are usually located in the finest branches of new growth near the tips of branches, so shrubs in good vigor are important to nesting (PIF 2000). They show strong site fidelity, returning year to year to nest in the same area (Wiens and Rotenberry 1985). Brewer's Sparrows are vulnerable to parasitism by Brown-headed Cowbirds, especially where the sagebrush landscape has been fragmented by agriculture and pastures. Reductions in sagebrush cover and vigor from control actions such as burning or herbicides reduces or eliminates habitat suitability for the species. The long-term viability of Brewer's Sparrows in Montana will depend on the maintenance of large stands of sagebrush in robust condition (PIF 2000).

Grasshopper Sparrow: Grasshopper Sparrows breed from southern British Columbia to southern Maine and south to southern California, central Texas and central Georgia. The majority of Grasshopper Sparrows are found in the Great Plains from North Dakota to Texas and east to Illinois. Grasshopper Sparrows prefer grasslands of intermediate height (Vickery 1996). They use both native grasslands and tame pastures (Wilson and Belcher 1989) and have occasionally been found using cropland, but at much lower densities than within grasslands (Smith 1968, Ducey and Miller 1980, Best et al. 1997). The Grasshopper Sparrow has experienced rangewide population declines due to habitat fragmentation and incompatible land use practices (PIF 2000).

Bobolink: The Bobolink is a migratory bird that breeds in the grasslands of North America and winters in South America (Jaramillo and Burke 1999). Within the western United States, distribution is discontinuous and spotty with large areas lacking birds. Bobolinks rely on dense, tall grasslands for nesting. Bobolinks are found in native grasslands as well as non-native, tame pastures, hayfields, wet meadows and old fields that are characterized by relatively dense, tall grass (PIF 2000). Bobolinks are area-sensitive and prefer large grasslands (Helzer 1996).

Nested target: grassland/sagebrush-associated plant Species of Concern

At least two plant Species of Concern occur in native grassland/sagebrush communities in the Blackfoot Subbasin: Missoula phlox and Howell's gumweed (MTNHP 2009b). More information on these species is provided in Table 3.6.

Nested target: ungulate winter range

Critical habitat for sustaining elk populations in the Blackfoot Subbasin ranges from high elevation Wilderness areas to private valley lands and includes a mosaic of aspen stands, serviceberry and native bunchgrass prairies (Figure 3.22). Native grassland/sagebrush communities provide critical forage for ungulates during the winter months. The elk population

in the Blackfoot has increased over the last 15 years. MFWP estimates that there are approximately 6,000 elk in the Blackfoot Subbasin. The Blackfoot-Clearwater Wildlife Management Area currently provides winter range for 1,200 elk, 800 mule deer, and 800 white-tailed deer (J. Kolbe, pers. comm.).

Figure 3.21 Ungulate Winter Range.

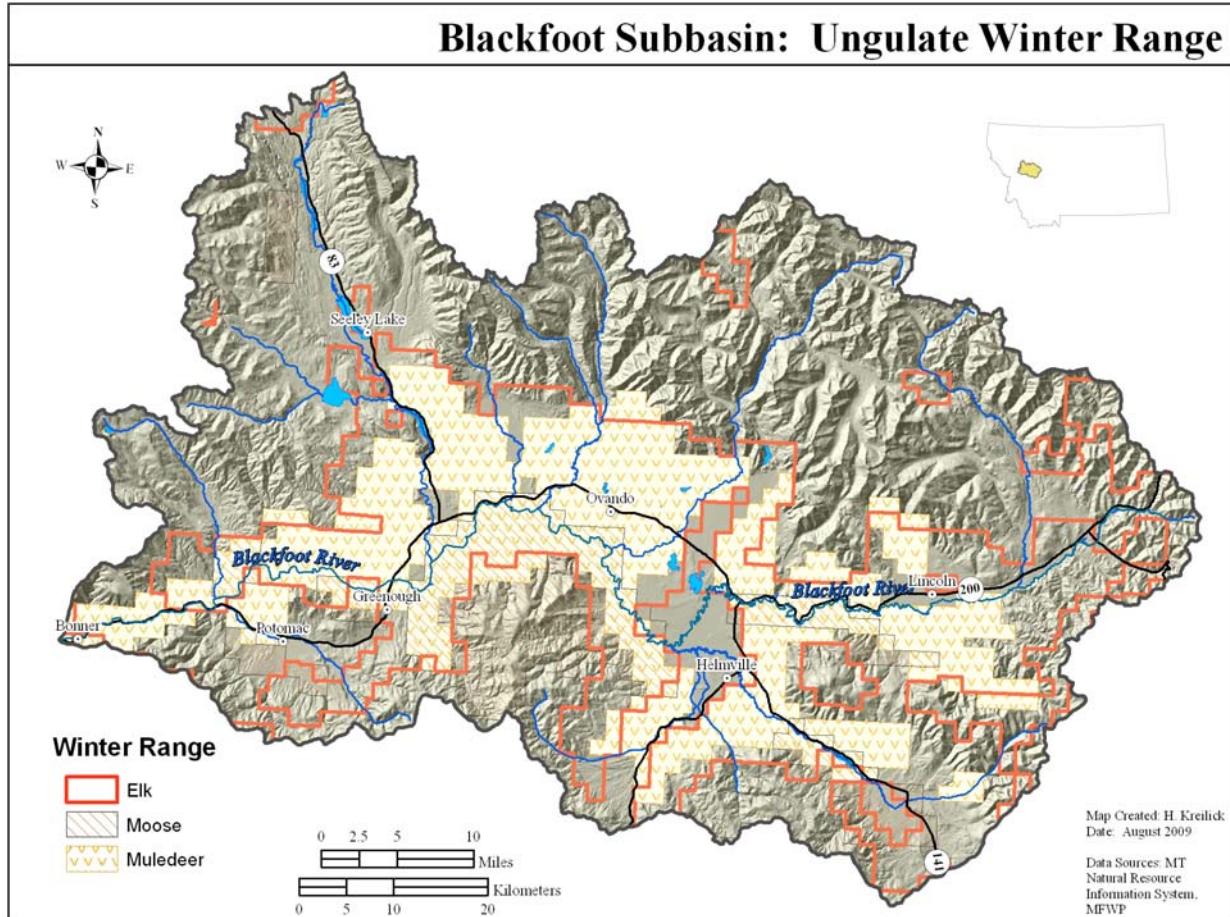


Table 3.14 Native Grassland/Sagebrush Communities Viability Assessment.

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Landscape Context (<i>Functioning fire regime</i>)	Fire Return Interval (FRI)	FRI < 25% of HRV ¹	FRI at 25 to 50% of HRV	FRI at 51-75% of HRV	FRI at > 75% of HRV	poor	good	Historic FRI was 5-10 years in rough fescue grassland and > 25 years in sagebrush. Longer FRI and grazing practices have probably increased sagebrush cover in some places in the valley.
Condition (<i>Native vegetation community intactness</i>)	Composition and structure of native plant community	< 25% of HRV	25-50% of HRV	51-75% of HRV	> 75% of HRV	fair	good	HRV refers here to historic structure and composition.
Condition (<i>Native plant community not invaded by exotic plants</i>)	Extent and proportion of exotic invasive species	< 25% intact native plant community	25 to 50% intact	51 to 75% intact	> 75% intact	poor	good	Includes exotic pasture grasses and annual grasses. Use USFS Region 1 noxious weed risk assessment (Mantas 2003).
Size (<i>Areal Extent</i>): Area/size of grasslands/sagebrush by vegetation type	Acres of grassland/sagebrush habitats throughout the subbasin in historic locations	< 25% of HRV	25-50% of HRV	51-75% of HRV	> 75% of HRV	fair (?)	good (?)	HRV refers here to historic extent (acreage). Ratings take into account acreage lost due to conifer encroachment. Baseline inventory is needed to determine accuracy of these indicator ratings.

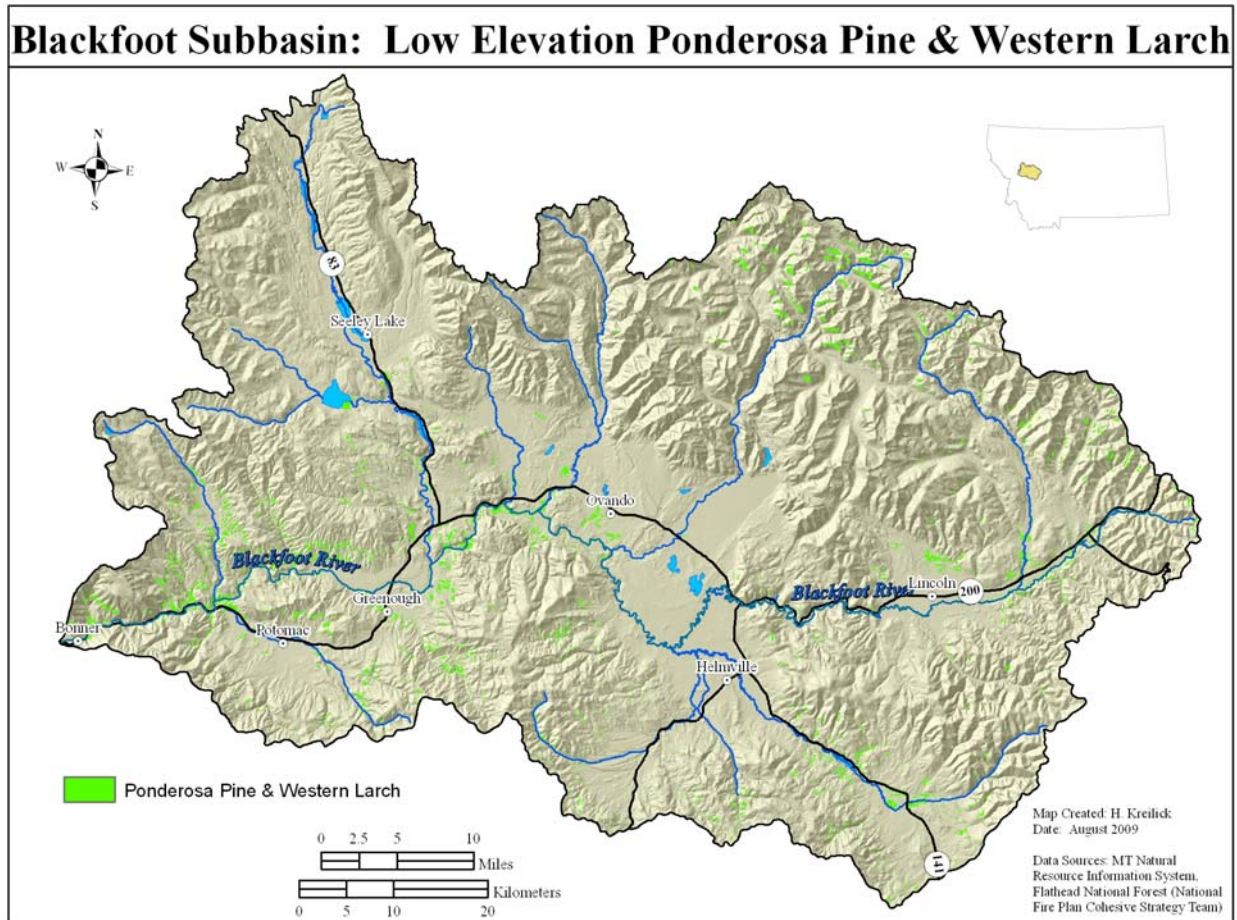
¹ HRV refers to “historic range of variability.” A definition of HRV is provided in Table 3.12.

3.3.3.5 Low elevation ponderosa pine/western larch forest

Nested targets: low elevation ponderosa pine/western larch forest-associated birds; ungulate winter range

Relatively dry and warm conditions prevail at low elevations and on gentle slopes in the Blackfoot Subbasin, giving rise to forest cover types dominated by ponderosa pine and western larch. The ponderosa pine forest type occurs on dry, forested sites within the Blackfoot Subbasin. The open-grown western larch forest type occurs on slightly more mesic. Low elevation ponderosa pine/western larch forests are distributed across many land ownerships in the subbasin, but are found primarily on USFS, DNRC, Plum Creek Timber Company and Nature Conservancy lands (Figure 3.23).

Figure 3.22 Low Elevation Ponderosa Pine/Western Larch Forest.



Historically, these forests were more open-grown than forests at mid to high elevations. This structure was created and perpetuated by frequent (5-25 year mean return interval), low to moderate severity fires that burned primarily in the understory (Morgan et al. 1998). In these open stands, fire-resistant ponderosa pine and western larch trees grew to very large diameters (up to and exceeding 36 inches). The forest understory was characterized by light fuel loads and native perennial grasses. This is especially true for mature, widely-spaced stands of ponderosa pine with relatively low stand densities (trees/acre). Downed woody fuels in such stands usually consisted of widely scattered, large trees (deadfalls) and concentrations of needles, twigs, branches, bark flakes and cones near the base of individual trees (Fisher and Bradley 1987). The western larch type also supported low densities of small-statured shrubs. Some researchers suggest that some low elevation ponderosa pine systems may be better characterized by mixed severity than by low severity fire regimes (Agee 1993, Shinneman and Baker 1997, Brown et al. 1999, Veblen 2000, Schoennagel et al. 2004, Baker et al. 2007, Hessburg et al. 2007). High severity fires were likely part of this mix (Hutto 2008).

Most low elevation ponderosa pine/western larch forests in the subbasin have been harvested over the past 125 years, and many of the large diameter trees have been removed. In addition, nearly 100 years of fire control has resulted in a dramatic shift in forest density, structure, composition and age class distribution away from the historic range of conditions. Due to this combination of harvest history and fire suppression, many low elevation forests in the Blackfoot Subbasin today are comprised of closely-spaced, small diameter ponderosa pine and Douglas-fir at stand densities higher than historic conditions. These current stand conditions make this forest type prone to drought stress, insects, disease and stand-replacing fires.

Nested target: low elevation ponderosa pine/western larch forest-associated birds

Species associated with low elevation ponderosa pine/western larch forests in the Blackfoot Subbasin include Flammulated Owl, Lewis's Woodpecker, Pygmy Nuthatch, and Solitary (Cassin's) Vireo. A brief description of two of these species, both Montana Species of Concern (MTNHP 2009b), follows.

Flammulated Owl: The Flammulated Owl, a Montana Partners in Flight Level I Priority Species (PIF 2000), breeds from southern British Columbia to southern Mexico (McCallum 1994). In Montana, the first Flammulated Owl nesting record was not documented until 1986 (Holt et al. 1987). Most Montana breeding records are from west of the Continental Divide. Breeding habitat for Flammulated Owls consists primarily of low to mid-elevation, open ponderosa pine and/or western larch forest (PIF 2000). Flammulated Owls nest primarily in cavities excavated by Pileated Woodpeckers and Northern Flickers in large trees and snags. Due to this affiliation, they are tied to the preferred nesting trees of these two species. In northwestern Montana, Pileated Woodpeckers in particular are strongly associated with mature to old-growth western larch and ponderosa pine forests, making these important habitats for Flammulated Owls as well (Holt and Hillis 1987, Reynolds and Linkhart 1992, McClelland and McClelland 1999).

Lewis's Woodpecker: The breeding range of the Lewis's Woodpecker extends from southwestern Canada south to southern New Mexico and Arizona, west to western California, and east to eastern Colorado, approximating the distribution of ponderosa pine in North America. The Lewis's Woodpecker generally winters in the southern portion of its

breeding range north to southwestern Oregon, central Utah and central Colorado (Tobalske 1997). Lewis's Woodpeckers have been recorded during the breeding season in all parts of Montana except the northeastern quarter (Lenard et al. 2003). The three primary breeding habitats of Lewis's Woodpeckers in Montana and elsewhere are open ponderosa pine forest, burned coniferous forests and open riparian woodland (particularly cottonwood) (Bock 1970, Linder 1994, Vierling 1997). Lewis's Woodpeckers are commonly associated with an open forest canopy that permits flycatching, dense understory shrub coverage to generate an abundance of insects and large snags for nesting (Bock 1970, Linder 1994). This species is considered a burn specialist due to its relatively high nesting success and high breeding densities in burned ponderosa pine forests (Saab and Vierling 2001, Gentry and Vierling 2007, Saab et al. 2007). In unburned forests, necessary snag and understory conditions are generally found in older, open stands that lack a dense layer of subcanopy trees. Lewis's Woodpecker populations in North America have declined in recent decades (PIF 2000).

Nested target: ungulate winter range

Low elevation forests in the Blackfoot Subbasin are a key component of ungulate winter range, providing thermal cover and lower snow depths. Maintaining connectivity between these low elevation forests and native grassland/sagebrush communities (see Section 3.3.3.4) is important for ensuring the functionality of winter range habitat in the subbasin. See Figure 3.21.

Table 3.15 Low Elevation Ponderosa Pine/Western Larch Forest Viability Assessment.

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Landscape Context/Condition <i>(Functioning disturbance regime):</i> Fire	Appropriate species composition and structure in the understory and overstory relative to historic conditions	< 25% of HRV ¹	25-50% of HRV	51-75% of HRV	> 75% of HRV	poor	good (by year 2058)	HRV refers here to historic structure and composition. Indicator includes down and standing dead wood.
Landscape Context/Condition <i>(Patch Size and Distribution of Age Classes)</i>	Patch Dynamic Analysis: Departure from HRV for all cover types and age classes	< 25% of HRV	25-50% of HRV	51-75% of HRV	> 75% of HRV	poor	good (by year 2108)	HRV refers here to historic patch size and distribution of age classes.

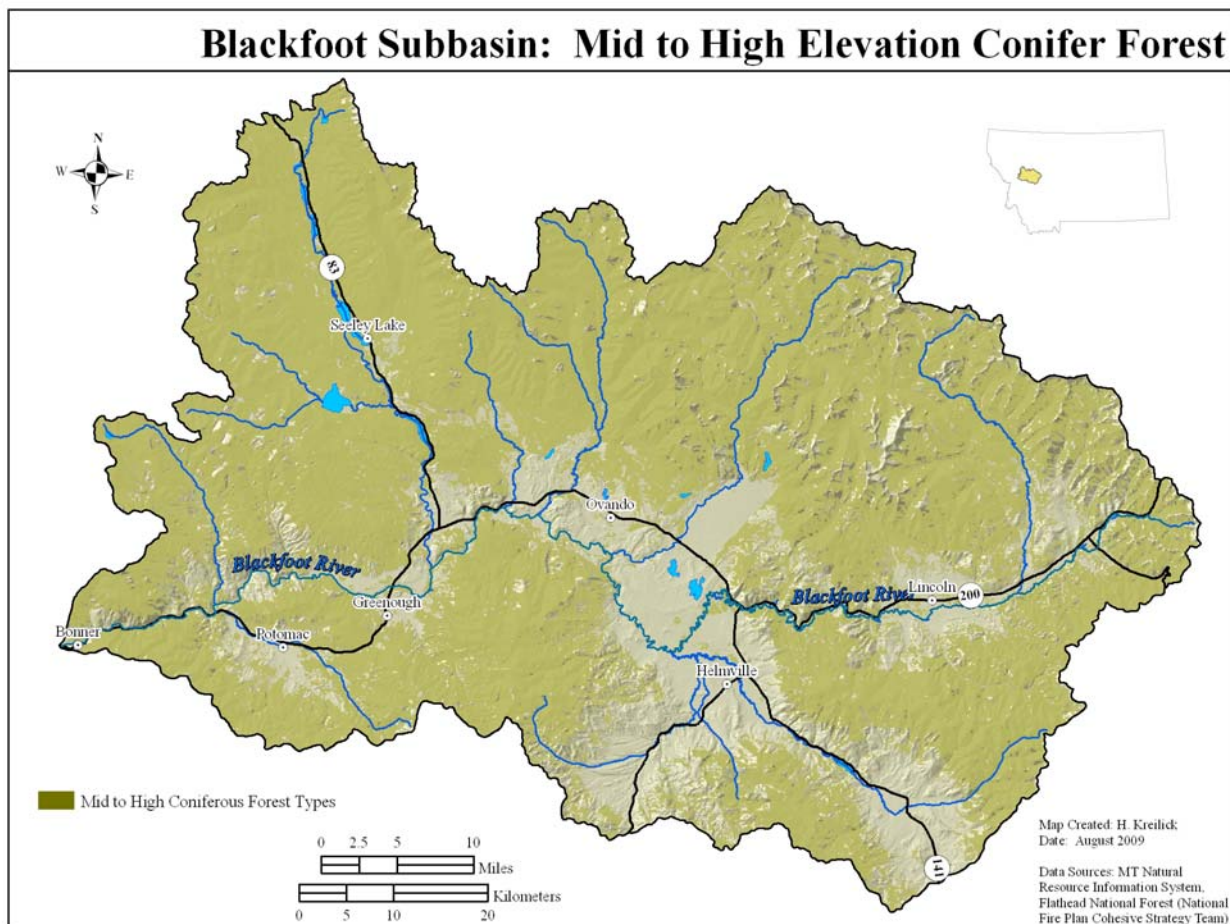
¹HRV refers to “historic range of variability.” A definition of HRV is provided in Table 3.12.

3.3.3.6 Mid to high elevation coniferous forest

Nested Targets: mid to high elevation coniferous forest-associated birds; forest carnivores; whitebark pine

Mixed coniferous forest vegetation dominates at mid to upper elevations in the Blackfoot Subbasin (Figure 3.24). This forest type is found primarily on USFS and BLM lands, with smaller amounts on DNRC, Plum Creek Timber Company and Nature Conservancy lands. Depending on aspect, elevation and slope, various cover types occur including lodgepole pine, subalpine fir/Engelmann spruce and subalpine fir/whitebark pine. Western larch and Douglas-fir may also be significant components within these types. Whitebark pine is most common in subalpine areas. Forest structure, composition, and age class distribution varies with time since the most recent disturbance (timber harvest or fire). Older stands generally have continuous forest canopy cover. Down and standing dead wood is an important component of this forest type.

Figure 3.23 Mid to High Elevation Coniferous Forest.



Until recently, much of the mid-elevation forested land in the Blackfoot Subbasin was owned by corporate timber companies. Mid-elevation forests have been heavily roaded and harvested over the past 50 years and noxious weeds have invaded many of the disturbed sites. As a result of timber harvest and road building, species composition, structure, and age class distribution in mid-elevation forests have been significantly altered from historic conditions. In high elevation forests, white pine blister rust has also contributed to the departure from historic conditions.

Suppression of naturally occurring wildfires in the last 100 years has further affected composition, structure and age class distribution in both mid and high elevation forest types. The historic fire regime in mid and high elevation coniferous forests was characterized by mixed-fire frequency and severity, including either some infrequent severe fire events or patches of severe fire during fire events that occurred at intermediate frequencies (Schoennagel et al. 2004, Baker et al. 2007, Sherriff and Veblen 2007). Disturbed forest conditions are necessary for the maintenance of many plant and animal species (Hutto 2008). The Black-Backed Woodpecker, for example, is nearly restricted in its distribution to burned forest conditions (see below). There is a need, therefore, to manage for and maintain mixed and high severity fire in mid and high elevation forests in the Blackfoot Subbasin (D. Hutto, pers. comm.).

Nested target: mid to high elevation coniferous forest-associated birds

Black-backed Woodpecker: The Black-backed Woodpecker, a Montana Partners in Flight Level I Priority Species (PIF 2000) and Montana Species of Concern (MTNHP 2009b), occurs in mid to high elevation mixed conifer forests from New England and eastern Canada, across Canada to southern Alaska and south in the Rocky Mountains to Wyoming. It is a resident species in the forested habitats of Montana from the Rocky Mountain Front westward. The Black-backed Woodpecker is considered a sensitive, special concern, or management indicator species by most Montana agencies because of its strong association with burned forest conditions (Hutto 1995b, Dixon and Saab 2000, PIF 2000, Hutto and Young 2002, Hutto 2008). It is strongly associated with dying or dead trees infested with beetles. Mature and old-growth forests containing patches of beetle infested trees may provide habitat to support baseline populations of Black-backed Woodpeckers when burned areas are not available (Goggans et al. 1988).

Olive-sided Flycatcher: The Olive-sided Flycatcher, a Montana Partners in Flight Level I Priority Species (PIF 2000), generally occurs in mid to high elevation coniferous forests throughout the mountains of western North America (Altman 1997). It breeds throughout western Montana. Olive-sided Flycatchers have been found to be more abundant in disturbed than in undisturbed forests in the northern Rocky Mountains, including early postfire and logged (both partial cut and clearcut) habitats (Tobalske et al. 1991, Hutto and Young 1999). They appear to require large residual snags and/or live trees for foraging and singing perches (Altman 1997). Olive-sided Flycatcher populations appear to be in decline. In the northern Rocky Mountains, populations declined approximately 3% from 1966 to 1996, and approximately 5.8% within Montana over the same period (Sauer et al. 1997, PIF 2000).

Northern Goshawk: Northern Goshawks in western Montana and northern Idaho have been found to nest in mature to old-growth conifer forests (Hayward and Escano 1989). Douglas-fir and western larch seem to be the preferred species for nesting in the northern Rockies

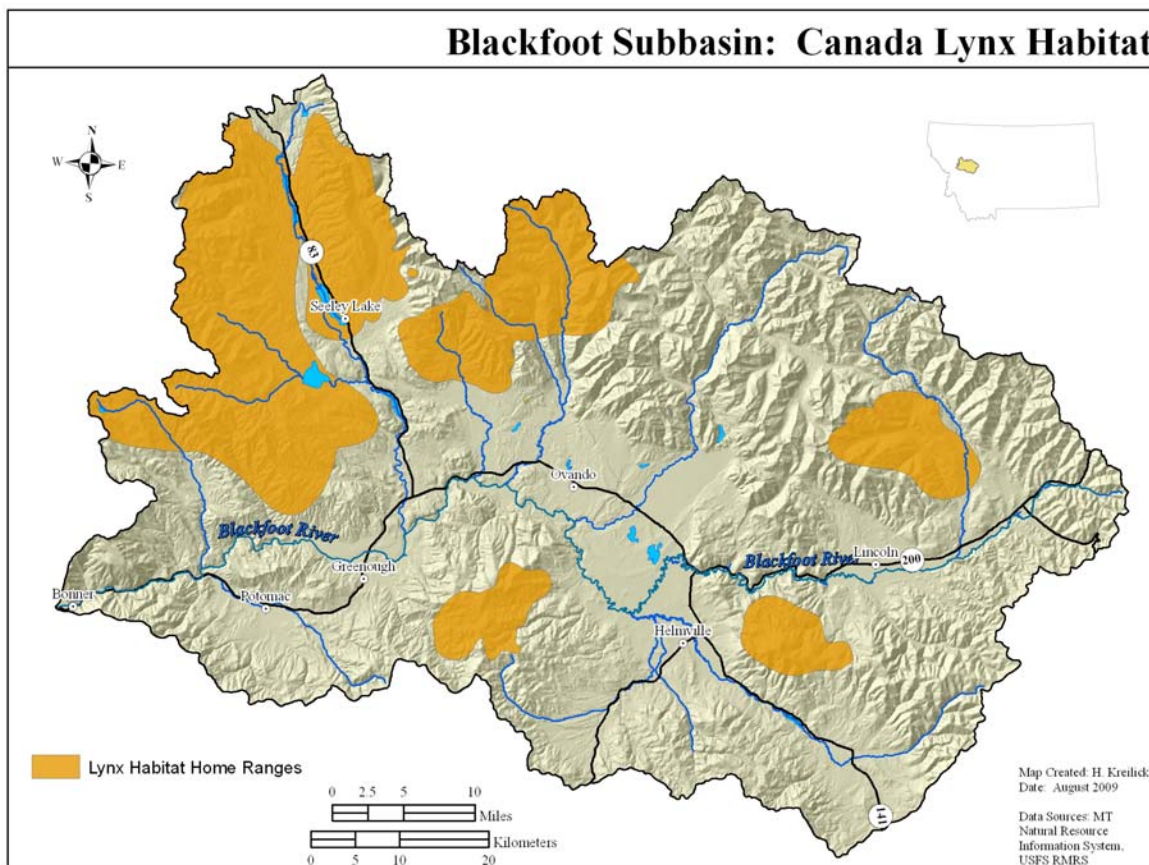
(Hayward et al. 1990). A survey of 316 nests in northern Idaho, Montana, western North Dakota, and northwestern South Dakota indicated that 60% of nest sites were in the Douglas-fir forest type, followed in order of prevalence by lodgepole pine (16%), ponderosa pine (14%), hemlock/spruce (4%), and small percentages of hardwood and mixed conifer types (USFWS 1998, PIF 2000). The Northern Goshawk is a Species of Concern in Montana (MTNHP 2009b).

Nested target: forest carnivores

Wide-ranging forest carnivores such as Canada Lynx, wolverine, and fisher require large areas of intact mid to high elevation coniferous forest to fulfill their life history needs.

Canada lynx: The Blackfoot Subbasin is a stronghold for the federally threatened Canada lynx in the northern Rocky Mountains (Figure 3.25). Based on ongoing research in the Upper and Middle Blackfoot, lynx populations appear stable, although low reproductive rates are characteristic of this population. Since 1998, over 80 lynx have been monitored in the subbasin, providing information on habitat use, reproduction, mortality and movement. This research has shown that the Blackfoot Subbasin contains some of the most critical habitat for lynx in the continental United States. Large, intact spruce/subalpine fir forests above 4,000 feet in the subbasin provide high quality habitat for lynx and for snowshoe hares, the primary lynx food source. Regenerating forest stands are often used as foraging habitat during the snow-free months while older, multi-storied stands serve as denning and year-round habitat (BC 2005b, J. Kolbe pers. comm.).

Figure 3.24 Canada Lynx Habitat.



Wolverine: The wolverine, a Species of Concern in Montana (MTNHP 2009b), was nearly extinct in Montana during the early 1900s but has been increasing in numbers and range since then. Recovery originated in northwestern Montana and subsequently spread to its current range (Newby and Wright 1955, Newby and McDougal 1964). Wolverines are generally solitary, wide-ranging and occur at relatively low densities. In Montana, the mean annual wolverine home range is 163 square miles for males and 150 square miles for females (Hornocker and Hash 1981). Available evidence indicates that juveniles disperse usually around 20 to 60 miles from their natal range, though dispersal movements of more than 180 miles are known (Gardner et al. 1986). Wolverines are limited to alpine tundra and boreal and mountain forests (primarily coniferous) in the western mountains, particularly in large wilderness or other essentially roadless areas. Dispersing individuals, however, have been found far outside of usual habitats (MTNHP 2009b). Tracking data, sightings and trapper harvest indicate that wolverines are well distributed throughout suitable habitat in the Blackfoot Subbasin (J. Kolbe, pers. comm.).

Fisher: The fisher is also a Species of Concern in Montana (MTNHP 2009b). Although fisher were purportedly extirpated from the state by the 1930s, recent genetic research indicates that native remnant populations persisted in the Bitterroot and Blackfoot Watersheds (Vinkey et al. 2006). Efforts in 1959 and 1960 resulted in the establishment and augmentation of native populations in Lincoln, Granite, and Missoula counties. Within the Blackfoot Subbasin, fisher have been trapped in the Clearwater drainage, the Lincoln Valley, and the Garnet Mountains in recent decades. Recent genetic hair-snare surveys (USFS, unpublished data 2007) have confirmed fisher populations in the Clearwater drainage and Lincoln Valley portions of the Blackfoot as recently as 2007. A wide-ranging mammal, fisher home ranges have been estimated at 4 to 300 square miles. Fishers have been recorded moving up to 56 miles in three days (Ruggiero et al. 1994, J. Kolbe, pers. comm.).

Nested target: whitebark pine

Whitebark pine is a common component of subalpine forests and a dominant species of treeline and krummholtz habitats. It occurs in almost all major mountain ranges of western and central Montana. Whitebark pine occupies a critical niche in western ecosystems by producing large seeds that are extremely nutritious and important in food chains of an estimated 110 animals. Whitebark pine seeds are especially important components of grizzly bear, black bear, red squirrel, and Clark's Nutcracker diets (Kendall & Arno 1989, Schmidt 1992, Reinhart et al. 2001). Populations of whitebark pine in Montana and across most of western North America have been severely impacted by past mountain pine beetle outbreaks and by white pine blister rust, an introduced pathogen.²⁰ As a result, there have been major declines in whitebark pine populations across large areas of its range. Additionally, encroachment and increased competition from other trees (primarily subalpine fir) have occurred as a result of fire suppression in subalpine habitats.

²⁰ More information on white pine blister rust is provided in Section 3.4.4.3.

Table 3.16 Mid to High Elevation Coniferous Forest Viability Assessment.

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Landscape Context/Condition (<i>Functioning disturbance regime</i>): Fire	Appropriate species composition and structure in the understory and overstory relative to HRV ¹	< 25% of HRV	25-50% of HRV	51-75% of HRV	> 75% of HRV	fair	Good	HRV refers here to historic species composition and structure. Age class distribution and condition have shifted in the Blackfoot. Indicator includes down and standing dead wood.
Condition (<i>Cone producing whitebark pine stand</i>)	Amount and distribution of cone producing whitebark pine stands	< 25% of HRV	25-50% of HRV	51-75% of HRV	> 75% of HRV	poor	fair/good	HRV refers here to historic amount and distribution of cone producing whitebark pine stands. Note that white pine blister rust is an introduced pathogen and not part of HRV. More ecological and status information is required to refine ratings.
Landscape Context/Condition (<i>Patch size and distribution of age classes</i>)	Patch dynamic analysis: departure from HRV	< 25% of HRV	25-50% of HRV	51-75% of HRV	> 75% of HRV	fair	good	HRV refers here to historic patch size and distribution of age classes.

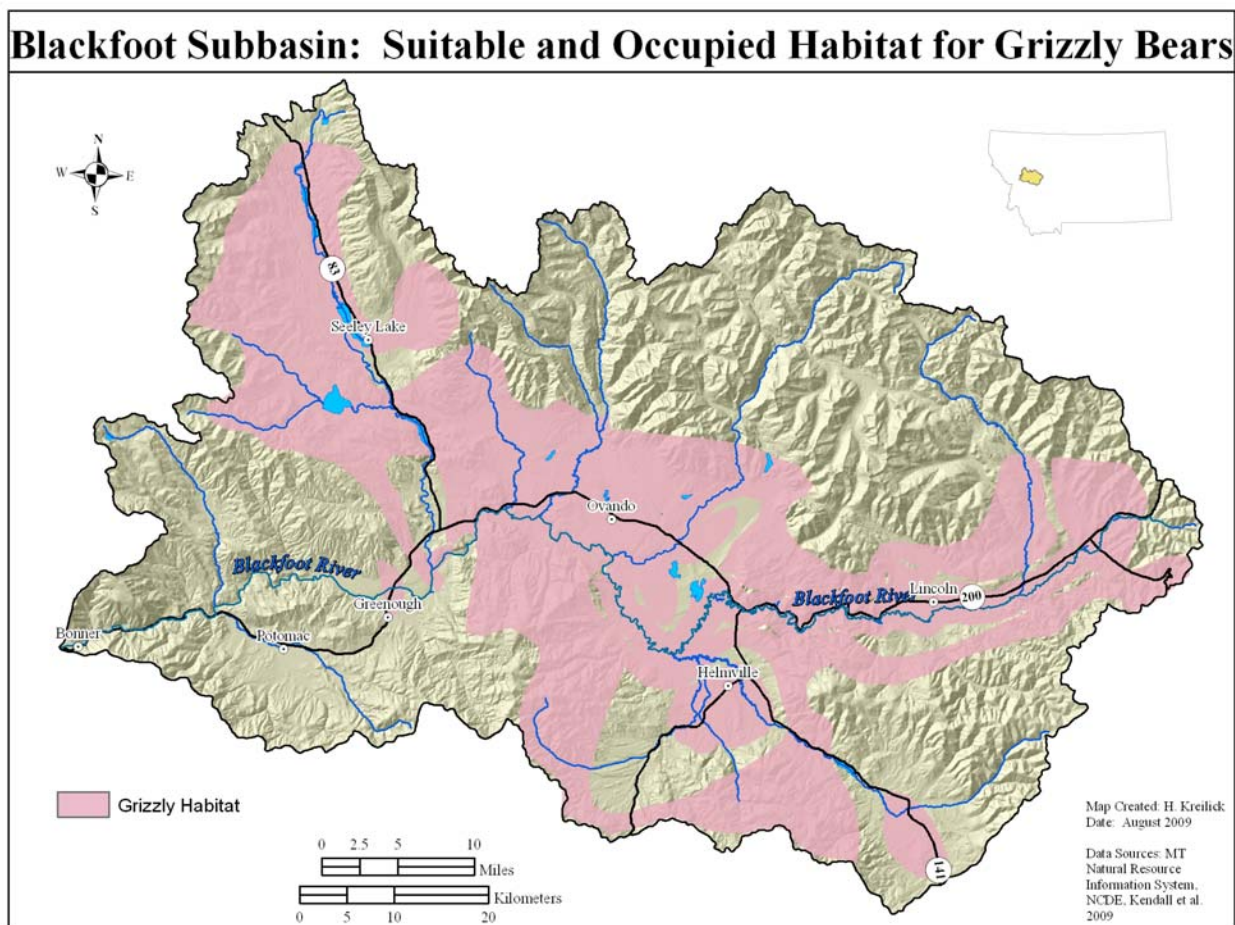
¹ HRV refers to “historic range of variability.” A definition of HRV is provided in Table 3.12.

3.3.3.7 Grizzly bear

Nested Targets: habitat connectivity for wildlife

Grizzly bears are currently listed as a federally threatened species in the Northern Continental Divide Ecosystem (NCDE) (USFWS 2009b). The NCDE is an area of the northern Rocky Mountains with large blocks of protected public land containing some of the most pristine and intact environments found in the contiguous United States. The NCDE supports the largest population of grizzly bears in the lower 48 states. Despite dramatic losses of habitat throughout North America, the grizzly bear has maintained a presence in Montana and occurs in portions of the Blackfoot Subbasin. The Blackfoot Subbasin is the southern boundary for the NCDE grizzly bear recovery zone. The Grizzly Bear Recovery Plan (USFWS 1993) includes most of the Blackfoot Subbasin as suitable and/or occupied habitat (Figure 3.26).

Figure 3.25 Suitable and Occupied Habitat for Grizzly Bears.



The USGS Northern Divide Grizzly Bear Project, designed to estimate population size and distribution, confirmed the presence of 29 individual grizzly bears in the Blackfoot Subbasin in 2003 and 2004. The USGS estimates that at least 40 bears are present during all or part of the year in the subbasin. In recent years, grizzly bear activity has increased in the subbasin. This area appears to be an important habitat link for grizzlies that are re-colonizing historic ranges to the south of the subbasin. Maintaining habitat connectivity is critical to sustaining grizzly bear life histories and maintaining sustainable subpopulations within the southern portion of the NCDE.

Grizzlies breed, forage and migrate throughout the subbasin and den above 6,500 feet. They move from high mountain elevations to lower valley bottoms to forage seasonally for available food. Lakes, ponds, fens and spring-fed creeks, common in portions of the valley floor, provide excellent bear habitat. Additionally, the vegetation found along certain reaches of the Blackfoot River and its tributaries provide bears with cover, food and natural movement corridors. While grizzlies are taxonomically classified as carnivores, they are opportunistic and omnivorous in practice, eating a variety of forbs, roots, seeds, berries, insects, fish, birds and mammals. Important food sources found in the Blackfoot include chokecherries, serviceberries, hawthorns and rosehips.

As grizzly bears expand in population and spend more time on private agricultural lands in the Blackfoot, particular attention must continue to be focused on preventative management to reduce human-bear conflicts, protect human safety and reduce impacts to rural livelihoods. These efforts include securing bear attractants and installing electric fencing around agricultural food sources (beehives, sheep bedding grounds and calving areas) (J. Jonkel and S. Wilson, pers. comm.).

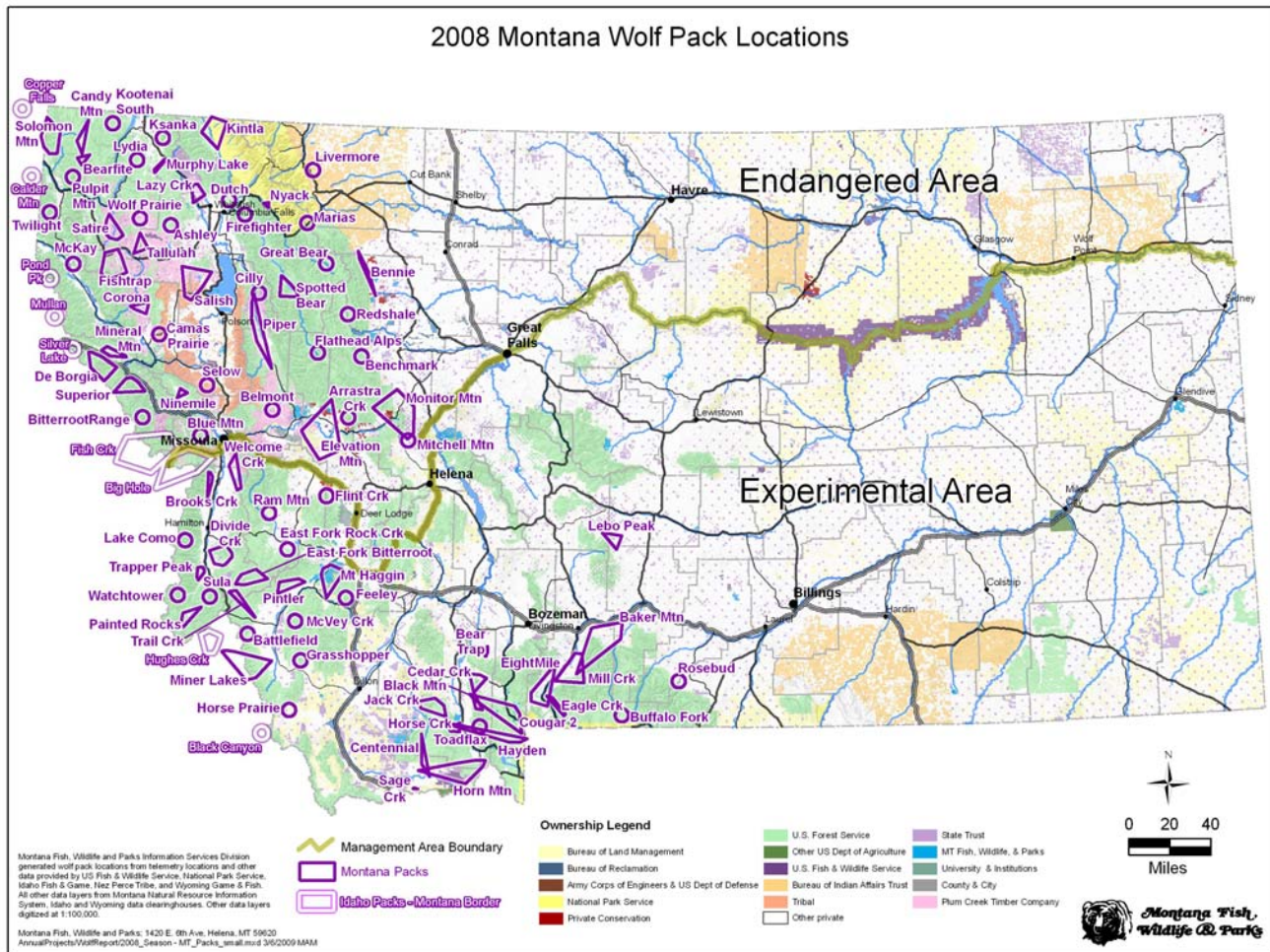
Nested target: habitat connectivity for wildlife

The Blackfoot Subbasin lies in a region which contains some of the best remaining habitat for many of North America's threatened or sensitive species including grizzly bear, gray wolf, wolverine, Canada lynx and native salmonid species. The location of the Blackfoot Subbasin in relation to larger ecosystems, such as the NCDE and the Yellowstone-to-Yukon region, adds to the importance of the area for maintaining large-scale connectivity for wildlife species. The subbasin provides crucial links for wildlife moving between the NCDE and other landscapes to the south. The Blackfoot River corridor and the entire subbasin serve as a complex network of linkage zones for wildlife moving in and out of the Bob Marshall/Scapegoat Wilderness Complex, the Mission Mountains Wilderness and between the lower Clark Fork drainage and the Garnet and Sapphire Ranges. Maintenance of the subbasin area as a linkage between large protected areas is important to many wildlife species including elk, moose, white-tailed and mule deer, fisher, Canada lynx, bobcat, pine marten, wolverine, mountain lion and wolf. Within the subbasin, maintaining connectivity at smaller scales, such as between elk summer and winter range, is also critical to preserving the diversity and abundance of wildlife species and overall ecosystem function.

The Blackfoot Subbasin lies at the confluence of three federally-designated gray wolf recovery areas: Northwestern Montana, Central Idaho and the Greater Yellowstone. Gray wolves in the Blackfoot are natural dispersers from wolf populations in Canada, moving southward from the Glacier National Park and Bob Marshall Wilderness Complex (Oakleaf et al. 2006). In 2007,

MFWP confirmed the first resident wolf pack (Elevation Mt. Pack) in the Blackfoot Subbasin. Subsequent livestock depredations by this pack ensued in April 2008 and resulted in three confirmed and one probable calf loss, and the subsequent removal of four wolves by wildlife management authorities. As of 2009, MFWP has confirmed the presence of four resident wolf packs and estimates that at least 25 to 35 wolves inhabit the subbasin, Arrastra Creek, Elevation Mountain, Belmont and more recently the Ovando Mountain Pack (Figure 3.27). The Blackfoot Valley also serves as an important wolf movement corridor between the NCDE and the Bitterroot Ecosystem to the south.

Figure 3.26 2008 Montana Wolf Pack Locations.



More information on elk, mule deer and white-tailed deer in the subbasin is provided in Section 3.3.3.4. More information on Canada lynx, wolverine, and fisher is provided in Section 3.3.3.6.

Table 3.17 Grizzly Bear Viability Assessment.

Key Attribute	Indicator	Indicator Ratings				Current Rating	Desired Rating	Comments
		Poor	Fair	Good	Very Good			
Landscape Context <i>(Habitat Connectivity)</i>	Linkage zone intactness for wildlife movement	lose most	lose a lot, keep a little	lose some, keep some	maintained functionality of all wildlife linkage zones	very good	very good	Linkage zones or number of barriers should be defined so that this could be measured quantitatively for the subbasin. Indicators = highways and development.
Landscape Context <i>(Secure Available Habitat)</i>	“Available habitat”	< X % of available habitat is secure	X to X % of available habitat is secure	X to X % of available habitat is secure	> X % of available habitat is secure	very good	very good	Use USFS Cumulative Effects Model (CEM) to determine amount and distribution of available habitat and refine ratings.
Condition <i>(Population demographics):</i> Reproduction	Reproductive success of mothers and survivorship of cubs	0 verified females with young of the year	1 verified female with young of the year	2 verified females with young of the year	> 3 verified females with young of the year	good	very good	Number of females with young already tracked at NCDE scale. Animals to south of Highway 200 are not part of NCDE population estimate, but area still managed by MFWP.
Condition <i>(Population demographics):</i> Human-caused mortality	Number of human-caused breeding female deaths annually	> 3 breeding female deaths (this is a trend)	1-2 breeding female deaths	0 breeding female deaths in a year	0 breeding female deaths for 2 years in a row	fair	good	Referring to mortalities caused by hunters, highways, and malicious killing incidents. Mortality is good indicator of human presence/development.
Condition <i>(Human/grizzly bear conflicts)</i>	Incidence of human-grizzly conflicts with grizzlies	> 25 conflicts	10 to 25 conflicts	5 to 10 conflicts	up to 5 conflicts	good	very good	Includes incidents involving agricultural/residential attractants and recreation/hunter conflicts.

Table 3.17 (continued).

		Indicator Ratings						
Key Attribute	Indicator	Poor	Fair	Good	Very Good	Current Rating	Desired Rating	Comments
Size <i>(Population size and trend)</i>	Population trend monitoring and DNA studies	declining population	slight decline	stable trend	increasing population	very good	very good	Already tracked at NCDE scale. Population numbers should be tracked in the Blackfoot, but within the larger context of the NCDE population.

3.3.3.8 Rural way of life

Nested Targets: sustainable natural resource-based livelihoods; healthy/resilient communities

The Blackfoot Subbasin has provided critical ecological resources and functions to centuries of human communities from Native American Salish, Kootenai, Nez Perce, Shoshone, Blackfoot and Crow tribes to homesteaders and ranchers of European descent and present day residents. Recognizing the important interaction between natural resources and human communities, the subbasin planning team included *rural way of life* as an eighth conservation target. To define this target and its significance in the subbasin, it is necessary to examine the rural restructuring that is occurring across the Rocky Mountain West and the associated changes to communities that have historically been closely connected to natural resources and working landscapes.

The Rocky Mountain West is a region characterized by high alpine rugged mountains, large tracts of public land, clear running rivers and streams, large working ranches and a complex mosaic of habitats that support grizzly bear, gray wolf, Canada lynx and many other charismatic species. These regional characteristics are the substance behind many contentious political, economic and community debates related to natural resource preservation, conservation and sustainable use. Many argue that the controversies are a result of the shifting dynamics of the West—its history and value to old-timers versus newcomers. Terms like “the old west,” “the new west,” and “the next west;” “range-riding cowboy” and “web-surfing modern cowboy;” “working landscapes;” “amenity-based economy,” “resort communities,” and “recreation-based economy” all allude to the shift in culture and values (Brick et al. 2001, Wilkinson 1992, Decker 2001, Jungwirth 2001). Riebsame (2001) characterizes the new geography of the West as the “gentrified range of hobby ranchers and New West homesteaders.” From resource production—and, in some places, exploitation—to resource conservation, communities in the West are exploring tradeoffs between natural resource protection and community sustainability.

According to population census data, the Rocky Mountain West is undergoing some of the highest growth rates in the United States. According to demographers and economists, the factors contributing to this rapid growth include 1) businesses and jobs shifting away from cities due to information technology and a more mobile population, 2) the region’s newness as an economic development center and 3) the quality of life (Power 1996, Cromartie and Wardwell 1999, Riebsame et al. 1997). Stohlgren (1999), who examined population growth in several Rocky Mountain states and cities, found that the population of Jackson Hole, Wyoming increased by 260% between 1950 and 1990 and, closer to this study, the population of Missoula, Montana increased by 91% during the same time period.

In many places, shifting population dynamics, telecommunication, technology and global markets have created an “urban economy in a rural setting” (Rasker 2001). Both an influx of urban refugees and retirees means that the landscape is changing to a competitive, global and knowledge-based economy. Today, for example, over one-third of the personal income in the

Intermountain West is from nonlabor sources (e.g., investment and retirement and savings) (Rasker 2001).

The shift in demographics not only affects the land, as discussed later (see *Unplanned Residential and Resort Development*, Section 3.4.4.1), but also affects social and economic factors that are linked to natural resource-based communities, such as the loss of working farms and ranches, timber contracts, mills and infrastructure linked to these industries. In some areas, the use of zoning, county planning and conservation easements (a voluntary land protection tool employed by agencies and land trusts to conserve land) has reduced the opportunity for generational landowners to buy land or homes in the communities they were raised in due to larger parcel sizes. In other areas of the West, new and wealthy landowners have created quasi-nature preserves, keeping locals off their land with no trespassing signs. Numerous studies explore the relationships between property rights, value shifts and land use. Jackson-Smith and others (2005), for example, point out that landowners without farming and ranching backgrounds may depend less on their land for resource productivity than generational landowners, instead paying more attention to the cumulative impacts of aesthetic and environmental qualities across the landscape.

The Blackfoot Subbasin is experiencing many of the same changes as other rural communities across the West. New landowners are moving to the subbasin, bringing a range of values, skills and resources that provide potential benefits to the subbasin, including academic/professional knowledge, transfer or investment income and wealth and political sophistication. Many are welcomed, especially when they become active community members or leaders, participate in and organize local functions and fundraisers, serve on local community organization boards, spend time and money in local restaurants and businesses, and, most importantly, build long-lasting friendships and relationships with their neighbors. Others face barriers with generational landowners for a variety of reasons. Some new landowners, for example, have been quick to make decisions about land use and public access without fully understanding the impacts on natural resources and rural communities. Others take land out of production, “preserving” it for its amenity values. Some simply are not present, given that the ownerships are seasonal or absentee-based. Lastly, there is concern by rural residents over the fact that many of the seasonal or absentee landowners are not required to pay state income tax to benefit the local economy. Despite the mixed feelings, there is general recognition that the subbasin is changing and that efforts must be made to bridge old/new and rural/urban values.

In addition to changing demographics, it is important to highlight that the Blackfoot Subbasin is comprised of seven very distinct communities (Bonner, Greenough, Helmville, Lincoln, Ovando, Potomac and Seeley Lake) with different histories, landscapes and cultures. This diversity provides both challenges and opportunities to defining the rural way of life and associated indicators of community viability from a socioeconomic perspective. The proximity of the subbasin to the urban centers of Missoula and Helena (both approximately 60 miles away from the central portion of the valley) also influence the changing nature of the rural communities. The convenience of airports, hospitals/healthcare facilities and access to the internet will likely mean that many of the Blackfoot communities will not decrease in population.

The Blackfoot Challenge’s mission is to coordinate efforts that conserve and enhance the natural resources and rural way of life of the Blackfoot River Valley for present and future generations. The central question for partners practicing resource conservation and communities within the Blackfoot Subbasin is: can the communities retain their rural character in the midst of a changing west and a globally- and technologically-connected world? To address this question and assess the viability of the rural way of life in the Blackfoot Subbasin, representatives from the seven communities might complete a conservation target viability assessment (see Section 3.3.2) to 1) confirm or edit the following nested targets as key socioeconomic attributes of the subbasin rural way of life, 2) define indicators to measure each attribute, 3) rate the current status of each indicator, and 4) determine the desired status of each indicator.

Unlike key ecological attributes defined in Section 3.3.2, key *socioeconomic* attributes are factors that are critical for the long-term viability of societies (Belsky 2009). In the context of “rural” and “rural way of life,” this refers to areas with the following characteristics:

- relatively low population density
- located in relatively isolated or remote areas
- a large percentage of household income is from natural-resource based livelihoods (e.g., agriculture, ranching, forestry, hunting)
- the pace of life is slower than in cities
- strong ties exist between community members, social institutions (e.g., schools and other civic institutions) and the surrounding natural environment

It is important to note that the above definition of “rural” and “rural way of life” is highly generic. Differences will emerge within and across the seven distinct communities in the Blackfoot Subbasin, as discussed previously. The key to defining and choosing indicators related to the rural way of life is both resilience and sustainability (Belsky 2009).

The nested targets below have been identified based on current theory and models from the social scientific literature, available local social scientific data and/or comparative data from other areas and expert opinion.

Nested target: sustainable natural resource-based livelihoods

Although this nested target needs to be examined by community members with data collected from the subbasin, it can be loosely defined as the continued existence and support of industries such as agriculture, forestry, outfitting and recreation and the businesses that support these industries. In exploring indicators and opportunities to promote sustainable natural resource-based livelihoods, experts recommend that communities do not return to the old economy of resource production or seek large companies to move to small towns (Rasker, 2001). Instead, they advocate developing the physical and fiscal infrastructure to support local business and entrepreneurship, including seeking funds for education, infrastructure, and start-up capital. Possible indicators to measure progress in this area include:

- 1) Developing baseline and recent trend information that addresses how the different sectors are able to stay in business (and pass the business and knowledge on to the next generation);
- 2) Exploring the degree to which agriculture and forestry businesses are seeking economic diversification with value-added services and producing multiple products (e.g., animal processing, specialty meats, local marketing, utilization of small diameter wood products from restoration/fuel reduction treatment);
- 3) Defining the local benefit of these livelihoods in terms of product consumed or purchased and/or jobs in the subbasin;
- 4) Promoting businesses that:
 - a. Link resource use/natural amenities to the economy (e.g., recreation, guest-ranching, inns and restaurants, eco-tourism and/or the “restoration” economy)
 - b. Capitalize on global markets and public demand (e.g., wind energy development)
 - c. Develop new technologies to support a natural resource-based economy; and,
- 5) Exploring the relationship between conservation, local economy and community by creating new markets for the protection and stewardship of open space and healthy habitat and broadening the profit and income base versus complete reliance on government programs or philanthropy.

Nested target: healthy/resilient communities

The emphasis here is on the capacity of a community to continually create and improve its physical and social resources and environments and to be able to respond to new conditions. At the core is the concept of “social capital”, which is the ability of people and institutions within a community to come together and support each other to work through differences and define and accomplish common goals. The literature on the subject and ideas expressed in the Blackfoot Subbasin share many common themes and principals. Possible indicators of the viability of this nested target, as discussed by Edelman and Burke (2004) and Kenyon (2005), include:

- 1) A stable and/or increasing population;
- 2) Education (i.e., schools), keeping and attracting young people;
- 3) Accessible healthcare services and opportunities to care for the aging population;
- 4) Affordable housing;
- 5) Cultural “hubs” for community connection, conversation and relationships, e.g., restaurants, cafes, bars, churches, social organizations (Sew and So Club, Blackfoot Cattlewomen’s Association), community centers, events (4th of July Celebration, Births/Weddings/Funerals); and,
- 6) Low crime rates and public safety through rural fire departments and emergency response teams.

The Healthy Cities and Communities Coalition emphasizes the following seven pillars to a resilient and/or healthy community:

- 1) Practices ongoing dialogue
- 2) Generates leadership

- 3) Shapes its future
- 4) Embraces diversity
- 5) Knows itself
- 6) Connects people and resources
- 7) Creates a sense of community

Although rural way of life is not included in the threat assessments outlined in the following pages, conservation objectives and strategic actions undertaken in the subbasin will take into account the needs of local communities.

3.3.4 Summary of Viability

All conservation targets within the Blackfoot Subbasin were determined to have a current viability rating of *good*, *fair* or *poor*, suggesting that each conservation target will require some degree of human intervention in order to persist under current conditions (Table 3.18). In Section 3.4 (Threat Assessment), we analyze and describe the most important factors impacting conservation target viability in the subbasin. In Section 5.0 (Management Plan), we outline a set of conservation objectives and strategic actions to mitigate these threats and maintain or restore conservation target viability.

Table 3.18 Viability Summary for Blackfoot Subbasin Conservation Targets.¹

Conservation Targets	Landscape Context	Condition	Size	Viability Rank
	Grade			
Native Salmonids ²	Poor	Good	Fair	Fair
Herbaceous Wetlands	Good	Poor	Good	Fair
Moist Site and Riparian Vegetation	Fair	Fair	Fair	Fair
Native Grasslands/Sagebrush Communities	Poor	Poor	Fair	Poor
Mid to High Elevation Coniferous Forest ³	Fair	Fair	-	Fair
Low-Elevation Ponderosa Pine/Western Larch Forest ³	Poor	Poor	-	Poor
Grizzly Bear	Very Good	Fair	Very Good	Good
Subbasin Biodiversity Health Rank				Fair⁴

¹ The viability assessment for the rural way of life target has not yet been completed; depending on methods chosen for the assessment, different criteria other than landscape context, condition and size may be used.

² Viability ratings for native salmonids are subject to change pending review at 6th code HUC scale.

³ Forest work group did not consider size as a key attribute for forest targets.

⁴ Subbasin biodiversity health rank subject to change based on the variables noted above.

3.4 Threat Assessment

3.4.1 Overview

After identifying conservation targets and assessing target viability, technical work groups identified the most critical factors that currently impact or have the potential to impact target viability over the next ten years. The process entailed identifying and ranking *stresses* affecting each conservation target and *threats*, or the causes of each stress. The threat assessment process, including definitions of terms, is outlined below (adapted from Low 2003).²¹

Step 1: Identify Stresses

In the first step of the subbasin threat assessment, technical work groups identified stresses affecting each conservation target.²² Stresses destroy, degrade or impair a conservation target by impacting a key ecological attribute²³ relating to its size, condition or landscape context. Stresses are caused directly or indirectly by human activities. Technical work groups identified 19 stresses that negatively impact subbasin conservation targets (see Tables 3.19-3.25).

Step 2: Identify Threats (Sources of Stresses)

Threats represent the proximate cause of a stress. Most threats are rooted in incompatible human uses of land, water and natural resources. Many threats are driven by social, economic, or political underlying causes. Technical work groups identified 20 threats that represent the proximate cause(s) of each subbasin stress (see Tables 3.19-3.26).

Step 3: Rank Threats

After identifying the threats that affect each conservation target, technical work groups then ranked each one according to its *contribution* and *irreversibility* relative to each stress. *Contribution* refers to the expected contribution of the threat, acting alone, to the full expression of a stress under current circumstances. Contribution ratings indicate whether the threat is a very substantial, moderate or relatively insignificant cause of a stress. Contribution ratings are:

Very High (VH)	The source is a very large contributor to the particular stress.
High (H)	The source is a large contributor to the particular stress.
Medium (M)	The source is a moderate contributor to the particular stress.
Low (L)	The source is a low contributor to the particular stress.

²¹ For more information on the threat assessment process, see *Landscape-Scale Conservation: A Practitioner's Guide* (Low 2003).

²² *Stresses* are analogous to *limiting factors*, a term used by NPPC to describe the problems that impede the desired biological performance of a conservation target (NPPC 2001).

²³ *Key ecological attributes* are factors that are critical for the long-term viability of a conservation target. These are factors that, if degraded, would seriously jeopardize the target's ability to persist for a century or longer. Key ecological attributes for each conservation target are described in the Blackfoot Subbasin Viability Assessment, Section 3.3.2.

Irreversibility ratings indicate whether the threat produces a stress that is irreversible, reversible at extremely high cost, or reversible with moderate or little investment. Irreversibility ratings are:

<i>Very High (VH)</i>	Not reversible (e.g., wetlands converted to a shopping center).
<i>High (H)</i>	Reversible, but not practically affordable (e.g., wetland converted to agriculture).
<i>Medium (M)</i>	Reversible with a reasonable commitment of resources (e.g., ditching and draining of wetland).
<i>Low (L)</i>	Easily reversible at relatively low cost (e.g., off road vehicles trespassing in wetland).

3.4.2 Conservation Target Threat Assessments

Individual threat assessments for each subbasin conservation target illustrate the relationship between conservation targets, stresses, and threats in the subbasin (Tables 3.19-3.25). An understanding of both stresses and threats is necessary to develop effective conservation objectives and strategic actions that will maintain and/or improve the long-term viability of conservation targets in the subbasin. Narrative descriptions of each threat are provided in Section 3.4.4.

Table 3.19 Native Salmonids Threat Assessment.

Threats (Causes) ↓		Stresses (Effects) →					
		Water Quality Impairments	Habitat Access/ Connectivity Impairments	Physical Habitat Impairments	Altered Hydrologic Regime	Riparian Vegetation Impairments	Non-Natives, Exotics and/or Parasites Invasion
Mining	Contribution	M	L	M	L	L	n/a
	Irreversibility	H	H	H	H	H	n/a
Incompatible Grazing	Contribution	H	L	H	M	VH	M
	Irreversibility	M	M	M	M	M	H
Physical Road Issues	Contribution	VH	VH	H	M	M	M
	Irreversibility	M	M	M	M	M	H
Incompatible Forestry Practices	Contribution	M	L	H	H	H	M
	Irreversibility	H	M	M	M	M	H
Unplanned Residential and Resort Development	Contribution	M	L	L	M	L	M
	Irreversibility	H	H	H	H	M	H
Drainage and Diversion Systems	Contribution	H	H	M	H	M	M
	Irreversibility	M	M	M	M	M	M
Channel Alteration	Contribution	H	L	H	M	H	M
	Irreversibility	M	M	M	M	M	H
Non-Motorized Recreational Use	Contribution	L	M	L	L	L	H
	Irreversibility	L	M	L	L	L	H
Exotic/Invasive Species	Contribution	L	M	M	n/a	M	H
	Irreversibility	L	L	L	n/a	H	H
Climate Change	Contribution	H	M	M	VH	M	H
	Irreversibility	H	M	M	M	M	H

Table 3.20 Herbaceous Wetlands Threat Assessment.

Threats (Causes) ↓		Stresses (Effects) →					
		Altered hydrologic regime	Altered physical habitat condition	Altered native plant species, composition, and/or structure	Altered distribution, areal extent, patch size of community types	Degradation or loss of wildlife habitat	Reduced diversity of wetland types
Incompatible Grazing	Contribution	L	H	H	L	L	L
	Irreversibility	M	M	M	M	L	L
Drainage and diversion Systems	Contribution	VH	H	H	L	H	VH
	Irreversibility	M	M	M	L	L	M
Exotic/Invasive Species	Contribution	L	M	VH	L	M	H
	Irreversibility	M	M	M	L	M	M
Motorized Vehicle Use	Contribution	n/a	L	L	n/a	L	n/a
	Irreversibility	n/a	M	M	n/a	M	n/a
Conversion to Agriculture	Contribution	H	VH	VH	H	H	H
	Irreversibility	M	M	M	M	M	M
Filling of Wetlands	Contribution	H	H	H	M	M	H
	Irreversibility	H	H	M	M	H	M
Existing Crop Production	Contribution	H	VH	H	H	M	H
	Irreversibility	M	M	M	M	M	M
Incompatible Forestry Practices	Contribution	n/a	L	L	L	L	n/a
	Irreversibility	n/a	M	M	M	M	n/a
Climate Change	Contribution	H	L	H	H	H	H
	Irreversibility	VH	VH	VH	VH	VH	VH

Table 3.21 Moist Site and Riparian Vegetation Threat Assessment.

Threats (Causes) ↓		Stresses (Effects) →			
		Altered hydrologic regime	Altered disturbance regime (fire, grazing, browsing, flooding, beaver)	Altered native plant species, composition, and/or structure	Altered distribution, areal extent, patch size of community types
Channel Alteration	Contribution	M	H	M	L
	Irreversibility	M	M	M	M
Unplanned Residential and Resort Development	Contribution	M	H	H	M
	Irreversibility	H	H	VH	H
Conversion to Agriculture	Contribution	L	L	M	L
	Irreversibility	H	H	H	H
Lack of Fire	Contribution	n/a	VH	H	H
	Irreversibility	n/a	M	H	H
Incompatible Grazing	Contribution	M	H	H	H
	Irreversibility	M	M	M	M
Drainage and diversion Systems	Contribution	VH	L	L	L
	Irreversibility	M	M	M	M
Exotic/Invasive Species	Contribution	n/a	n/a	VH	M
	Irreversibility	n/a	n/a	H	M
Altered Wildlife Use Patterns	Contribution	n/a	M	H	M
	Irreversibility	n/a	M	M	M
Climate Change	Contribution	H	VH	H	VH
	Irreversibility	VH	VH	VH	VH

Table 3.22 Native Grasslands/Sagebrush Communities Threat Assessment.

Threats (Causes) ↓		Stresses (Effects) →			
		Altered fire regime	Altered Grazing Regime (domestic & wild)	Altered native plant species, composition, and/or structure	Altered distribution, areal extent, patch size of community types
Lack of Fire	Contribution	VH	M	H	H
	Irreversibility	M	M	M	M
Conversion to Agriculture	Contribution	M	H	H	H
	Irreversibility	M	H	H	M
Incompatible Grazing	Contribution	M	VH	H	H
	Irreversibility	M	M	M	M
Exotic/Invasive Species	Contribution	M	H	VH	H
	Irreversibility	M	M	H	H
Unplanned Residential and Resort Development	Contribution	H	M	M	H
	Irreversibility	H	VH	VH	H
Motorized Vehicle Use	Contribution	n/a	n/a	M	n/a
	Irreversibility	n/a	n/a	H	n/a
Altered Wildlife Use Patterns	Contribution	L	M	L	L
	Irreversibility	L	M	M	M
Climate Change	Contribution	VH	H	H	VH
	Irreversibility	VH	VH	VH	VH

Table 3.23 Low Elevation Ponderosa Pine/Western Larch Forest Threat Assessment.

Threats (Causes) ↓		Stresses (Effects) →			
		Altered fire regime	Degradation or loss of wildlife habitat (for forest carnivores)	Altered native plant species, composition, and/or structure (limited recruitment of ponderosa pine and larch)	Altered distribution, areal extent, patch size of community types
Incompatible Forestry Practices	Contribution	L	VH	VH	H
	Irreversibility	M	M	M	M
Lack of Fire	Contribution	VH	H	H	VH
	Irreversibility	M	M	M	M
Physical Road Issues	Contribution	M	n/a	L	H
	Irreversibility	M	n/a	M	M
Motorized Vehicle Use	Contribution	L	n/a	n/a	M
	Irreversibility	M	n/a	n/a	M
Unplanned Residential and Resort Development	Contribution	H	H	H	H
	Irreversibility	VH	VH	VH	VH
Climate Change	Contribution	VH	VH	n/a	n/a
	Irreversibility	VH	VH	n/a	n/a
Epidemic Levels of Native Insects and Pathogens	Contribution	L	M	M	n/a
	Irreversibility	H	H	H	n/a
Exotic/Invasive Species	Contribution	M	M	n/a	H
	Irreversibility	M	M	n/a	M

Table 3.24 Mid to High Elevation Coniferous Forest Threat Assessment.

Threats (Causes) ↓		Stresses (Effects) →				
		Altered fire regime	Non-functioning whitebark pine stands	Altered native plant species, composition, and/or structure	Altered distribution, areal extent, patch size of community types	Degradation or loss of wildlife habitat
Lack of Fire	Contribution	H	H	H	H	H
	Irreversibility	M	M	L	M	M
Incompatible Forestry Practices	Contribution	L	H	n/a	VH	H
	Irreversibility	M	M	n/a	M	M
Physical Road Issues	Contribution	L	n/a	n/a	L	H
	Irreversibility	M	n/a	n/a	M	M
Motorized Vehicle Use	Contribution	L	n/a	n/a	n/a	M
	Irreversibility	M	n/a	n/a	n/a	M
Exotic/Invasive Species	Contribution	L	L	VH	n/a	H
	Irreversibility	M	M	H	n/a	H
Unplanned Residential and Resort Development	Contribution	L	L	n/a	L	L
	Irreversibility	VH	VH	n/a	VH	VH
Climate Change	Contribution	VH	VH	H	n/a	n/a
	Irreversibility	VH	VH	H	n/a	n/a
Epidemic Levels of Native Insects and Pathogens	Contribution	L	M	L	L	L
	Irreversibility	H	M	H	H	H

Table 3.25 Grizzly Bear Threat Assessment.

Threats (Causes) ↓		Stresses (Effects) →					
		Loss of connectivity from the COCE to other historic ranges	Degradation or loss of wildlife habitat	Loss of habitat connectivity in the Blackfoot Subbasin	Decreasing reproduction (fitness)	Loss of genetic viability	Loss of population viability
Physical Road Issues	Contribution	VH	VH	VH	n/a	VH	VH
	Irreversibility	H	H	H	n/a	H	H
Incompatible Grazing	Contribution	M	M	M	n/a	M	M
	Irreversibility	L	L	L	n/a	L	L
Human-Caused Mortality	Contribution	n/a	n/a	n/a	VH	VH	VH
	Irreversibility	n/a	n/a	n/a	VH	VH	VH
Presence of Bear Attractants	Contribution	n/a	n/a	n/a	M	M	H
	Irreversibility	n/a	n/a	n/a	M	M	M
Motorized Vehicle Use	Contribution	VH	VH	H	H	H	VH
	Irreversibility	H	H	M	M	M	M
Mining	Contribution	M	M	M	M	M	M
	Irreversibility	VH	VH	VH	VH	VH	VH
Non-motorized Recreational Use	Contribution	M	M	M	M	M	M
	Irreversibility	M	M	M	M	M	M
Unplanned Residential and Resort Development	Contribution	VH	VH	VH	VH	VH	VH
	Irreversibility	VH	VH	VH	VH	VH	VH
Exotic/Invasive Species	Contribution	n/a	H	n/a	n/a	n/a	n/a
	Irreversibility	n/a	VH	n/a	n/a	n/a	n/a
Lack of Human Tolerance	Contribution	H	H	H	H	H	H
	Irreversibility	M	M	M	M	M	M
Climate Change	Contribution	M	M	H	H	M	H
	Irreversibility	VH	VH	VH	VH	VH	VH

3.4.3 Summary of Threats

Table 3.26 provides a synthesis of all 20 subbasin threats and illustrates the relative impact of each threat to individual targets and to the subbasin as a whole. The highest ranking threats are those that have the greatest impact on the greatest number of conservation targets in the subbasin. Although low ranking threats may not have a large impact on the subbasin as a whole, they can have a disproportionately large impact on a single conservation target (e.g., the threat of human-caused mortality to grizzly bears).

The cumulative impact of threats results in an overall subbasin threat rank of *very high*, indicating that all of the conservation targets face some threat of degradation or destruction across portions of the subbasin over the next ten years. A *very high* rating suggests that, without conservation action, the viability of conservation targets within the subbasin will decline. This synthesis provides the foundation for development of the Blackfoot Subbasin Management Plan (Section 5.0). Conservation objectives and strategic actions outlined in the Management Plan are designed to abate the critical threats in the subbasin, thereby ensuring the long-term viability of conservation targets.

Table 3.26 Summary of Threats to Blackfoot Subbasin Conservation Targets.

Targets → Threats ↓		Native Salmonids	Herbaceous Wetlands	Moist site and Riparian Vegetation	Native Grasslands and Sagebrush Communities	Mid to High-Elevation Coniferous Forest	Low-Elevation Ponderosa Pine and Larch Forest	Rural Way of Life	Grizzly Bear	Overall Threat Rank
		1	2	3	4	5	6	7	8	
1	Unplanned Residential and Resort Development	High		High	High	Medium	Very High	Very High	High	Very High
2	Climate Change	Very High	High	High	High	High	Very High	High	High	Very High
3	Exotic/Invasive Species	High	High	Medium	High	High	High	High	Medium	High
4	Lack of Fire			High	High	Medium	Very High	High		High
5	Incompatible Forestry Practices	High	Low			Medium	Very High			High
6	Physical Road Issues	High				Medium	High		High	High
7	Conversion to Agriculture		High	Medium	High					High
8	Mining	High							High	High
9	Motorized Vehicle Use			Medium	Medium	Medium	Medium		High	Medium
10	Incompatible Grazing	High	Medium	Medium	Medium				Low	Medium
11	Drainage and Diversion Systems	High	Medium	Medium						Medium
12	Channel Alteration	High		Medium						Medium
13	Epidemic Levels of Native Insects and Pathogens					Medium	High			Medium

Table 3.26 (continued).

Targets → Threats ↓		Native Salmonids	Herbaceous Wetlands	Moist site and Riparian Vegetation	Native Grasslands and Sagebrush Communities	Mid to High-Elevation Coniferous Forest	Low-Elevation Ponderosa Pine and Larch Forest	Rural Way of Life	Grizzly Bear	Overall Threat Rank
		1	2	3	4	5	6	7	8	
14	Non-motorized Recreational Use	High							Medium	Medium
15	Existing Crop Production		Medium							Low
16	Filling of Wetlands		Medium							Low
17	Lack of Human Tolerance								Medium	Low
18	Human-Caused Mortality								Medium	Low
19	Altered Wildlife Use Patterns				Low					Low
20	Presence of Bear Attractants								Low	Low
Threat Status for Targets and Subbasin		Very High	High	High	High	High	Very High	High	High	VERY HIGH

3.4.4 Description of Threats

In the following pages, we describe 20 subbasin threats and their impacts on subbasin conservation targets. Although these threats are considered obstacles to sustaining viable occurrences of native fish, wildlife and habitats in the subbasin, they also present excellent opportunities for collaboration and conservation action. In the Blackfoot Subbasin, these types of natural and community resource challenges have historically spurred cooperation and communication to better manage and protect natural resources and rural way of life. Many of the factors considered subbasin threats (e.g., incompatible forestry practices, incompatible grazing) can, in fact, be used as progressive management tools when practiced sustainably. By embracing these opportunities, partners in the subbasin will be better able to sustain a landscape that is ecologically and socioeconomically resilient and adaptive.

3.4.4.1 Unplanned Residential and Resort Development – Very High ²⁴

Targets Affected: native salmonids, moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest, grizzly bears, rural way of life

Description: Community members and conservation partners recognize that development is not inherently detrimental. In fact, in portions of the subbasin, there is a critical need for sustainable development and affordable housing to support rural communities and the rural way of life. This threat refers to *unplanned* residential and resort development that is *dispersed*. Dispersed development refers to construction of structures and associated infrastructure, such as driveways and outbuildings, outside of existing towns and on lands that were previously unimpacted by permanent human habitation.

Implications: Disturbance from unplanned, dispersed development affects all conservation targets in the subbasin. Some of these impacts are highlighted below:

- Many new homes and resorts built in the subbasin are “view properties” situated in low and mid-elevation forests, native grassland/sagebrush communities, and riparian habitats along the Blackfoot River and its tributary streams. New construction in these areas results in direct habitat loss, fragmentation and degradation.
- When development occurs in close proximity to streams and rivers, riparian vegetation may be impaired and the natural flooding regime that helps to maintain riparian communities may be altered. Dispersed residential development can have multiple impacts on riparian communities, particularly in light of the fact that there is currently no stream setback zoning in any of the three Blackfoot Subbasin counties. Under Montana law, counties can adopt stream setback zoning ordinances, but the issue of stream setbacks is a politically charged one that invokes issues of property rights. Recent attempts to pass statewide legislation to require setbacks on certain streams failed in the

²⁴ Overall (subbasin-wide) threat ranks from Table 3.25 are provided next to each threat.

2009 legislature. While setbacks may be an effective way to reduce riparian encroachment, the issue is sufficiently contentious as to make this a highly uncertain remedy.

- Residential and resort development and associated human activity near streams, lakes, and rivers can also impact native salmonids. Increased water use can lead to reduced stream flows, elevated stream temperatures, and further constraints on rearing habitats and migratory corridors. In and downstream of Seeley Lake, for example, urbanization, septic systems and channel encroachment pose a direct threat to water quality and native salmonid habitat.²⁵ Throughout the USFWS-designated Upper Clark Fork Recovery Unit, growth and residential development are considered to be among the greatest threats to the recovery of bull trout. Impacts to spawning and rearing streams are of particular concern (USFWS 2002). Some of these impacts may be partially mitigated by an active program to acquire conservation easements to protect fragile lands in riparian zones. Missoula County subdivision regulations require developers to map areas with riparian vegetation and create a management plan for those areas (Missoula County 2008). This regulation is limited in its scope and extent in terms of protection for riparian areas and can be difficult to enforce. Missoula County Rural Initiatives is currently evaluating multiple regulatory and non-regulatory mechanisms for providing better riparian protection.²⁶
- Dispersed development leads to an increase in open road density and road use. Numerous studies have shown the negative effects of open road densities on wildlife, which include wildlife displacement and increased mortality due to wildlife-vehicle collisions (Trombulak and Frissell 2000).
- Resorts, homes and associated infrastructure and human activity create new sites and new opportunities for noxious and invasive weeds, especially new invaders.
- Dispersed development results in expansion of the wildland-urban interface (WUI), or the zone where structures and other human development are within the vicinity of forests and other wildlands. Expansion of the WUI increases the threat of wildfire to human life and property, thereby increasing the demand for fire suppression and raising the cost of infrastructure for fire fighting and emergency services. Continued fire suppression is a particular threat to subbasin forest targets (especially low elevation forests where the majority of development is located) that have been altered from their historic structure and composition after ~100 years of fire suppression and logging. Where residences are dispersed throughout forest habitats, efforts to allow the natural process of fire to return, even on a small scale, are problematic. Instead, the focus shifts to reducing the threat of wildfire via pre-commercial thinning and other fuels reduction projects. This type of forest management may not generate the revenue of a commercial timber sale, and it may reduce habitat for Canada lynx and other interior forest species.

²⁵ There are current efforts underway to upgrade the water treatment facility in the town of Seeley Lake and to fund a wastewater treatment facility.

²⁶ See <http://www.co.missoula.mt.us/rural/StreamProtection/index.htm> for more information.

- Dispersed development leads to degradation and loss of habitat for grizzly bears, Canada lynx, wolverine, fisher and other wildlife species, many of which are nested subbasin conservation targets.²⁷ Riparian zones, for example, provide excellent habitat and cover for bears moving throughout the subbasin, but they are also among the most desired locations for building (Lolo National Forest 2003). For wide-ranging species, unplanned development leads to loss of habitat connectivity within the subbasin and, on a larger scale, between the Crown of the Continent Ecosystem and other historic or potential ranges. An increase in development also leads to more frequent conflicts between bears and people due in large part to the increased presence of bear attractants. Human garbage, dog food and bird seed can condition and habituate bears, leading to more interactions and conflicts with people. These factors can lead to human-caused grizzly bear mortality, which in turn results in a decrease in grizzly bear reproduction and loss of population and genetic viability.

3.4.4.2 Climate Change – Very High

Targets Affected: native salmonids, herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest, grizzly bears, rural way of life

Description: Climate change is caused by the emission of heat-trapping gases – mostly carbon dioxide (CO₂) – from vehicles, industry, power plants, and deforestation. As these gases build up, they act like a thick blanket, heating the planet, changing the climate, and threatening human health, the economy, and the natural environment. The terms *global warming* and *climate change* are often used interchangeably, but the two phenomena are different. *Global warming* is the rise in global temperatures due to an increase of heat-trapping carbon emissions in the atmosphere. *Climate change*, on the other hand, is a more general term that refers to changes in many climatic factors (such as temperature and precipitation) around the world. These changes are happening at different rates and in different ways.²⁸

Implications: The potential impacts of climate change in the Blackfoot Subbasin are widespread. Throughout the region, warmer temperatures have already resulted in upward latitudinal and elevational movement for many insects, birds, trees and forbs. Species dependent on high-elevation habitats—species limiting the dispersal options for many plants and animals living there—are especially vulnerable in a warming climate. The pika, a small mammal of high elevation habitats, has been shown to stop feeding at temperature thresholds now common throughout Montana summers, with even short periods of exposure to temperatures of 88 °F being directly lethal (Smith 1974). As glaciers and alpine snow fields melt in Montana, so does the specialized habitat for bird species such as the White-tailed Ptarmigan and both Black and Gray-crowned Rosy Finches. Climate change in Montana is also diminishing habitat for forest

²⁷ Nested subbasin conservation targets are described in Section 3.3.3.

²⁸ Overview of climate change is from The Nature Conservancy's Climate Change Initiative website (<http://www.nature.org/initiatives/climatechange>).

carnivores, such as Canada lynx, whose hunting success is associated with snow conditions that are now changing with winter warming (Stenseth et al. 2004), and for high elevation forest plants such as whitebark pine, an important food source for grizzly bears and other birds and mammals throughout the Crown of the Continent and Greater Yellowstone Ecosystems (Kendall & Arno 1990). Whitebark pine is susceptible to increased mortality as the incidence of drought, high elevation wildfire, and mountain pine beetle attacks, all associated with a warming climate, increase (Hanna et al. 2009).

A warming climate also appears to be affecting species migrations on a large scale. Over the last 40 years, during which the United States has experienced an average January temperature rise of 5 °F, 60% of bird species wintering in North America have moved northward an average of 35 miles. Northward movement was documented for 19 bird species that occur in Montana, including movement of hundreds of miles for some species (Spruce Grouse: 316 miles; Cedar Waxwing: 190 miles; Northern Flicker: 192 miles; Northern Pintail: 90 miles; Red-tailed Hawk: 82 miles). According to researchers, global warming is the only explanation for why so many birds over such a broad area are wintering in more northern locales. Since warming has been most pronounced in the north, states such as Montana have recorded an influx of more southern species and could see some northern species retreat into Canada as ranges shift (Hanna et al. 2009).

While wildfire is natural within ecological systems and favors regeneration of many native species, the intensity and frequency of fires across the landscape will likely increase due to the combined effects of warming climate and increased tree densities from fire suppression. Wildfire frequency and intensity have already increased in the northwest United States, and nearly all climate projections predict that this fire trend will continue and increase. Insect infestations, such as those of the mountain pine bark beetle, will likely increase over time (ISAB 2007), which will kill more trees and increase combustible fuels.

Very little is known about how climate change will affect vegetation communities. New research in the western United States suggests that, in some cases, climate change may cause a shift in dominance toward invasive species while in other cases, climate change may lead to a retreat of some invasive species (Bradley et al. 2009).

Changes in hydrology and temperature may negatively affect stream habitats and aquatic species. This is especially true for salmonid species. Several projections of the potential impact of climate change on cool and cold water fishes have been completed. One of these analyses suggests that temperature increases alone will render 2% to 7% of current trout habitat in the Pacific Northwest unsuitable by 2030, 5% to 20% by 2060, and 8% to 33% by 2090 (Kinsella 2008, ISAB 2007). In the Columbia Basin, recent projections of the loss of suitable bull trout habitat as a result of climate warming range from 22% to 92% (ISAB 2007). Climate change has the potential to affect most freshwater life history stages of bull trout and other fall-spawning species. Increased frequency and severity of flood flows during winter can affect over-wintering juvenile fish and incubating eggs in the streambed. Eggs of fall-spawning fish such as bull trout suffer an increased risk of mortality from winter flooding and fry run the risk of premature emergence during warmer winters (ISAB 2007).

Although climate change ranks among the highest threats to subbasin conservation targets, the subbasin technical work groups elected not to focus specific strategic actions on abating this threat. Rather, through subbasin planning, our goal is to build resilience in ecological systems and communities throughout the subbasin so that, even as climate conditions change, the subbasin may support its full range of native biodiversity and ecological processes. Building resilience includes maintaining intact, interconnected landscapes and restoring fragmented or degraded habitats. For the most part, the threat of climate change originates outside of the subbasin and will therefore require large-scale (or landscape level) solutions that extend beyond subbasin boundaries (see *External Threats* in Section 3.4.5).

3.4.4.3 Exotic/Invasive Species – High

Targets Affected: native salmonids, herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest, grizzly bears

Description: Since European settlement, many non-native species have been introduced to the Blackfoot Subbasin. These exotic species represent a variety of life forms and affect multiple conservation targets. In their native habitats, plant and animal populations are kept in check by predators, food supply and other natural controls. However, when a species is introduced (accidentally or intentionally) into a new landscape, it has the potential to spread unchecked, displacing native species and causing ecological disruption. All habitats are vulnerable to these invasions, from grasslands and forests to lakes, rivers and wetlands. Invasive species damage the lands and waters that native plants and animals need to survive, as well as local economies. Worldwide, the estimated damage from invasive species totals more than \$1.4 trillion – five percent of the global economy.²⁹ In the Blackfoot, existing invasive species must be aggressively managed to limit impacts to conservation target species and communities. At the same time, the potential for new invaders in the subbasin must be mitigated through preemptive actions.

Implications: The implications of exotic and invasive species in the subbasin vary depending on the invader and the conservation target species or community affected. Significant invaders (and potential invaders) in the Blackfoot Subbasin are discussed below.

Non-native fish species

Introduction of non-native fish species in rivers, streams, and lakes in the Blackfoot Subbasin poses great concern for the viability of native salmonids and aquatic ecosystems. The tools available to mitigate this threat are limited and, in many cases, there is strong public opposition to controlling or eliminating fish (salmonids, in particular) that are considered valuable for sport fisheries. Still, this issue is a high priority: intact native fish ecosystems are increasingly rare and substantial resources must be allocated to protecting and restoring those that remain (USFWS

²⁹ Information on worldwide impacts of invasive species is from The Nature Conservancy's Invasive Species Initiative website: <http://www.nature.org/initiatives/invasivespecies>.

2002). Background information on non-native fish in the Blackfoot Subbasin is provided in Section 3.2.6.3. A brief discussion of the threats associated with each species is provided below.

Brook trout: Brook trout have vastly increased their distribution and abundance and now pose a threat to native cutthroat trout and bull trout. Brook trout have replaced populations of both species in certain waters (Rieman et al. 2006, Dunham et al. 2002, Leary et al. 1983).

Brown trout: Brown trout are suspected to adversely affect bull trout (Pratt and Huston 1993), although the nature of the negative interaction between bull trout and brown trout, which is thought to include elements of competition and predation, is not well understood. Recent work in Japan shows that brown trout can hybridize with chars closely related to bull trout (Kitano et al. 2009); a result that could lead to further erosion of reproductive potential in depressed bull trout populations. The influence of habitat improvement efforts in the Blackfoot Subbasin on the relative abundance of brown trout and bull trout is being investigated under the current MFWP monitoring program (Pierce et al. 2004, Pierce and Podner, 2006, Pierce et al. 2008). These investigations suggest that both westslope cutthroat trout and bull trout are expanding and brown trout are declining in certain streams where restoration actions have led to suitable habitat conditions for native fish. Angling regulations in the Blackfoot Subbasin have been liberalized to focus angler harvest on brown trout.

Rainbow trout: Hybridization with rainbow trout is believed to be the greatest threat across the range of native westslope cutthroat trout (Behnke 2002). Hybridization has occurred primarily in the lower Blackfoot Subbasin within the range of naturalized rainbow trout (Pierce et al. 2008). In a recent study, hybrid offspring of rainbow trout and westslope cutthroat trout were shown to have dramatically reduced reproductive success (Muhlfeld et al. 2009).

Asian carp: All four species of Asian carp (bighead, black, grass, and silver) listed as Priority Class 1 Aquatic Nuisance Species³⁰ in Montana grow quickly and feed voraciously on a variety of aquatic species including mollusks, aquatic insects, and plankton. The impacts of Asian carp in the United States vary by species, but are likely to include competition with native species for food resources, eliminating vegetation, increasing nutrients, eradicating habitat for native fishes and impacting native mussel and snail populations.

Other Fish: MFWP no longer stocks largemouth bass (or other warmwater fish) within the Blackfoot Subbasin and only plants arctic grayling and kokanee salmon on a very limited basis. Interactions between largemouth bass and native salmonids are unknown. Illegal stocking of northern pike, yellow perch and walleye has occurred in the Blackfoot Subbasin, and poses a significant risk to native species in some areas including the Clearwater lakes (MBTSG 1995, USFWS 2002).

³⁰ Priority Class 1 Aquatic Nuisance Species are currently not known to be present in Montana but have a high potential to invade. There are limited or no known management strategies for these species. Appropriate management for this class includes prevention of introductions and eradication of pioneering populations (see Section 3.2.6.3).

Non-native invertebrates³¹

Only one of the species listed in this section (New Zealand mudsnail) is currently found in Montana, and none of these species are currently found in the Blackfoot Subbasin. Although the likelihood of introduction varies by species, all have the potential to be introduced to the state and to the subbasin and therefore warrant attention as potential threats to the viability of native salmonids and aquatic systems in the subbasin.

New Zealand mudsnail: New Zealand mudsnails degrade habitat due to their high reproductive capacity and the subsequent impacts on invertebrate food sources. Abundant snail populations may outcompete other grazers and inhibit colonization by other macroinvertebrates. Effects of the New Zealand mudsnail on native aquatic invertebrates are being documented in the Madison River and in Darlington Ditch, a small stream along the lower Madison River (Montana ANS Technical Committee 2002).

Mud bithynia/faucet snail: The mud bithynia has been known to reduce species richness of mollusks in Oneida Lake, NY, although it also decreases in abundance after colonization by invasive zebra mussels. It has also been known to infest municipal water supplies.

Zebra and quagga mussel: In addition to their fouling impacts on human infrastructure (e.g., colonizing and restricting water flow in water supply pipes, engine cooling systems, irrigation systems and fishing gear), zebra and quagga mussels can have severe impacts on the ecosystems they invade by filtering substantial amounts of phytoplankton and suspended particulates from the water. Water clarity increases with filtration, causing an increase in light penetration and a proliferation of aquatic plants that can change species dominance and alter the entire ecosystem. Ecological effects radiate throughout the aquatic system, including impacts to macroinvertebrates and fish. Although zebra and quagga mussels are not currently present in Montana, they could easily survive overland transport to Montana while attached to boat hulls or in live wells, engine cooling systems or bait buckets. In the western United States, zebra and quagga mussels have significant potential to disrupt irrigation systems, fish passage facilities, and cause ecological and economic damage (Montana ANS Technical Committee 2002).

Non-native parasites/pathogens

Whirling disease is a current threat to aquatic systems in the Blackfoot Subbasin. Whirling disease affects fish in the trout and salmon family. By damaging cartilage, whirling disease can kill young fish directly, or cause diseased fish to swim in an uncontrolled whirling motion. This can make it impossible for them to escape predators or to effectively seek food. Habitat for the intermediate host worm (*Tubifex tubifex*) is associated with areas of fine sediment and warm water temperatures. Mainstem and lower tributary areas appear to be the most vulnerable sites, although the distribution of suitable habitat might expand through further habitat degradation and warming linked to reduced stream flows and climate change. Once established in a stream, the parasite cannot be eradicated, nor can its intermediate host, without significantly damaging the ecosystem (Pierce et al. 2008, Montana ANS Technical Committee 2002).

³¹ Information on non-native invertebrates, parasites, and pathogens is from the USGS Nonindigenous Aquatic Species fact sheets (<http://nas.er.usgs.gov>) and the Montana ANS website (<http://fwp.mt.gov/fishing/fishingmontana/ans>).

Other parasites and pathogens listed in Section 3.2.6.3 do not currently exist in Montana but warrant careful attention to avoid potential introduction. More information is available on the Nonindigenous Aquatic Species fact sheets (<http://nas.er.usgs.gov/>).

Non-native plants

Among the noxious weeds present in the Blackfoot Subbasin, some, such as spotted knapweed, infest tens of thousands of acres. Others, such as leafy spurge, are limited in their geographic distribution but are nearly impossible to eradicate due to their extensive root systems and herbicide resistance. A detailed discussion of non-native plants in the Blackfoot Subbasin is provided in Section 3.2.7.3. Appendix G provides a list of weeds classified by the State of Montana as “noxious.” Table 3.7 lists noxious weeds established in the Blackfoot Subbasin. Table 3.8 lists well-known weeds with high potential to become problem plants in the subbasin, and Table 3.9 includes an alert list for recently invading or less well-known weeds, along with risk ratings for Blackfoot Subbasin habitats.

Tame, naturalized pasture grasses fall into a category of “quasi-desirable” non-native plants. They are valuable for agriculture and are routinely planted for such purposes. Several of these species, however, such as Kentucky bluegrass and smooth brome, are sod-forming and spread aggressively into grassland and wetland communities where they compete for resources with native species. Another highly invasive species affecting wetlands is reed canarygrass, although authorities question whether reed canarygrass is native or non-native to this region.

Although not classified as a noxious weed in Montana, cheatgrass is a weed of concern in many parts of the state, including the Blackfoot Subbasin. In recent years, cheatgrass has established and spread on undisturbed, dry, scabby sites across low elevations in the subbasin. Cheatgrass is only palatable to livestock during a very short period in the spring. It is extremely flammable and therefore a significant fire hazard. In many situations, cheatgrass can impose significant economic costs, reducing crop yields and lowering weight gain of grazing livestock.

The spread of exotic plants into subbasin plant communities alters species composition and structure and, in many cases, degrades habitat for wildlife. Forest management activities such as timber harvest and road building can disturb soils, particularly at low elevations, and increase the spread and establishment of invasive species in these forests. Improper herbicide application may also impact native plant communities and water quality. Managing invasive species drains resources away from ranches and farms, impacting the rural way of life in the Blackfoot Subbasin.

The spread of non-native aquatic plants can also cause significant economic and ecological problems. Non-native plants that colonize aquatic communities compete with and often displace native species. Hydrilla and Eurasian watermilfoil, for example, are both well known for their ability to alter physical and biological functions of aquatic systems. Emergent species such as purple loosestrife reduce wildlife cover and habitat. Saltcedar degrades wetlands, completely drying up some lakes, ponds and river areas. Although none of these plants is currently present in the Blackfoot Subbasin, all have the potential to be introduced and therefore warrant attention as potential threats to the viability of native plants and plant communities in the subbasin. Pathways

for introduction of aquatic plant species include boats and trailers, the aquarium trade, nursery and garden centers, and mail order and internet suppliers (Montana ANS Technical Committee 2002).

White pine blister rust

White pine blister rust, a disease caused by the non-native fungus *Cronartium ribicola*, poses a major threat to high elevation whitebark pine stands and their ecosystems. The rust fungus was introduced in shipments of nursery stock from Europe to the United States and Canada in the late 1800s and early 1900s (Hoff & Hagel 1989, USDA Forest Service 1991). The fungus thrives in cool, wet environments and attacks whitebark pine and other five-needle pine species across their ranges, causing galls that eventually girdle branches and stems. Gooseberry and currant species serve as alternate hosts.

An estimated 80% to 90% of whitebark pines in Glacier National Park and the Bob Marshall Wilderness area, just north of the Blackfoot Subbasin, are infected with blister rust (Schmidt 1992). In the Blackfoot Subbasin, whitebark pine occupies only an estimated five percent of the total forest cover. This limited distribution makes it a high conservation priority. Whitebark pine seeds are an important dietary component for many species of birds and mammals (Kendall & Arno 1989, Schmidt 1992, Reinhart et al. 2001). For grizzly bears, seasonal variation in food supply can influence mortality. In Yellowstone National Park, variation in seasonal production of whitebark pine seed was correlated with grizzly bear mortality. Grizzly bear deaths nearly doubled during years when whitebark pine seed crops failed, causing bears to forage in lower elevations that are often dominated by human uses and contain attractants that can lead to an increased frequency of contact with humans, conflicts, and eventual mortality (Pease and Mattson 1999).

Different approaches have been used to address white pine blister rust, including breeding of rust-resistant seedlings (Neuenschwander et al. 1999, Sniezko et al. 2000, Hunt 2002) and gooseberry and current eradication programs in eastern forests (Tainter & Baker 1996). Because whitebark pine is not a commercially important species for timber, however, it has not received much attention in terms of resistance breeding (Campbell 2004).

3.4.4.4 Lack of Fire – High

Targets Affected: moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest

Description: Federal and state land management agencies have been very successful at suppressing wildfires throughout the United States for over 100 years. In the Blackfoot Subbasin, the lack of fire has impacted a range of vegetation communities, from the prairie-dominated lowlands to high elevation coniferous forests. The lack of fire in these communities has contributed greatly to altered plant species composition and structure as well as altered and degraded wildlife habitat.

Implications: Fire suppression has affected vegetation target communities throughout the Blackfoot Subbasin. A discussion of the effects of fire exclusion on subbasin targets is provided in individual conservation target descriptions (Sections 3.3.3.4-3.3.3.6). To summarize, fire exclusion in low elevation ponderosa pine/western larch forests, in combination with timber harvest practices over the past century, has greatly altered forest species composition, age class distribution, and structure. In the absence of fire, many low elevation forests in the Blackfoot Subbasin are characterized by closely-spaced, small diameter trees. Increased tree density in forest stands leads to water stress, increased susceptibility to insects, diseases, and stand-replacing fires, and generally reduced resiliency of trees.

Because the historic fire return interval is longer in mid to high elevation coniferous forests than in low elevation ponderosa pine/western larch forests, lack of fire in this forest type has not had as drastic an effect on stand composition. Lack of fire (in combination with timber harvest) has, however, significantly altered the historic age class distribution, structure, patch size and distribution of mid to high elevation coniferous forest stands. Historically, fire created a mosaic of forest patches of various size and age classes across the landscape. Without this natural disturbance process, patches have become larger and more uniform.

Severe fire was likely a component of the historic fire regime in both low and mid to high elevation coniferous forests (Hutto 2008). Fire exclusion, however, has permitted a buildup of forest fuels (both downed woody debris and ladder fuels) so that much larger expanses of forest are susceptible to stand replacing fires. Some areas have also become more susceptible to insect infestations in the absence of fire. In high elevation coniferous forests, whitebark pine stands infected with white pine blister rust are more susceptible to wildfire.

Historic fire regimes in native grassland/sagebrush communities were also characterized by frequent, low to moderate severity fires (Morgan et al. 1998). In the absence of frequent wildfires, native grassland/sagebrush communities are lost to conifer encroachment. Some types of moist site and riparian vegetation, most notably quaking aspen stands, are rejuvenated or even established by fire. In the absence of periodic fires, these aspen stands grow decadent, exhibit poor clonal regeneration, and may eventually be encroached upon and replaced by other woody plant species, particularly conifers.

3.4.4.5 Incompatible Forestry Practices – High

Targets Affected: native salmonids, herbaceous wetlands, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest

Description: Forestry has been a dominant land use in the Blackfoot Subbasin for over 100 years. Many drainages in the subbasin have been logged. Incompatible forestry practices with impacts on forest, riparian and aquatic habitats include road construction, log skidding, harvest in riparian areas, clear-cutting, terracing and log drives on the Blackfoot and Clearwater Rivers (MBTSG 1995, USFWS 2002). Although these activities occurred predominantly in the past, present activities occasionally exacerbate historical problems. For over 10 years, public land

management agencies and industrial timber companies have followed Forest Best Management Practices (BMPs) mitigating many of these resource impacts.

Implications: Over 100 years of logging in low elevation ponderosa pine/western larch forests and mid to high elevation coniferous forests has resulted in the removal of many large diameter trees and an overall shift in forest structure, composition and age class distribution away from the historic range of conditions. In aquatic communities, the impacts of past forestry practices include increased sediment in streams, increased peak flows, hydrograph and thermal modifications, loss of instream woody debris and channel stability, and increased accessibility for anglers and poachers (USFWS 2002). Impacts associated with past forestry practices are major contributing causes of bull trout decline. Silvicultural impairment to water quality has been noted in the following drainages (MDHES 1994, USFWS 2002):

Bear Creek	Belmont Creek	Black Bear Creek
Blanchard Creek	Blanchard Creek	Braziel Creek
Buffalo Gulch	Camas Creek	Chamberlain Creek
Cottonwood Creek	Deer Creek	Dunham Creek
East Fork Ashby	Elk Creek	Gallagher Creek
Jefferson Creek	Keno Creek	Marcum Creek
McElwain Creek	Monture Creek	Murray Creek
Poorman Creek	Richmond Creek	Rock Creek
Union Creek	Upper Nevada Creek	Wales Creek
Ward Creek	Warren Creek	Washington Creek
Washoe Creek	West Fork Ashby	Yourname Creek
North Fork Blackfoot	West Fork Clearwater	Blackfoot River (Landers Fork to Monture Creek)

Current forestry practices can also negatively impact terrestrial and aquatic habitats in the subbasin. Current forestry practices to reduce the risk of fire in the wildland-urban interface, for example, can negatively affect subbasin forest types if they do not follow an ecosystem restoration prescription. Impacts of current forestry practices on herbaceous wetlands include piling slash in wetlands, road building in and near wetlands, failure to maintain buffers around wetlands and driving through wetlands. These activities are prohibited by Forest BMPs; however some may still occur on private lands.

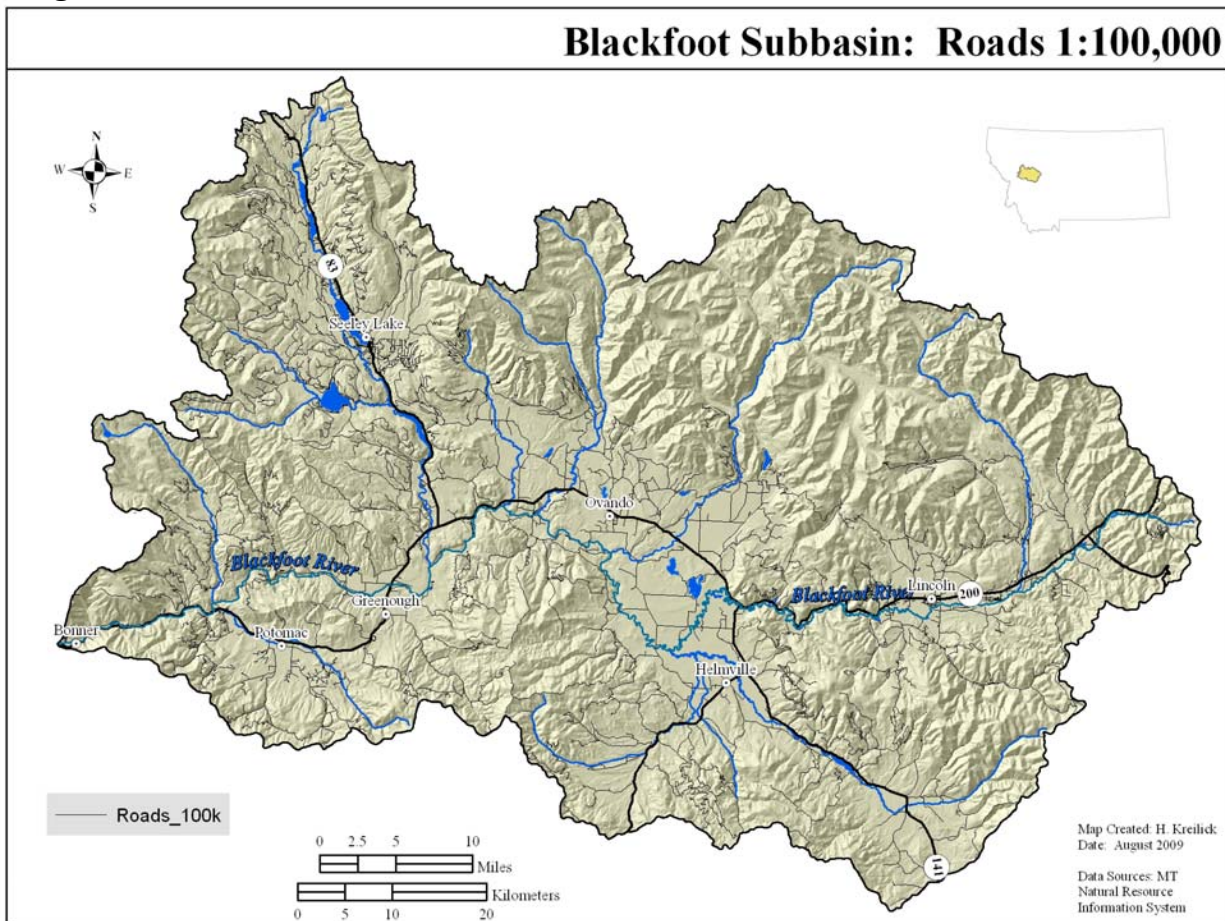
3.4.4.6 Physical Road Issues – High

Targets Affected: native salmonids, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest, grizzly bears

Description: Roads and road density are key factors affecting both terrestrial and aquatic systems in the Blackfoot Subbasin. Although the Blackfoot Subbasin includes substantial roadless areas, including parts of two federally-designated Wilderness areas, portions of the subbasin have extensive road networks associated mainly with past timber harvesting on national forest and

private timber company lands (Figure 3.28). The Highway 200 corridor along the mainstem Blackfoot River and the associated county road system are also key parts of the subbasin road network. As new homes are built away from the main highway corridor, the subbasin road network expands, impacting water quality, wildlife and weed management. For the purposes of the Blackfoot Subbasin Plan, this threat refers to the physical presence of roads. The impacts of road use on subbasin conservation targets are addressed in the *motorized vehicle use* threat.

Figure 3.27 Roads 1:100,000.



Implications: High road density is correlated with declines in aquatic habitat quality and native salmonids (USFS 1996). Road construction methods during the late 19th and early 20th centuries that involved stream/river channelization and straightening negatively affected aquatic habitat in the subbasin. Today, there are significant legacy effects of old roads including passage barriers, sediment production and unstable slopes (USFWS 2002). In addition, insufficient funding to maintain the existing road system has resulted in maintenance deficiencies, even on some well-designed roads, compounding the impacts of the existing road system (MDHES 1994, USFWS 2002).

Roads negatively affect water quality through chronic erosion of road surfaces and episodic failures of culverts at road-stream crossings that result in road sediments washing into streams (Lolo National Forest 2003). Improperly designed or installed culverts create barriers to the

movement of aquatic organisms and water and other natural materials, fragmenting and isolating populations, limiting access to spawning and rearing habitat, and altering the character of channels and associated habitats. Channel incisement associated with roads can also limit habitat access and impair habitat quality. Threats to native salmonids and aquatic habitat associated with Highway 200 and other heavily used roads in the subbasin include the risk of toxic spills and impacts associated with road grading, sanding, deicing and other road maintenance activities (USFWS 2002).

Roads and development are inextricably linked: roads facilitate new development and new development leads to expansion of the road network. The dispersed subbasin road network fragments forest habitat and facilitates the spread of noxious weeds. Habitat fragmentation by roads negatively impacts grizzly bears, bull trout, westslope cutthroat trout and other wide-ranging animals in the subbasin (e.g., Canada lynx, fisher, wolverine and gray wolf), leading to direct loss of habitat, loss of habitat connectivity within the subbasin and between the subbasin and adjacent habitats, and, ultimately, decreased population viability.

Impacts of roads on grizzly bears include: 1) direct mortality (collisions and human-caused death from encounters through an increase in the frequency and lethality of contact between people and bears), 2) displacement, 3) habituation and 4) habitat perforation and fragmentation. In the Blackfoot Subbasin, the presence of attractants for grizzly bears includes garbage at rest stops and homes, road-killed big game, tractor trailer food-cargo spills and roadside/highway-enhanced vegetation such as berries and grass. These food sources increase the susceptibility of grizzly bears to direct highway mortality. There have been three documented road-killed grizzlies in the Blackfoot Subbasin, one possible road-kill, several reports of collisions, and multiple reports of near misses (J. Jonkel, pers. comm.). The threat of vehicle mortality has widespread implications for grizzly bear reproduction, large-scale habitat connectivity and genetic viability.

3.4.4.7 Conversion to Agriculture – High

Targets Affected: herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities

Description: Agriculture is a critical component of the Blackfoot Subbasin economy. Ranchers play a vital role in conserving natural resources and the rural way of life in the subbasin. Roughly 14.5% of the total acreage in the Blackfoot is used for agriculture with livestock grazing characterizing the most common agricultural practice. This threat refers specifically to *new plowing and draining* in critical habitats within the Blackfoot Subbasin. Due to the conservation and restoration partnerships that started in the 1990s in the subbasin, new plowing and draining in critical habitats rarely occurs on private lands. The threat is listed as high to reinforce the implications listed below.

Implications: Conversion of ecologically critical habitats to agriculture results in habitat loss and degradation. In herbaceous wetlands, draining often occurs, altering the surface and groundwater

regimes that sustain these communities. Agricultural activity in or near riparian zones can result in bank destabilization, elevated water temperatures and increased sediment loads, among other problems (MBTSG 1995, USFWS 2002). Conversion to agriculture can also result in displacement of wildlife. The conversion of native grassland/sagebrush communities to agriculture, for example, is the primary factor responsible for the rangewide reduction in Columbian Sharp-tailed Grouse populations (Ulliman et al. 1998, PIF 2000).

3.4.4.8 Mining – High

Targets Affected: native salmonids, grizzly bears

Description: Numerous mines have been developed in the southern and eastern portions of the Blackfoot Subbasin. Mining in the headwaters of the Blackfoot River began in the mid-1800s. A variety of minerals including gold, silver, lead and copper were recovered from numerous small placer and hard rock mining operations (USFWS 2002). The Mike Horse Mine was the largest of several mines in the Heddleston District located between Lincoln and Rogers Pass. It produced gold, silver and lead during the first half of the 1900s. Continued exploration of the area after the Mike Horse Mine was closed in 1955 revealed a large deposit of copper and molybdenum. The Mike Horse tailings dam breached in 1975, resulting in acute and chronic contamination of the upper Blackfoot River (Stratus Consulting 2007), collapse of fisheries (Spence 1975, Peters and Spoon 1989, Pierce and Podner 2000, Pierce et al 2008), downstream movement of heavy metals, and biological uptake of toxins within the aquatic food web (Moore et al. 1991). The headwaters location of the mine and the toxic nature of existing contaminants continue to pose significant ecological risks to the mainstem Blackfoot River (Stratus Consulting 2007). The Heddleston Mining District has been the focus of some mine reclamation activity since 1993 (MDEQ 2003), although these have not addressed the ecological risks to the Blackfoot River (Stratus Consulting 2007).

The potential exists for new mining activity in the Blackfoot Subbasin. A large open-pit gold mine (the McDonald Gold Project) was proposed near Lincoln, but blocked by a 1999 state law resulting from a successful citizen-sponsored ballot initiative prohibiting new cyanide heap leach mining projects (USFWS 2002).

Implications: The legacy effect of past mining activities continues to impact aquatic habitat and fisheries in the subbasin. Impacts include the direct loss of aquatic habitat and, particularly in the upper portions of the drainage, chemical contamination. Mine drainage continues to contaminate waters in the Blackfoot Subbasin headwaters (Spence 1975, MBTSG 1995, Stratus Consulting 2007), although inflows of limestone groundwater below Lincoln enhance the river's buffering capacity against changes in pH and the effects of metals (Ingman et al. 1990). Impairment to water quality from mining activities has been noted in the following drainages (MDHES 1994, USFWS 2002, Pierce et al. 2008):

Blackfoot River (headwaters to Nevada Creek)	Beartrap Creek	Buffalo Gulch
Day Gulch	Douglas Creek	East Fork Ashby Creek
Elk Creek	Gleason Creek	Humbug Creek
Jefferson Creek	Keep Cool Creek	Mike Horse Creek
Moose Creek	Poorman Creek	Sandbar Creek
Sauerkraut Creek	Seven Up Pete Creek	Stonewall Creek
Union Creek	Upper Nevada Creek	Washington Creek
Washoe Creek	West Fork Ashby	Willow Creek

Any new mining activity in the Blackfoot Subbasin could pose a threat to native salmonids and aquatic habitat. New mining activity in the subbasin could also negatively affect grizzly bears. Depending on the size and type of mining operation, negative impacts could include: 1) direct habitat loss, 2) habitat degradation, 3) displacement of grizzly bears, 4) increased risk of habituation/food conditioning at the mine site (depending on how attractants are managed) and 5) cumulative negative impacts resulting from increased human population growth, development and recreation pressure in grizzly bear habitat.

3.4.4.9 Motorized Vehicle Use (on and/or off-road) – Medium

Targets Affected: herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest, grizzly bears

Description: Motorized vehicle use is one of many current uses in the subbasin. In particular, snowmobile, ATV and motorcycle use provide not only opportunities for recreation, but are also travel methods for private and public land managers and contractors accessing more remote areas. This threat primarily addresses motorized vehicle use on subbasin roads that have not been designated for public or administrative use as well as off-road motorized vehicle use. Impacts associated with the physical road network are described in Section 3.4.4.6.

Implications: Motorized vehicle use can directly impair vegetation communities, particularly off-road use in sensitive riparian areas, wetlands, grasslands and other plant communities. Use of motorized water craft in larger lakes and ponds may negatively impact Common Loons (a Species of Concern in Montana) and other wildlife. Motorized boats facilitate the spread of non-native species (invertebrates, plants and sometimes fish), cause erosion from their wake and can contribute to the petrochemical pollution of waters. Motorized vehicle use (both on and off-road) can also facilitate the spread of noxious weeds into native grasslands, forests and other plant communities and promote erosion and sedimentation in wetland and aquatic habitats.

Both on and off-road motorized vehicle use can result in disturbance to wildlife. Road density is usually higher at low elevations where grizzlies are concentrated in the spring. Road access management decisions, therefore, can impact grizzly bears (Lolo National Forest 2003). Roads

open to vehicle travel, especially during the spring, can displace grizzly bears, resulting in impairment of grizzly bear breeding and feeding. Road access can increase the frequency and lethality of contact between grizzlies and people. Hunting, ATV recreation and recreational road use by people who may be armed increases the probability that people will kill bears through: 1) self-defense killing from real or perceived risk of injury by bears, 2) malicious killing, and 3) mistaken identity killing of grizzly bears by black bears hunters. In some situations, private and public partners are employing increased human presence as a tool to deter grizzly and/or wolf-human conflicts.

Snowmobile trails are used by local clubs for recreation. Most large groups practice riding between communities and stay on the trails. In some areas, potential (and generally unintended) disturbance-related effects of snowmobile activity on grizzly bears include: 1) in-the-den disturbance, 2) disturbance at den emergence, 3) disturbance post emergence and 4) displacement from suitable denning habitat (Craighead and Craighead 1972). Potential impacts of snowmobile activity on Canada lynx include: 1) improved winter access and increased trapping mortality and 2) increased competition by bobcats and coyotes facilitated by compacted snowmobile trails (Ruediger et al. 2000). Potential impacts of snowmobile activity on wolverines include: 1) disturbance at the natal den and subsequent loss of recruitment and 2) improved access that facilitates increased take of legally trapped wolverines (Lolo National Forest 2000).

3.4.4.10 Incompatible Grazing – Medium

Targets Affected: native salmonids, herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities, grizzly bears

Description: For centuries, grazing by ungulates (bison, deer, and elk) and livestock (cattle and sheep) has been a dominant land use and management tool in the Blackfoot Subbasin. Today, land managers recognize the important connections between grazing and vegetation management. Public and private landowners in the subbasin are experimenting with rest-rotation and temporary and permanent fencing practices to manage for healthy vegetation and reduce noxious weeds. One ranch has been using goats and sheep to reduce spotted knapweed for nearly 10 years. The threat of *incompatible* grazing includes such practices as overgrazing by both ungulates and livestock, locating cattle feed lots and calving yards along streams, and accessibility of calving yards to grizzly bears.

Implications: Historical cattle grazing in the Blackfoot Subbasin is a significant cause of bull trout decline. Although grazing impacts have decreased in recent years as a result of cooperative efforts between landowners and agencies, 65 streams or stream reaches in the Blackfoot Subbasin are still impacted by grazing practices or cattle feedlots (Pierce et al. 2008). Livestock grazing is of particular concern to native salmonids where allotments are located along spawning and rearing streams (USFWS 2002).

Loss of riparian vegetation due to excessive livestock grazing can result in reduced stream bank stability, increased erosion and sedimentation, and elevated water temperatures (Rieman and

McIntyre 1993, Ehrhart and Hansen 1998). Rieman and McIntyre (1993) concluded that temperature is a critical habitat characteristic for bull trout. Temperatures in excess of 59 °F are thought to limit bull trout distribution in many systems (Fraley and Shepard 1989). Excessive livestock grazing in riparian areas can also result in over-widened and unproductive stream habitat. Excessive livestock browsing of deciduous woody species in moist site and riparian vegetation communities can result in a lack of recruitment in young age classes and deviation from historic community composition and structure.

Incompatible grazing practices may also contribute to the spread of non-native species in native grassland/sagebrush communities, herbaceous wetlands, moist site and riparian communities, and other plant communities. Habitat degradation, including loss of native plant species diversity, can increase with season-long grazing or other incompatible grazing strategies. Overgrazing in uplands can result in reduced residual cover for nesting birds.

The major impact of incompatible livestock practices on grizzly bears is site conflicts resulting from access to calving yards, livestock feed and other livestock-related attractants (e.g., crystal licks, molasses licks, granaries). Such site conflicts often result in death to bears, particularly when repeated conflicts occur. Livestock operations that maintain large blocks of open rangeland can provide many benefits to the long-term conservation of grizzly bears, not the least of which is the maintenance of open space and habitats that support a wide variety of wildlife, including grizzlies. At the same time, livestock operators can suffer losses from bear depredation. These losses tend to be directed at sheep, calves and sometimes apiaries (MFWP 2006).

3.4.4.11 Drainage and Diversion Systems – Medium

Targets Affected: native salmonids, herbaceous wetlands, moist site and riparian vegetation

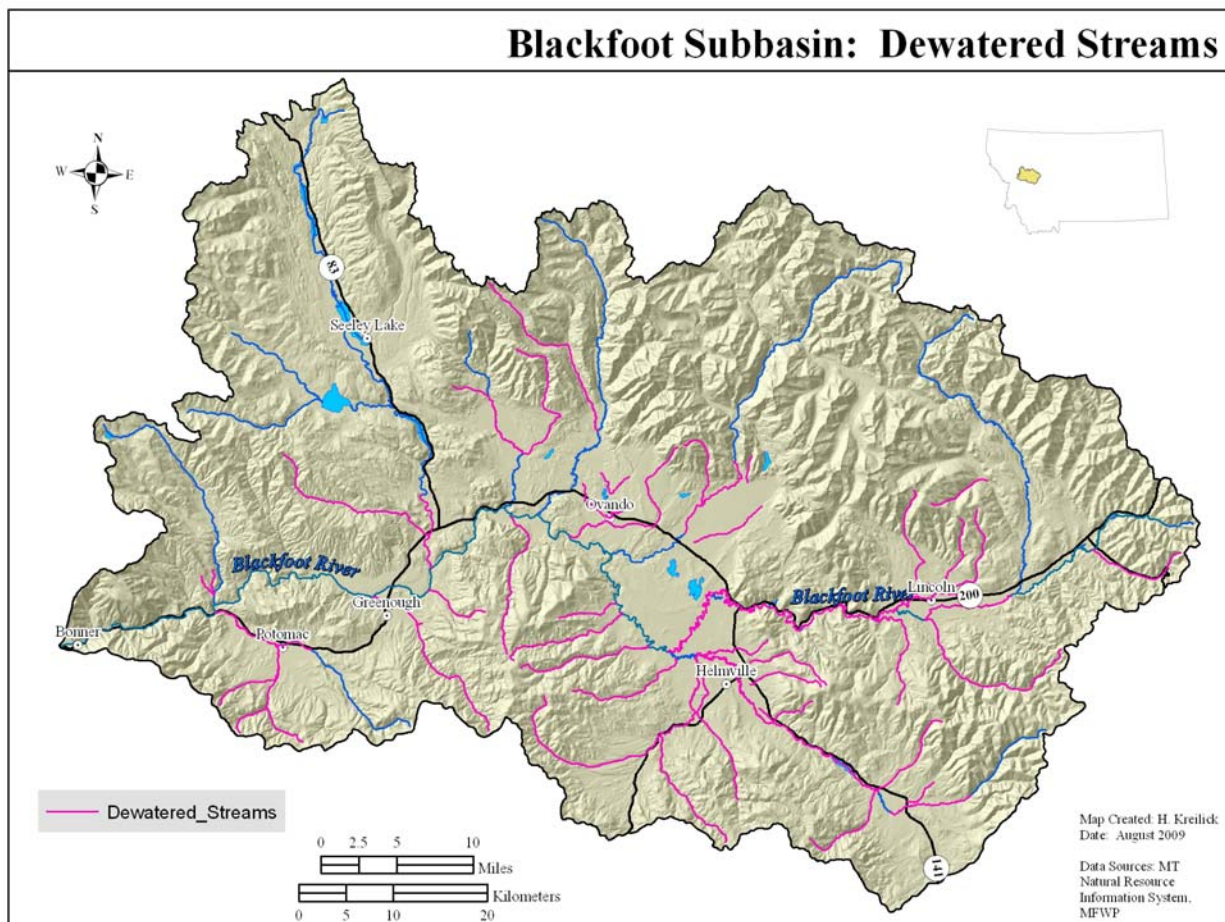
Description: Stream dewatering occurs naturally but is exacerbated in many cases by human activity. Drainage and diversion systems impact aquatic, wetland and riparian communities by altering the surface and groundwater flows that sustain them. Water is diverted from the Blackfoot River and its tributaries primarily for crop and livestock production. Coupled with the effects of an extended drought, stream dewatering is of great concern to both fisheries and water quality in the subbasin (BC 2005a).

Implications: Irrigation impacts and instream flow problems affect numerous streams and stream reaches in the Blackfoot Subbasin (Pierce et al. 2005).³² Diversions for irrigation can reduce flow, destabilize stream channels, interrupt migratory corridors (via blockages and dewatering) and entrain migrating fish (USFWS 2002). Lack of instream flows from dewatering and drought increases water temperature, limits fish passage, reduces survival and increases the spread of diseases among fish. In addition, lack of instream flows limits the transportation of sediment, nutrients and metals through the system leading to higher concentrations of these materials and impairments to water quality (MDEQ 2004, 2008a, 2008b).

³² A detailed discussion of water rights in the Blackfoot Subbasin is provided in Section 3.2.5.1.1.

Within the Blackfoot Subbasin, 194 river miles are periodically or chronically dewatered (Pierce et al. 2005) (Figure 3.29) (Appendix A). Natural dewatering occurs on 17 streams and 49 river miles. The upper Blackfoot River, for example, naturally becomes dewatered downstream of the Landers Fork. Human-caused dewatering occurs on about 45 streams and 165 river miles. The middle Blackfoot River, for example, includes 34 miles of human-related dewatering, most notably up and downstream of Nevada Creek. A combination of both natural and human-related dewatering occurs on eight streams (BC 2005a). In favorable flow years, the lower Blackfoot River from the North Fork to the mouth generally maintains flows sufficient to meet minimal aquatic needs and to satisfy relatively junior instream flow water rights. In low flow years, however, the lower Blackfoot may fall to less than 50% of minimum instream flow needs (BC 2005a).

Figure 3.28 Dewatered Streams.



Elevated water temperatures are common to streams that are heavily diverted and/or subject to receiving irrigation return flows (Pierce and Peters 1990, USFWS 2002). Water temperatures exceed the tolerance limits for bull trout in portions of many of these streams. Within the Blackfoot Subbasin, elevated water temperatures are found in Nevada, Douglas, Nevada Spring, Cottonwood, Willow, Union, and Elk Creeks and in the Clearwater River (MBTSG 1995, USFWS 2002, Pierce et al. 2004, 2006, 2008).

3.4.4.12 Channel Alteration – Medium

Targets Affected: native salmonids, moist site and riparian vegetation

Description: Channel alteration is associated with road corridors and levees that may constrain the channel migration zone. Stream banks have been armored in areas where natural bank erosion may threaten structures built too close to the channel, or where stream energy has been displaced by restrictions or channelization upstream. Channels have been intentionally straightened in areas where channel migration threatens property or structures and in an effort to gain access to or use of floodplain or stream migration zones. Some streams in the subbasin have been channelized for mining purposes or to drain wet meadows and increase hay production. Channel encroachment is caused mainly by development and land conversion for agricultural purposes.

Implications: Channel alteration and encroachment lead to riparian vegetation impairments, water quality impairments and physical habitat impairments (e.g., habitat elements and channel condition), all of which pose threats to native salmonid viability. Channel alteration also impacts the natural flood regime, which affects the viability of riparian vegetation communities. Forty streams in the Blackfoot Subbasin are currently identified with altered channels (Pierce et al. 2008).

Historically, the impact of channel encroachment was greatest in the valley-bottom agricultural lands. More recently, the impacts are associated with residential and resort development adjacent to streams. Landowners can exacerbate impacts by removing riparian vegetation or altering stream banks to gain stream access, improve views or protect vulnerable property within the flood plain and active channel migration zone.

3.4.4.13 Epidemic Levels of Native Insects and Pathogens – Medium

Targets Affected: low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest

Description: Significant insect threats in the Blackfoot Subbasin include the mountain pine beetle in lodgepole, ponderosa, and whitebark pine, the Douglas-fir bark beetle in Douglas-fir, and the western pine beetle in ponderosa pine.

Implications: The abovementioned beetles are at epidemic proportions in subbasin forests, largely as a result of drought conditions since 2000. Insect infestations in subbasin forests have resulted in significant mortality of coniferous tree species. Impacts of extensive tree mortality include increased risk of severe wildfires and, in the case of whitebark pine, reduced seed production and loss of this food source for grizzly bears and other subbasin wildlife.

3.4.4.14 Non-Motorized Recreational Use - Medium

Targets Affected: native salmonids, grizzly bears

Description: Outdoor recreation and tourism is a major component of the Blackfoot Subbasin economy. The area is renowned for its high quality fishing, hunting, camping, hiking, river floating, wildlife viewing, and sightseeing opportunities. Many of these outdoor activities are made possible by public ownership of large tracts of mountainous habitat and additional access provided by many private landowners (MFWP 2006). There are, however, a range of impacts associated with non-motorized recreational use.

Implications: For salmonids, angler pressure and poaching are the two primary threats associated with recreational use in the Blackfoot. The Blackfoot River is one of the most popular fisheries in the Upper Clark Fork region. The average number of angling days/year between 2001 and 2007 was 36,489 (MFWP 2008). Illegal stocking of non-native fish, such as northern pike, largemouth bass and walleye, is another side-effect of recreational angling that threatens native species in the subbasin. The mainstem of the Blackfoot River is also extremely popular for non-angling recreation (e.g., picnicking, sunbathing, boating), particularly in the lower reaches closer to Missoula. Both angling and non-angling river recreation have impacts on aquatic and riparian habitat in the subbasin (MFWP 2008). Fish stocking, boating and angling can all contribute to the spread of whirling disease, an exotic parasite that affects fish in the trout and salmon family (Montana Water Center 2009). MFWP is in the process of drafting a recreation management plan for the Blackfoot River and the North Fork of the Blackfoot River that will guide recreation management now and into the future (MFWP 2009). The proposed plan is based on the recommendations of the River Recreation Advisory for Tomorrow (RRAFT) Citizen Advisory Committee.

For grizzly bears, negative bear-human interactions are the primary threat associated with non-motorized recreational use. Recreationists have largely unhindered access to millions of acres of undeveloped land in the Blackfoot Subbasin, much of which is currently occupied by grizzly bears. As numbers of bears and outdoor recreationists increases, contact between bears and people is likely to increase as well. These encounters could lead to injuries or death for both humans and bears (MFWP 2006). Backcountry camps used by hikers and hunters may be sources of bear attractants. Because habituation to humans often results in bear removals or death, high levels of human use in certain areas may eventually preclude bear use.

3.4.4.15 Existing Crop Production – Low

Targets Affected: herbaceous wetlands

Description: There are over 44,000 irrigated acres in the subbasin (CFTF 2004). Most of the existing cropland in the subbasin is located on the valley floor. This threat is again primarily of historic interest. In fact, in the recent past there has been more conversion of traditional agricultural land (grazing or hay production) back to herbaceous wetland communities than conversion of wetlands to cropland production.

Implications: In the past, crop production resulted in the loss and/or degradation of herbaceous wetland communities across the Blackfoot Valley floor. Crop production practices that can negatively impact herbaceous wetlands include draining and plowing, result in hydrologic alteration and water quality impairment in wetlands through increased nutrient inputs.

3.4.4.16 Filling of Wetlands - Low

Targets Affected: herbaceous wetlands

Description: It is estimated that about one-fourth of Montana's wetlands have been lost because of agriculture and urbanization. As mentioned above, this threat is primarily of historic interest as there has been recent conversion of traditional agricultural land (grazing or hay production) back to herbaceous wetland communities.

Implications: Filling of herbaceous wetlands reduces the number, size, distribution and diversity of this important habitat, resulting in degradation and/or loss of many important wetland functions, such as (McCarthy 2001):

- Holding and gradually releasing water into the soil and into adjacent streams or water bodies during low flow periods of the year (maintaining late summer stream flows is critical for irrigating crops, watering livestock, sustaining fisheries and recharging aquifers).
- Enhancing water quality by absorbing and holding toxins and nutrients before they enter nearby lakes, streams or groundwater. Wetlands also filter sediments, which protects water quality and prolongs the life of irrigation pumps, and reduces siltation of ponds and irrigation ditches.
- Supporting rare plants and vegetation that stabilizes shorelines and acts as a flood buffer.
- Decomposing organic matter and incorporating nutrients back into the food chain.
- Providing habitat for birds, mammals, reptiles and amphibians.
- Providing shallow water for freshwater fish to spawn, shelter and feed.

3.4.4.17 Lack of Human Tolerance – Low

Targets Affected: grizzly bears

Description: Some residents of the Blackfoot Subbasin are ideologically opposed to having grizzly bears reoccupy private lands and therefore do not feel it necessary to accommodate bears. Intolerance of grizzly bears results from such factors as:

- Fear for personal safety and safety of children/family
- Perceived or real threat of loss of personal property (e.g., livestock, beehives)
- Perceived loss of recreational opportunity (e.g., loss of favorite fishing hole due to fear of encountering grizzlies in river/creek bottoms)
- Perceived loss of intergenerational equity (some parents do not allow their children to roam freely).
- Negative perceptions and intolerance of grizzly bears that can result in refusal to adopt coexistence practices.

Implications: A lack of public and political support can result in human practices and behaviors that lead to human-bear conflicts, which in turn can lead to grizzly bear deaths. In some situations, residents believe that bear management is the sole responsibility of state wildlife management entities. Unfortunately, this shifts the burden to engage in bear-friendly behavior away from the public. The willingness of humans to coexist with grizzly bears is critical to the recovery and long-term viability of this threatened species.

Because lack of human tolerance is a threat to grizzly bear viability in the Blackfoot Subbasin, wildlife managers, the Blackfoot Challenge and their partners have worked hard in recent years to mitigate this threat. The subbasin grizzly bear work group assigned lack of human tolerance a threat rank of “medium” based on their experiences with community members throughout the basin. Hundreds of community members take part in a variety of programs that have reduced grizzly bear-human conflicts by 84% since 2003 to the present. While the grizzly bear work has not directly measured human tolerance for grizzly bears in the subbasin, the number of complaints, concerns or discussions regarding grizzly bears is virtually nonexistent. Because this threat only affects one conservation target, the overall threat rank to the subbasin is “low.”

3.4.4.18 Human-Caused Mortality – Low

Targets Affected: grizzly bears

Description: Humans kill grizzly bears for a variety of reasons including self defense, mistaken identity killing during legal black bear hunting season, management removal of bears from conflicts, collision with vehicles, or killing for malicious purposes (poaching) (MFWP 2006). In the NCDE, between 2000 and 2004, roughly one-third of known mortality was from illegal

killing. Certain locations seem to have greater densities of illegal killing, suggesting localized poaching activity. This type of poaching is not for the bear parts trade, but is likely the work of an individual or individuals that engage in vandal-type killing of bears for a variety of unknown reasons (S. Wilson, pers. comm.).

Implications: Human-caused mortality is a major limiting factor for long-term grizzly bear recovery. The decline of grizzly bear populations in the United States and the southern Canadian Rockies is clearly linked to human causes, as human-grizzly bear conflicts are often a precursor to mortality (Mattson et al. 1996). A synthesis of long-term grizzly bear radio collar studies in the United States and southern Canada showed that between 1974 and 1996, approximately 85% of known bear mortality was attributed to humans (Mattson et al. 1996). McLellan et al. (1999) found that undetected grizzly bear deaths were typically due to non-hunting human causes and that between 1975 and 1997, malicious killing was the major cause of grizzly bear death in Montana. Moreover, these same researchers determined that for every known human-caused mortality, it is likely that another undetected mortality occurs (McLellan et al. 1999).

Grizzly bear mortality in the United States tends to be spatially concentrated on the periphery of core habitats, particularly in portions of Montana like the Blackfoot Subbasin (USFWS 2003). Core habitats refer to lands that contain self-sustaining populations of grizzly bears. There are generally a mix of multiple use national forest lands, national parks, and designated Wilderness areas. Lands on the periphery of core areas are less secure, low elevation habitats. They are typically privately owned agricultural lands that contain a variety of unnatural bear foods (S. Wilson pers. com.). Upon emergence from the den, bears move considerable distances from high, snow covered elevations to lower elevations to reach palatable, emerging vegetation on avalanche chutes or to feed on winter-killed or weakened ungulates on foothill winter ranges. Similar movement patterns often occur in the fall due to ripening of fruit and berries at lower elevations. These movement patterns often bring bears near areas of human habitation, increasing the incidence of human/bear conflicts and human-caused grizzly bear mortality (MFWP 2006).

Because human-caused mortality is a serious and long-term threat to grizzly bear viability in the Blackfoot Subbasin, wildlife managers, the Blackfoot Challenge and their partners have worked directly on mitigating this threat. Since 2004 there have been no grizzly bears mortalities resulting from management related incidents or conflicts. For this reason, the subbasin grizzly bear work group assigned human-caused mortality a threat rank of “medium.” Because this threat only affects one conservation target, the overall threat rank to the subbasin is “low.”

3.4.4.19 Altered Wildlife Use Patterns - Low

Targets Affected: moist site and riparian vegetation, native grassland/sagebrush communities

Description: Historic patterns of wildlife use in native plant communities have been altered due to a variety of human land use activities in the subbasin. These changes have occurred largely

since European settlement when a variety of relatively high impact land uses began, including logging, mining and agriculture.

Implications: Wildlife use patterns in vegetation communities change when degradation occurs such as plowing of native prairie, excessive livestock grazing, non-native plant invasion, draining of wetlands or disturbance next to wetlands such as roads. If degradation of vegetation communities occurs on a small scale (i.e., < 20% of a landscape), the impact to wildlife is generally minimal. If degradation occurs on a larger scale, certain species of wildlife may no longer be able to use that landscape. If historic wildlife use patterns are altered significantly enough, species (both plants and animals) composition and structure in native vegetation communities can shift.

3.4.4.20 Presence of Bear Attractants – Low

Targets Affected: grizzly bears

Description: Attractants like garbage, livestock feed, bird seed, beehives, calving areas and other bear food sources associated with humans and human settlements are a major cause of repeated human-grizzly bear conflicts in the subbasin (J. Jonkel, pers. com., Mattson 1990). Under certain conditions, grizzly bears can kill significant numbers of cattle and sheep (Murie 1948, Johnson and Griffel 1982, Knight and Judd 1983, Jorgensen 1983, Brown 1985). Grizzly bears apparently prefer to kill livestock in the following approximate order: swine, ewes, lambs, calves and yearling cattle, cows, horses, and bulls (Mattson 1990) but site specific situations also influence the type of livestock grizzlies prefer. Forestry operations also provide opportunities for grizzly bears to be attracted to food and garbage and to become food conditioned (Lolo National Forest 2003).

Implications: Attractants located in high quality bear habitat result in human–grizzly bear conflicts on private land (Wilson et al. 2005; Wilson et al. 2006). Chronic conflict situations from attractants lead to bears being trapped and relocated or removed from the ecosystem. In the NCDE, 49% of known, human-caused grizzly bear mortality results from human foods or livestock (USFWS 2006). Excessive human-caused mortality can result in a decrease in grizzly bear genetic and population viability.

Removing or securing attractants is a simple yet critical step in fostering human-bear coexistence. In Montana, researchers have called for a reduction in the availability of anthropogenic food sources and attractants on privately owned lands to reduce conflicts and mortalities, particularly for female grizzly bears (Mace and Waller 1998). Action item #1 in the Grizzly Bear Recovery Plan (USFWS 1993) is to “reduce human-bear conflicts,” most of which occur on private lands. The Blackfoot Challenge is currently working with ranchers and other private landowners to reduce conflicts by removing livestock carcasses in the spring and fencing calving areas and bee yards. These efforts have successfully reduced grizzly bear/human conflicts in the subbasin in the last six years by 84% (S. Wilson, pers. com.). One individual failing to secure bear attractants, however, can precipitate a chain of events that leads

to a bear becoming more familiar with people and their dwellings. Also, as time goes by without conflict, people can become complacent. It is through awareness of the risk, and by responding accordingly, that risks can be minimized and support for grizzlies in Montana can increase (MFWP 2006).

Because the presence of bear attractants is a serious, dynamic and long-term threat to grizzly bear viability in the Blackfoot Subbasin, wildlife managers, the Blackfoot Challenge and partners have focused directly on securing or removing attractants throughout the subbasin. Nearly all high risk calving areas in the subbasin have electric fences (41,000 feet of fencing have been installed) and on average, 225 livestock carcasses are removed annually from ranches in the subbasin. All ranches located in core grizzly bear habitat in the subbasin remove livestock carcasses. Ninety-five percent of all beehives in the subbasin are protected with electric fences. All road killed deer and livestock composting facilities are protected with electric fences, and plans are underway to protect two of the three transfer stations in the subbasin with electric fences. A network of 120 residents monitor both grizzly and wolf activity and the Blackfoot Challenge has dozens of trash resistant garbage cans that are loaned out to residents each year. For these reasons, the subbasin grizzly bear work group assigned presence of bear attractants a threat rank of “low.” Because this threat only affects one conservation target, the overall threat rank to the subbasin is also “low.”

3.4.5 External Threats

Threats to Blackfoot Subbasin conservation targets originate both within and outside of the subbasin. The preceding discussion of 20 key threats identified by subbasin work groups focuses on within-subbasin impacts. In this section, we note the significance of external factors that pose a threat to subbasin targets. External impacts to fish and wildlife in the Blackfoot Subbasin include climate change, fish migration barriers, habitat conditions, land use in adjacent subbasins and human population growth at a regional scale. Of the Blackfoot Subbasin conservation targets, bull trout, westslope cutthroat trout and grizzly bears are all wide-ranging species that are particularly vulnerable to threats originating outside of the subbasin.

External threats to bull trout and westslope cutthroat trout include:

- Climate change, as described in Section 3.4.4.2, has specific impacts on the life histories of both westslope cutthroat trout and bull trout.
- The removal of Milltown Dam just downstream of the mouth of the Blackfoot River, while generally considered to a positive change for migratory native fish, may have the ancillary effect of allowing the in-migration of non-native species, which could intensify competition and hybridization.
- The spread of invasive, aquatic species not yet established in the Blackfoot Subbasin (e.g., New Zealand mud snail, zebra mussel) in areas outside of the subbasin may increase the likelihood of their future import into the subbasin.

External threats to grizzlies include:

- Future coal mining north of the Canadian border in the British Columbia portion of the Flathead Subbasin could impact grizzly populations in the NCDE.
- High grizzly bear mortality in southwest Alberta could act as a ‘sink’ to grizzlies that disperse there from the NCDE, potentially reducing the NCDE population over time.
- The impacts of climate change on grizzlies is unknown, but drier and hotter conditions throughout the NCDE could pose additional threats to grizzly bears through habitat change and reduced abundance in naturally occurring bears foods.
- Large-scale wind development along the Rocky Mountain Front could impact grizzlies throughout habitat loss, displacement, and increased human-caused mortality depending on how site development, maintenance, and road access is managed.
- High-speed rail and highway improvements throughout the NCDE are potential future threats to grizzly populations in the NCDE.

Climate change is the most significant external threat affecting all conservation targets to varying degrees. In addition to conservation and restoration actions at the subbasin scale, addressing the threat of climate change will require large-scale solutions that extend beyond the subbasin boundaries.

4.0 Inventory of Existing Programs and Activities

4.1 Background

The Blackfoot Subbasin Inventory summarizes current fish, wildlife, and habitat protection and restoration activities within the subbasin. The Inventory includes a description of 1) protected areas in the subbasin, 2) management plans, including endangered species recovery plans, 3) management and funding programs and 4) on-the-ground restoration and conservation projects that target fish, wildlife and habitat in the subbasin. Following this review of existing protections and current management strategies, we evaluated and identified gaps in conservation and restoration activities in the Blackfoot Subbasin, particularly in relation to the stresses and threats identified in Section 3.4 of the Blackfoot Subbasin Assessment. The results of this gap assessment are outlined in Section 4.4. To complete the Subbasin Inventory, we surveyed a large number of agencies, organizations and individuals involved directly or indirectly in fish and wildlife activities in the subbasin.

In the Blackfoot Subbasin, a history of landowner-led cooperation has resulted in an emphasis on voluntary, incentive-based conservation and restoration in contrast to top-down regulation and enforcement. The lack of courtroom-settled disputes indicates the success of this collaborative approach. In the following pages, we outline the wide variety of programs and tools used by public and private partners in the subbasin to achieve on-the-ground conservation and restoration.

4.2 Current Management Activities

Protection for fish, wildlife and habitat in the Blackfoot Subbasin comes in many forms, including state and federal laws and regulations, federal wilderness designations, wildlife management and conservation areas, natural areas, and various special fisheries or wildlife designations. In the following sections (4.2.1.1 - 4.2.1.3), we provide brief descriptions of major regulations, protected areas and special designations within the Blackfoot Subbasin.

4.2.1 Existing Protection

4.2.1.1 Federal Protection

Federal laws and regulations: Federal laws and regulations that protect westslope cutthroat trout and bull trout habitat in the Blackfoot Subbasin include:

- The Clean Water Act (CWA), including Sections 401 and 404 permits, which regulate discharge or placement of dredged or fill material into waters of the United States.
- The Federal Land Management Protection Act (FLPMA).
- National Forest Management Plans and other internal agency management guidelines and policies.
- The Endangered Species Act (ESA), which compels review of actions that may affect habitat of threatened and endangered species or species proposed for listing.

- The National Environmental Protection Act (NEPA), which compels review of all activities that may affect westslope cutthroat trout and bull trout on federal and tribal lands and may thus modify those activities, when necessary, to minimize adverse effects on these species.

Federal protected areas:

- *Scapegoat and Mission Mountains Wilderness Areas (USFS):* The Scapegoat Wilderness, designated by the U.S. Congress in 1972, encompasses 239,936 acres along the northern edge of the Blackfoot Subbasin and includes within its boundaries the headwaters of Monture Creek, the North Fork of the Blackfoot and the Landers Fork. It is managed by the Rocky Mountain, Lincoln, and Seeley Lake Ranger Districts. A small portion of the Mission Mountains Wilderness Area extends into the western portion of the Blackfoot Subbasin. The Mission Mountains Wilderness was officially classified as Wilderness in 1975. In total, there are 164,413 acres of wilderness in the Blackfoot Subbasin that are managed in accordance with the Wilderness Act of 1964. If passed, the proposed Blackfoot-Clearwater Cooperative Stewardship Project will result in an additional 83,478 acres of wilderness designated in the Blackfoot watershed (71,378 acres as part of the North Fork Blackfoot Monture Creek Addition to the Bob Marshall and Scapegoat Wilderness Areas; 7,599 acres as part of the Grizzly Basin Swan Range Wilderness Addition to the Bob Marshall Wilderness Area; and, 4,501 acres as part of the West Fork Clearwater Wilderness Addition to the Mission Wilderness Area).
- *Waterfowl Productions Areas (USFWS):* Waterfowl Production Areas (WPAs) are purchased and managed by the USFWS. All WPAs are tracts of wetlands and uplands purchased with funds from the sale of Federal Duck Stamps under the Small Wetlands Acquisition Program. Units that contain habitat for waterfowl are purchased from willing sellers when money and acreage are available. Units are sometimes expanded as opportunities arise. The USFWS owns three Waterfowl Production Areas (WPAs) within the Blackfoot Subbasin that are managed as part of the National Wildlife Refuge System. The three properties total 4,452 acres and are locally known as the Blackfoot WPA, the H2-O WPA and the Kleinschmidt Lake WPA.
- *Conservation easements (USFWS):* The USFWS manages over 43,277 acres of perpetual conservation easements on private lands in Powell and Lewis and Clark Counties.

4.2.1.2 State Protection

State laws and regulations: Montana has several laws and regulations directed toward protection of aquatic habitats that, if properly applied and enforced, reduce threats to native salmonids throughout the state. Before permits allowing activities covered under these regulations are issued, applications are reviewed by MFWP, MDNRC, and MDEQ. Recommendations to limit impacts to westslope cutthroat trout and bull trout and their habitat are mandated through the permitting process.

- The *Montana Natural Streambed and Land Preservation Act* requires private, non-governmental entities to obtain a permit for any activity that physically alters or modifies the bed or banks of a perennially flowing stream.

- The *Montana Stream Protection Act* requires a permit for any project that may affect the natural and existing shape and form of any stream or its banks or tributaries.
- The *Montana Pollutant Discharge Elimination System* requires permits for all discharges to surface water or groundwater, including discharges related to construction, dewatering, suction dredges and placer mining.
- The *Streamside Management Zone Law* permits only selective logging and prohibits clear cutting and heavy equipment operation within 50 feet of any lake, stream or other body of water.

State protected areas:

- *Montana Department of Natural Resources and Conservation lands:* While the MDNRC manages school trust lands in the Blackfoot Subbasin, none of those lands have received designation as “protected,” for purposes other than fire protection, under any state program or statute. The total number of MDRNC lands in the subbasin is 73,200 acres and is expected to increase in the future, as part of the Montana Legacy Project (see Section 4.2.1.3).
- *Montana Fish, Wildlife and Parks lands:* MFWP owns and manages 25,000 acres of key wildlife habitat in the Blackfoot Subbasin consisting of four Wildlife Management Areas (WMAs) (the Blackfoot-Clearwater, Ovando Mountain, Aunt Molly, and Nevada Lake) and more than 20 Fishing Access Sites. In addition, MFWP is actively pursuing fee purchase of an additional 24,000-acre parcel in the Clearwater drainage of the Blackfoot which will also be managed as a WMA. The Department currently holds 12 conservation easements in the valley totaling more than 22,000 acres and expects to acquire an additional 26,000 acres of conservation easements within the next two years. MFWP land management, and the conservation easements that it holds, emphasize the maintenance and improvement of wildlife habitat and the provision of public recreational access.

4.2.1.3 Other Special Designations and Projects

The Blackfoot Community Conservation Area (BCCA): In 2003, the Blackfoot Challenge and The Nature Conservancy initiated the Blackfoot Community Project, involving the purchase and re-sale of 89,215 acres of Plum Creek Timber Company (PCTC) lands based on a community-driven disposition plan. The lands encompassed all PCTC lands from the headwaters near Rogers Pass to the Clearwater drainage and are in the process of being resold to both public agencies and private individuals. Approximately 70% of the lands will be transferred into federal or state ownership with the remaining 30% into private ownership. As part of the project, partners established the 41,000-acre Blackfoot Community Conservation Area at the base of Ovando Mountain. The BCCA involves 5,609 acres of community forest ownership and cooperative ecosystem management of surrounding USFS-Lolo National Forest, MFWP, MDNRC, and private lands.

Bull Trout Critical Habitat (USFWS): The final bull trout critical habitat rule was published in the federal register on September 26, 2005. It designated 1,058 stream miles in Montana as critical habitat. Of those miles, approximately 146 miles are in the Blackfoot Subbasin. Included in the designation are the mainstem Blackfoot, Monture Creek, the Clearwater River, Morrell

Creek, Cottonwood Creek, the North Fork of the Blackfoot, and Landers Fork. Also receiving critical habitat designation are Seeley Lake, Placid Lake, Lake Alva, Lake Inez, and Salmon Lake, Rainy Lake, and Clearwater Lake.

Montana Legacy Project: In 2008, The Nature Conservancy and The Trust for Public Land entered into an agreement with Plum Creek Timber Company to purchase 312,500 acres of timberland in western Montana. A total of 71,754 acres in the Clearwater and Potomac valleys of the Blackfoot Subbasin will be purchased and resold to public agencies and/or private buyers. A majority of the lands that are part of this project in the Blackfoot Subbasin are intended to be resold to the USFS or MDNRC. For more information, please visit <http://www.themontanalegacyproject.org/>.

Powell County Agricultural District 3: Powell County development regulations divide the county into five "Agricultural Districts." Each of these districts has minimum lot sizes and allowable uses, creating what is essentially county-wide zoning. Agricultural District 3, which encompasses Powell County in the Blackfoot Subbasin, has minimum lot sizes of 160 acres. This District was established out of concern from the community over the rate at which family farms were being sold and converted to second homes.

4.2.2 Existing Management Plans

This section provides brief descriptions of federal, state, county and other management plans that affect fish and wildlife in the Blackfoot Subbasin.

4.2.2.1 Federal Plans

Bull Trout Draft Recovery Plan (Chapter 3: Clark Fork, which includes the Blackfoot Subbasin) (USFWS 2002): This draft federal recovery plan was required under the Endangered Species Act. It is currently under revision. It includes recovery criteria, recovery tasks, estimated costs, and an implementation schedule. When the final plan is approved, it will become the official guidance document for federal bull trout recovery efforts.

Canada Lynx Conservation Assessment and Strategy, Second Edition (Ruediger et al. 2000): The Lynx Conservation Assessment and Strategy was developed to provide a consistent and effective approach to conserve Canada lynx on federal lands in the conterminous United States. The USFS, BLM and USFWS initiated the Lynx Conservation Strategy Action Plan in spring of 1998. The conservation measures presented in this document were developed to be used as a tool for conferencing and consultation, as a basis for evaluating the adequacy of current programmatic plans, and for analyzing effects of planned and on-going projects on lynx and lynx habitat.

Canada Lynx Conservation Agreement (USFS and USFWS 2005): This agreement is an interim measure to guide lynx management on federal lands within forests pending the amendment of forest plans to incorporate the provisions of the Lynx Conservation and Assessment Strategy.

Grizzly Bear Recovery Plan (USFWS 1993): This federal recovery plan, required under the Endangered Species Act, includes a description of the current status, habitat requirements and limiting factors, recovery objectives, recovery priorities, recovery criteria, and actions needed.

Habitat Conservation Plans (HCP): Organized under the ESA, HCPs provide a framework for people to complete projects while conserving at-risk species of plants and animals. Congress envisioned Habitat Conservation Plans as integrating development and land-use activities with conservation in a climate of cooperation. The ESA protects endangered and threatened species of wildlife and plants. Without a permit, it is unlawful to “take” (i.e., harm, kill) listed wildlife species. Under the ESA, the USFWS is authorized to issue incidental take permits to landowners who develop HCPs. HCPs provide a framework for creative partnerships with the goal of reducing conflicts between listed species and economic development. Habitat Conservation Plans can help communities plan for economic development while ensuring the future of endangered and threatened species. Through large-scale HCPs, stakeholders chart landscape-level strategies and conserve biological diversity. HCPs for MDNRC lands and Plum Creek Timber lands are described below in Sections 4.2.2.3 and 4.2.2.5.

Hatchery and Genetic Management Plan for the Creston National Fish Hatchery (USFWS 2000): This document describes the hatchery program including: funding, purpose, justification, performance standards and indicators, relationship of hatchery to other program objectives, ecological interactions, facilities water source, broodstock origin and identity, incubation, rearing, and release.

Helena National Forest Plan (Helena National Forest, USFS, updated 2004 to include Amendments 1 through 23): The Forest Plan guides all natural resource management activities and establishes management standards for the Helena National Forest. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management. The purpose of the Forest Plan is to provide long-term (10-15 year) direction for managing the Helena National Forest. The plan provides two levels of direction: general forest-wide management direction and specific direction for each management area. Direction is described in terms of management goals, objectives, and forest-wide and Management Area Standards. This update incorporates Amendments 1 through 23. The forest also has a management plan for the Lincoln Scapegoat Wilderness.

The Inland Native Fish Strategy (INFISH): INFISH was adopted by the USFS in 1995, amended National Forest Plans and Regional Guides to include interim direction for riparian management objectives, standards and guidelines, and monitoring in the Columbia River basin. Among other provisions, INFISH requires that 300-foot buffers be maintained along all streams. INFISH standards, which can only be modified following a watershed analysis or site-specific evaluation, are being implemented on USFS lands to minimize or eliminate present or potential destruction of westslope cutthroat trout and bull trout habitat and other aquatic resources. The June 10, 1998 listing of bull trout in the Columbia River basin as a threatened species under the Endangered Species Act (63 FR 31647) has further strengthened protections for focal species habitat.

Lolo National Forest Plan (Lolo National Forest, USFS, 1986): The Forest Plan follows the same format and serves the same purpose as the Helena National Forest Plan described above. It

was also amended by the 1995 INFISH as describe above. The Lolo National Forest also has management plans for the Wilderness areas within its boundaries. The Forest Plan also has management areas that designate areas as proposed Wilderness (MA 12) and roadless areas (MA 11). Proposed Wilderness areas include the Bob Marshall Extension which consists of lands in the headwaters of North Fork Blackfoot, Monture Creek, North Fork Cottonwood, and Morrell Creeks. Designated roadless areas include headwater portions of Monture Creek, Clearwater River, Morrell Creek, North Fork Placid, and Cottonwood Creek. The Lolo National Forest is currently revising its land management plans to reflect new scientific information as well as natural and social changes that have accumulated since the original plan was prepared in the 1980s. For more information, please visit <http://www.fs.fed.us/r1/wmpz/>.

Montana Bald Eagle Management Plan (USDI 1994): This plan is a revision of the 1986 Montana Bald Eagle Management Plan. It is intended to provide landowners and resource managers with information on the biology of Bald Eagles to facilitate informed decisions about land use and to promote the conservation of the species and its habitat. It includes information on biology and management guidelines.

Northern Rocky Mountain Wolf Recovery Plan (USFWS 1987): The Northern Rocky Mountain Wolf Recovery Plan outlines steps for the recovery of the gray wolf populations in portions of their former range in the Northern Rocky Mountains of the United States. The recovery plan is intended to provide direction and coordination for recovery efforts. State responsibility for many plan items is proposed because the Endangered Species Act of 1973, as amended, provides for State participation and responsibility in endangered species recovery. The plan is a guidance document that presents conservation strategies for the Northern Rocky Mountain wolf.

4.2.2.2 Tribal Plans

While the Confederated Salish and Kootenai Tribes of the Flathead Nation do not have any specific management initiatives in the Blackfoot Subbasin, they do have a strong management interest in the area because it is encompassed within the aboriginal territory of the Tribes and consists largely of lands ceded to the United States government under the provisions of the Hellgate Treaty of 1855. Tribal members of the Kootenai Tribe lived in northwestern Montana. Under the provisions of the Treaty, the Tribes maintained the right to continued use of resources in the area. Today, tribal members continue to utilize those resources for subsistence, cultural, and spiritual needs. As a result, the Confederated Salish and Kootenai Tribes value this area and take an active interest and role in ongoing management activities that affect fish, wildlife, and habitat resources (L. Ducharme, pers. comm.).

4.2.2.3 State Plans

Blackfoot River Recreation Management Plan (MFWP 2009): This plan seeks to guide recreation management now and in the future on the Blackfoot River. The plan identifies the desirable social and resource conditions for different reaches (sections) of the river, management actions that can be implemented on a routine basis to manage recreation on the Blackfoot River, and indicators and standards to guide the implementation of future management actions that can be used to maintain desired conditions or to improve undesirable conditions. The plan is based on

the recommendations of the River Recreation Advisory for Tomorrow (RRAFT) Citizen Advisory Committee. For more information, see <http://fwp.mt.gov>.

Columbian Sharp-tailed Grouse Mitigation Implementation Plan for Western Montana (MFWP 1991): This plan outlines management objectives to accomplish the goal of improving the current status of Columbian Sharp-tailed Grouse in western Montana by protecting existing populations and habitats and by establishing additional populations in areas of suitable habitat.

Deer Population Objectives and Hunting Regulation Strategies (MFWP 1998): This plan outlines objectives and strategies designed to manage for the long-term welfare of Montana's deer resource and provide recreational opportunities that reflect the dynamic nature of deer populations.

Final Bull Trout Restoration Plan (MFWP 2000): In 1993, the Governor of Montana appointed the Bull Trout Restoration Team (MBTRT) to produce a plan that maintains, protects, and increases bull trout populations. The team appointed a scientific group, the Montana Bull Trout Scientific Group (MBTSG), to provide the restoration planning effort with technical expertise. The scientific group wrote 11 basin-specific status reports and three technical, peer-reviewed papers about the role of hatcheries, the suppression of non-native fish species, and land management. A draft restoration plan that defined and identified strategies for ensuring the long-term persistence of bull trout in Montana was released for public comments in September 1998. In June 2000, the final restoration plan was issued (MBTRT 2000). The plan synthesizes the scientific reports and provides recommendations for achieving bull trout restoration in western Montana. It focuses activities on 12 restoration/conservation areas and was designed to complement and be consistent with this recovery plan. The Montana Restoration Plan relies on voluntary actions, promoted by watershed groups, but has no legislative or legal authority beyond existing state law. Implementation of the Montana Restoration Plan has not officially begun; it is expected to mesh with implementation of the USFWS Bull Trout Recovery Plan.

Five-Year Update of the Programmatic Environmental Impact Statement, the Grizzly Bear in Northwestern Montana (MFWP 1993): This document outlines MFWP's goals to manage for a recovered grizzly bear population, to maintain distribution in defined management areas, and to maintain the habitat in a condition suitable to sustain the population at an average density of one grizzly bear per 15-30 square miles outside of Glacier National Park.

Garnet Resource Management Plan (BLM): In 1986, the BLM adopted the Garnet Resource Management Plan for much of its holdings in Montana west of the continental divide, including the Blackfoot Subbasin. The plan sets out the prescription for managing the 145,660 surface acres of public lands and 213,385 sub-surface acres in the Garnet Resource area. The plan prescribes management options for road construction, grazing, logging, mineral leasing, and range improvement, among others. In addition it sets specific limitations for logging in sensitive areas such as riparian zones and key elk habitat.

Grizzly Bear Management Plan for Western Montana (MFWP 2006): This is the Draft Programmatic Environmental Impact Statement 2006-2016 that will guide MFWP's approach to grizzly bear management should the state assume control of grizzly bear management. This

document outlines goals and objectives for a recovered grizzly bear population and envisions effective connections of grizzly bear populations among the Cabinet-Yaak, Northern Continental Divide Ecosystem, Greater Yellowstone Area and Canada. The plan outlines management strategies that include an overall approach to grizzly bear management that allows bears to re-colonize former habitats where it is “biologically suitable and socially acceptable.”

Management of Black Bears in Montana (MFWP 1994): This plan defines a statewide management strategy for managing black bear populations and their harvest in Montana.

Management of Mountain Lions in Montana (MFWP 1996): This plan defines a statewide management strategy for mountain lions including objectives for determining carrying capacities for mountain lions and their prey; monitoring populations; regulating harvest; improving public understanding of lion biology, habitat requirements and management and public policies that deal with mountain lion conflicts with people and livestock.

Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout in Montana (MFWP): This Memorandum of Understanding and Conservation Agreement was developed to expedite implementation of conservation measures for westslope cutthroat trout in Montana as a collaborative and cooperative effort among resource agencies, conservation and industry organizations, resource users, and private land owners. Threats that warrant consideration of westslope cutthroat trout as a Species of Concern by the State of Montana, a Sensitive Species by the USFS, a Species of Special Concern by the BLM, and as Species of Special Management Concern by the USFWS should be significantly reduced or eliminated through implementation of this Agreement.

Montana’s Comprehensive Fish and Wildlife Strategy (MFWP 2005): Montana’s Comprehensive Fish and Wildlife Strategy describes both the vertebrate species in Montana and their related habitats “in greatest conservation need.” It is intended to provide a guide for the expenditure of federal funds under the State Wildlife Grants Program. The Strategy identifies the Blackfoot River as an aquatic conservation focus area in greatest need, and identifies both the bull trout and the westslope cutthroat as aquatic species of greatest conservation need. In addition, it lists riparian and wetland communities and mountain streams as community types of greatest conservation need. Among birds and mammals, it lists Trumpeter Swan, Bald Eagle, Columbian Sharp-tailed Grouse, gray wolf, grizzly bear, and Canada lynx, all species found within the Blackfoot drainage, as among species of greatest conservation need.

Montana Gray Wolf Conservation and Management Plan (MFWP 2004a): This plan outlines a balanced approach to sustain wolves as a native species in Montana, while balancing their presence with the costs and impacts on those people most directly affected by the presence of wolves.

Montana State Trust Lands Habitat Conservation Plan (MDNRC and USFWS): Habitat Conservation Plans (HCPs) are complex, long-term management plans authorized under the Endangered Species Act. MDNRC developed a draft HCP under which it intends to conduct forest management activities while conserving habitat for three species, which are currently listed as threatened under the ESA (grizzly bear, Canada lynx, bull trout), and for two species

that are not listed (westslope cutthroat trout, Columbia redband trout). MDNRC's HCP outlines the commitments it has made to minimize or mitigate impacts on the HCP species from forest management activities for the next 50 years within the HCP project area. The lands covered by the HCP include approximately 548,500 acres of state trust lands within three DNRC land offices in western Montana – Northwestern, Southwestern, and Central Land Offices.

MDNRC forest management activities that are covered in the HCP and associated permit application include timber harvest, road construction and maintenance, removal and replacement of stream crossing structures and issuance of grazing licenses on state trust lands classified as "forest" lands. The plan would benefit HCP aquatic species by managing for and maintaining suitable stream temperature regimes, instream sedimentation levels, instream habitat complexity, and stream channel stability and channel form and function within the HCP project area as well as improving connectivity among sub-populations of the covered species where appropriate on HCP project area lands.

The benefits of the HCP for grizzly bears include provisions for important seasonal habitat and limitations on activities affecting bears within those habitats. This is primarily accomplished by applying grizzly bear commitments across a greater geographic area within MDNRC's forested trust lands than are applied now, and increasing the level of commitments based on the importance of that habitat for bears (i.e., lands within federally designated recovery zones received the greatest level of commitments), and designing timber sales and applying silvicultural prescriptions to maintain important habitat features, including den sites, avalanche chutes, lush riparian zones, and locations that produce high volumes of forage.

The Canada lynx commitments would support federal lynx conservation efforts by maintaining important habitat elements for lynx and their prey at both the landscape and site specific scale, particularly in key locations for resident populations. This is primarily achieved by maintaining set ratios of suitable lynx habitat in the HCP project area and managing for vegetation structure and habitat elements important for lynx and their prey. Additional information on the HCP is available at: www.dnrc.mt.gov/HCP.

Statewide Elk Management Plan (Montana Fish, Wildlife & Parks 2004b): This plan provides guidance to wildlife managers, land managers and other parties responsible for planning and policy decisions that affect wildlife resources and wildlife-related recreation in Montana.

TMDL Plans for the Blackfoot Subbasin (MDEQ): In 1997, the Montana Legislature passed House Bill 546, which strengthened the state's authority to develop Total Maximum Daily Loads (TMDLs) for Montana waters. Under this legislation, MDEQ must identify impaired water bodies, identify the causes of impairment, and develop corrective actions. MDEQ's goal is to correct all impairments within the next 10 years. Such corrective actions will improve water quality in many streams and should result in enhancement of habitat for focal species. TMDLs are discussed further in Section 3.2.5.2. TMDLs for the Blackfoot Subbasin include:

- *Blackfoot Headwaters Planning Area Water Quality and Habitat Restoration Plan and TMDL for Sediment (MDEQ 2004)*: This document identifies causes and sources of sediment and habitat related water quality impairments for eight 303(d)-listed water

bodies in the Blackfoot Headwaters Planning Area. Targets for restoring water quality and achieving full beneficial use support in impaired water bodies are established in this document. Strategies for the restoration of water quality and monitoring needs in the Blackfoot Headwaters are also outlined. Available at: <http://www.deq.mt.gov/wqinfo/TMDL/finalReports.asp>.

- *Water Quality Restoration Plan for Metals in the Blackfoot Headwaters TMDL Planning Area (MDEQ 2003)*: This document identifies causes and sources of metals related water quality impairments for six 303(d)-listed water bodies in the Blackfoot Headwaters Planning Area. Targets for restoring water quality and achieving full beneficial use support in impaired water bodies are established in this document. Strategies for the restoration of water quality and monitoring needs in the Blackfoot Headwaters are also outlined. Available at: <http://www.deq.mt.gov/wqinfo/TMDL/finalReports.asp>.
- *Middle Blackfoot-Nevada Creek Total Maximum Daily Loads and Water Quality Improvement Plan: Sediment, Nutrient, Trace Metal and Temperature TMDLs (MDEQ 2008a)*: This document identifies causes and sources of sediment, habitat, nutrient, temperature, and metals related water quality impairments for 37 water bodies on the 303(d) list in the Middle Blackfoot and Nevada Creek Planning Areas. Targets for restoring water quality and achieving full beneficial use support in impaired water bodies are established in this document. Strategies for the restoration of water quality and monitoring needs in these planning areas are also outlined. A draft of this document was released in December 2007 with EPA approval anticipated in 2008. Available at: <http://deq.mt.gov/wqinfo/TMDL/tmdlPublicComments.asp#MiddleBlackfootNevada>.
- *Lower Blackfoot Total Maximum Daily Loads and Water Quality Improvement Plan: Sediment, Trace Metal and Temperature TMDLs. Public Review Draft (MDEQ 2008b)*: Development of TMDLs and water quality restoration plans for 12 streams or stream segments on the 303(d) list in the Lower Blackfoot Planning Area began in 2006. The plan, completed in 2009, is currently under review by EPA.
- *Blackfoot River TMDL Implementation Plan (Bureau of Land Management)*: This plan describes BLM's proposed implementation of TMDLs on BLM lands in the Blackfoot Subbasin. It describes proposed management actions on BLM lands to reduce non-point pollution in water bodies on the 303(d) list in the Blackfoot Subbasin.

4.2.2.4 County Plans

Lewis and Clark County: In 2004, Lewis and Clark County adopted a county growth policy to replace the comprehensive plan that it had adopted in 1983. The growth policy is intended to be a long-range, non-regulatory planning document for Lewis and Clark County. The growth policy establishes a broad framework for how to proceed with more detailed shorter-range planning. While the policy is county-wide, it focuses heavily on the Helena Valley and the county east of the Continental Divide, and makes only scant reference to the portion the county in the Blackfoot Subbasin.

Missoula County: In 2002, Missoula County adopted a growth policy that replaced the 1975 Missoula County Comprehensive Plan. It was updated in 2005. The overarching goals are: 1) manage growth in a proactive rather than reactive way, considering both immediate and cumulative impacts; and 2) create a truly healthy community by protecting critical lands and natural resources, such as wildlife habitat, riparian resources, hillsides, air and water quality and open spaces and by enhancing the community's resources in the areas of health and safety, social, educational, recreational, and cultural services, employment, housing and the valued characteristics of communities. The growth policy is not a regulatory document. It provides a framework for articulating goals and policies and establishes the legal and philosophical foundation upon which future plans and regulations will be based. While the growth policy gives guidance for the entire county, regional or issue plans provide specific guidance through land use designations, design and development guidelines, and recommendations for specific action steps. A portion of the Blackfoot Subbasin is covered by the 1989 Seeley Lake Regional Plan. This plan is currently being updated through a community process. The remainder of the Blackfoot Subbasin in Missoula County has recommended land use policies and designations carried forward from the 1975 Plan into the 2002 Regional Land Use Guide.

Powell County: In 1996, Powell County adopted a comprehensive plan and a set of development regulations. The comprehensive plan was transformed into a growth policy in 2004 and then revised in 2006. The growth policy is intended to be a long-range, non-regulatory planning document for Powell County. The growth policy establishes a broad framework for how to proceed with more detailed, shorter-range planning. The original set of development regulations has been amended/revised five times since 1996. They are currently titled "Powell County Zoning & Development Regulations" and dated January 7, 2009. Powell County has had discussions with the Missoula County/Seeley Lake community regarding coordination of planning across county lines.

4.2.2.5 Other Plans

A Basin-Wide Restoration Action Plan for the Blackfoot Watershed (The Blackfoot Challenge in partnership with BBCTU, MFWP, Hydrometrics, Inc., and other partners 2005): The goal of the Restoration Action Plan is to define strategies for prioritization, planning, and implementation of restoration projects for impaired and dewatered streams in the Blackfoot Watershed. A description of the plan is provided in Section 2.3.2. To access the complete plan, please visit www.blackfootchallenge.org.

Blackfoot Community Conservation Area-Management Plan for the Core (BCCA Council, 2006): The purpose of this plan is to guide land management decisions on the BCCA core—the 5,609 acres located in the heart of the conservation area (see Section 4.2.1.3). This document defines the community's vision for the property, characterizes the natural and cultural landscape, documents the public involvement process and administration of the property, and establishes management goals, objectives and issues requiring future study to guide conservation, restoration, and stewardship activities.

Blackfoot River Valley Conservation Area Draft Plan (The Nature Conservancy and the Blackfoot Challenge 2007): The purpose of this planning effort was to develop a framework of conservation strategies that can be implemented to conserve, and perhaps even further enhance,

the viability of significant ecological and social/economic components of the Blackfoot Subbasin. A description of the plan is provided in Section 2.3.2.

Blackfoot Watershed Cooperative Conservation Agreement (2009): Fifteen public and private partners signed this agreement in 2009. This agreement was established to document the commitment to cooperation between the partners for the enhancement, conservation, and protection of the natural resources and rural way of life in the Blackfoot watershed for present and future generations. The area encompassed by the agreement consists of all lands within the Blackfoot watershed in western Montana. The agreement will help partners to coordinate on issues such as unplanned residential development, noxious weeds, and other issues that transcend county and other jurisdictional boundaries.

Plum Creek Native Fish Habitat Conservation Plan for Montana (Plum Creek Timber Company/USFWS 2000): The Montana Native Fish Habitat Conservation Plan (HCP) was approved in 2000. This 30-year HCP applies to 1.3 million acres of Plum Creek Timber Company land in Montana. Under this plan, habitat for eight species of native trout and salmon are protected in over 1,300 miles of fish-bearing streams on Plum Creek property. The HCP contains 56 conservation commitments covering a wide range of activities including timber harvest, road construction, stream habitat enhancement and livestock grazing.

4.2.3 Management and Funding Programs

This section provides brief descriptions of federal, state, county, and other management programs and funding sources that affect fish, wildlife, and habitat in the Blackfoot Subbasin.

4.2.3.1 Federal Programs

Bonneville Power Administration: The BPA funds watershed protection and restoration projects, reconnection of fish migration routes, eradication of hybridized or non-native fish populations, reduction of sedimentation to protection of spawning areas, reduction of phosphorous, and protection and restoration of wetland and riparian habitat. In the Blackfoot Subbasin, BPA has supported a number of streamflow restoration projects (see Table 4.1).

Culvert inventory program (USFS): The USFS conducted a culvert inventory program in 2002 and 2003 in order to determine the magnitude of fish passage barriers on USFS road systems. Approximately 80% of the inventoried culverts were at least partial barriers to upstream fish migration and approximately 20% were considered total barriers. In addition, it was noted that approximately 95% of the culverts constrict the stream channel to some degree and 50% constrict the stream channel by more than 50%, suggesting a high concern of culvert failure during normal bankful flows.

Federal Migratory Bird Hunting and Conservation Stamps: Commonly known as “Duck Stamps,” these are pictorial stamps produced by the U.S. Postal Service for the USFWS. They are not valid for postage. Originally created in 1934 as the federal licenses required for hunting migratory waterfowl, today Federal Duck Stamps are a vital tool for wetland conservation. Ninety-eight cents out of every dollar generated by the sales of Federal Duck Stamps goes

directly to purchase or lease wetland habitat for protection in the National Wildlife Refuge System.

Land and Water Conservation Fund (LWCF): The LWCF was established by Congress in 1965. A portion of receipts from offshore oil and gas leases are placed into this fund annually for federal, state and local conservation. LWCF is authorized at \$900 million annually, a level that has been met only twice during the program's 40-year history. The program is divided into two distinct funding pots: state grants and federal acquisition funds. In FY 2005, the federal acquisition pot received \$166 million and the state grants program received \$92.5 million for a total of \$258.5 million. In FY 2006 the federal pot received \$114.5 and the state grants received \$30 million. FY 2007 was similar to the year before receiving \$113 million for federal acquisition and \$30 million for state grants.

The state side of LWCF provides for all 50 states, the District of Columbia, and the territories by a formula based on population and other factors. State grant funds can be used for park development and for acquisition of lands and easements. State park directors solicit communities to apply for projects and distribute funds to those worthy projects based on a scoring process. The federal side provides for national park, forest, and wildlife refuge and Bureau of Land Management area fee and easement acquisitions. Each year, based on project demands from communities as well as input from the federal land management agencies (NPS, USFS, USFWS, BLM), the President makes recommendations to Congress regarding funding for specific LWCF projects. Once in Congress, these projects go through a rigorous Appropriations Committee review process with much input from Members representing project areas. Given the intense competition among projects, funding is generally only provided for those projects with universal support.

Natural Resources Conservation Service (NRCS) in Powell, Missoula, and Lewis and Clark Counties: Federal programs active through NRCS and county conservation districts provide financial incentives, cost sharing, leases and conservation agreements to landowners (especially the farming community) to improve the use of natural resources. Efforts target improvement of irrigation methods, reduction of sediment runoff and sustainable management and/or exclusion of cattle from riparian areas to reduce impacts on water quality. The four key programs that have funded substantial investments in conservation and restoration work in the Blackfoot Subbasin include:

- **Environmental Quality Incentives Program (EQIP):** This program was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. EQIP offers financial and technical help to assist eligible participants install or implement structural and management practices on eligible agricultural land. EQIP applications are ranked and compete for county funding based on a set of local environmental benefits criteria. EQIP offers contracts with a minimum term that ends one year after the implementation of the last scheduled practices and a maximum term of ten years. These contracts provide incentive payments and cost-shares to implement conservation practices. Persons who are engaged in livestock or agricultural production on eligible land may participate in the EQIP

program. EQIP activities are carried out according to an environmental quality incentives program plan of operations developed in conjunction with the producer that identifies the appropriate conservation practice or practices to address the resource concerns. The practices are subject to NRCS technical standards adapted for local conditions. Local conservation districts approve plans and determine annual priorities for projects.

NRCS provided \$1.3 million through two rounds of the Cutthroat and Bull Trout EQIP Special Initiative during 2005 and 2006. The projects primarily focused on in-stream channel restoration and, to a lesser degree, off-stream grazing management. The Late Forestry EQIP Special Initiative was implemented in 2007 to address forest health issues by providing cost share dollars for forest thinning on private lands in the Blackfoot Subbasin and beyond. NRCS also provided significant financial assistance (cost-share) to numerous private landowners in the subbasin through county EQIP allocations. Primary categories included weed management, forest thinning, and grazing management.

- *Conservation Innovation Grant (CIG)*: In 2005, a two-year Conservation Innovation Grant was granted to the Blackfoot Challenge to leverage NRCS investment in the conservation of the threatened grizzly bear while sustaining agricultural livelihoods. The Challenge used a scientific approach to map, prioritize, and implement conflict abatement projects with EQIP-eligible producers throughout the Blackfoot Subbasin. Following this innovation for wildlife and agriculture, the Challenge received a two-year national Conservation Innovation Grant in 2009 to leverage NRCS investment in fire management and the conservation of forested lands while sustaining economic and rural values. This project used a community-based approach for EQIP delivery of innovative Forest Health Practices in the Blackfoot Subbasin.
- *Grazing Lands Conservation Initiative (GLCI)*: The Powell County Weed District and the Blackfoot Watershed received \$122,500 from this fund in 2006 as part of a national effort to enhance 40 million acres, primarily on grazing lands, with technical assistance at a grassroots level using a voluntary approach. The grant provided three years of funding to promote integrated weed management, Weed Management Area enhancement and organizational efforts in Missoula, Powell, and Lewis and Clark Counties, and cost share with landowners for weed control activities.

Other NRCS programs that provide funding opportunities include:

- *The Conservation Reserve Program (CRP)* provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with federal, state, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation (CCC). CRP is administered by the Farm Service Agency, with NRCS providing technical land eligibility determinations, Environmental Benefit Index Scoring, and conservation planning. The Conservation Reserve Program reduces soil erosion, protects the nation's ability to produce food and fiber, reduces sedimentation in streams and lakes, improves water quality, establishes

wildlife habitat, and enhances forest and wetland resources. It encourages farmers to convert highly erodible cropland or other environmentally sensitive acreage to vegetative cover, such as tame or native grasses, wildlife plantings, trees, filterstrips, or riparian buffers. Farmers receive an annual rental payment for the term of the multi-year contract. Cost sharing is provided to establish the vegetative cover practices.

- *The Grassland Reserve Program (GRP)* is a voluntary program that helps landowners protect, restore and enhance grassland, rangeland, pastureland, shrubland and certain other lands on their property. Section 2401 of the Farm Security For the Grassland Reserve and Rural Investment Act of 2002 (Pub. L. 107-171) amended the Food Security Act of 1985 to authorize this program. The Natural Resources Conservation Service, Farm Service Agency and Forest Service are coordinating implementation of GRP. The program prevents conversion of vulnerable grasslands to cropland or other uses and conserves valuable grasslands by helping to maintain viable ranching operations.
- *The Wetlands Reserve Program (WRP)* is a voluntary program that provides technical and financial assistance to eligible landowners to restore, enhance, and protect wetlands. Landowners have the option of enrolling eligible lands through permanent easements, 30-year easements, or restoration, cost-share agreements. The program is offered on a continuous sign-up basis and is available nationwide. Landowners can establish at minimal cost long-term conservation and wildlife habitat enhancement practices. WRP has an acreage enrollment limitation rather than a funding limit. Congress determines how many acres can be enrolled in the program and funding is somewhat flexible.
- *The Wildlife Habitat Incentives Program (WHIP)* is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, the NRCS provides both technical assistance and up to 75% cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from five to 10 years from the date the agreement is signed. WHIP has proven to be a highly effective and widely accepted program across the country. By targeting wildlife habitat projects on all lands and aquatic areas, WHIP provides assistance to conservation-minded landowners who are unable to meet the specific eligibility requirements of other USDA conservation programs. The Farm Security and Rural Investment Act of 2002 reauthorized WHIP as a voluntary approach to improving wildlife habitat in the United States.

U.S. Fish and Wildlife Service: USFWS management and funding programs applicable to the Blackfoot Subbasin include:

- *Cooperative Conservation Initiative:* This program supports efforts that restore natural resources and establish or expand wildlife habitat.
- *Cooperative Endangered Species Conservation Fund (Section 6):* This program funds a wide array of voluntary conservation projects for candidate, proposed and listed endangered species.

- *Dingell-Johnson Federal Aid in Sport Fish Restoration Act (DJ)*: This program supports activities designed to restore, conserve, manage or enhance sport fish populations and the public use benefits from these resources and to support activities that provide boating access to public waters. Projects supported include fish habitat improvement, research on fishery problems, surveys and inventories of fish populations, provision for public use of fishery resource and lake and stream rehabilitation.
- *Fisheries Restoration and Irrigation Mitigation Act (FRIMA)*: The program authorized by this act funds voluntary design, construction and installation of fish screens, fish ladders or other fish passage devices associated with water diversions. Projects may also include modifications to water diversion structures that are required for effective functioning of fish passage devices.
- *Fish & Habitat Conservation -Fish Passage*: Project funding is for fish passage restoration by removing or bypassing barriers to fish movement such as dam removal, culvert renovation, designing and installing fish ways, installing fish screens and barrier inventories to identify additional fish passage impediments.
- *Landowner Incentive*: These grants are available for conservation efforts to be carried out on private lands and to provide technical or financial assistance to private landowners for the purpose of benefiting federally listed, proposed or candidate species.
- *North American Wetlands Conservation Act (NAWCA)*: NAWCA's Standard Grants Program is a competitive, matching grants program that supports public-private partnerships carrying out projects in Canada, the United States, and Mexico. These projects must involve long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats. The Standard Grants Program began supporting projects in all three countries in 1990, shortly after the North American Wetlands Conservation Act of 1989 was passed. The USFWS Division of Bird Habitat Conservation is responsible for facilitating and administering the Act's Standard Grants Program. The Blackfoot Watershed has received \$2 million in NAWCA funding since 2002 to promote wetland conservation and restoration.
- *Partners for Fish and Wildlife Program*: This program works with private landowners and numerous partners in an effort to restore wetlands, riparian areas, instream habitats, and upland habitats for the benefit Federal Trust Species including threatened and endangered species, migratory birds, and native fish. The USFWS has established several staff positions in western Montana under the Partners for Fish and Wildlife Program, and these new employees have focused on developing funding opportunities and directing USFWS funds toward cooperative habitat restoration, management, and protection of key habitats for the benefit of Federal Trust Species including native salmonids.
- *Pittman-Robertson Wildlife Restoration Act (PR)*: The Federal Aid in Wildlife Restoration Act is commonly called the Pittman-Robertson Act. It has been amended several times, and provides federal aid to states for management and restoration of

wildlife. Funds from an 11% excise tax on sporting arms and ammunition are appropriated to the Secretary of the Interior and apportioned to states on a formula basis for paying up to 75% of the cost of approved projects. Project activities include acquisition and improvement of wildlife habitat, introduction of wildlife into suitable habitat, research into wildlife problems, surveys and inventories of wildlife problems, acquisition and development of access facilities for public use, and hunter education programs, including construction and operation of public target ranges.

- *Private Stewardship Grants Program*: This program provides grants and other assistance to individuals and groups engaged in private, voluntary conservation efforts that benefit species listed or proposed as endangered or threatened under the ESA. Eligible projects include those by landowners and their partners who need technical and financial assistance to improve habitat or implement other activities on private lands.
- *State Wildlife Grants (SWG)*: The Interior and Related Agencies Appropriations Act, 2002, created the State Wildlife Grants program. As indicated within this legislation, these grants were established, "...for the development and implementation of programs for the benefit of wildlife and their habitat, including species that are not hunted or fished..." Since its creation, the SWG program has received annual Congressional appropriations that are administered by the USFWS. The USFWS apportions these funds, using a legislated formula based on human population and geographic area, to fish and wildlife agencies within the states, territories and the District of Columbia. Each state fish and wildlife agency wishing to participate in the SWG program must develop a Comprehensive Wildlife Conservation Strategy.

U.S. Forest Service: USFS management and funding programs applicable to the Blackfoot Subbasin include:

- *Forest Legacy Program (FLP)*: The USFS administers the FLP in cooperation with state partners. Designed to encourage the protection of privately owned forest lands, FLP is an entirely voluntary program. To maximize the public benefits it achieves, the program focuses on the acquisition of partial interests in privately owned forest lands. FLP helps the states develop and carry out their forest conservation plans. It encourages and supports acquisition of conservation easements without removing the property from private ownership. Most FLP conservation easements restrict development, require sustainable forestry practices and protect other values. Participation in the FLP is limited to private forest landowners. To qualify, landowners are required to prepare a multiple resource management plan as part of the conservation easement acquisition. The federal government may fund up to 75% of project costs, with at least 25% coming from private, state, or local sources. In addition to gains associated with the sale or donation of property rights, many landowners also benefit from reduced taxes associated with limits placed on land use.
- *Section 7, Blackfoot Watershed, Bull Trout Baseline*: As part of the listing requirement of bull trout, all federal land management agencies were required to develop baseline conditions of bull trout habitat for each 6th field HUC within their ownership. This was

completed in 2000 and reported to the USFWS in the Section 7, Blackfoot Watershed, Bull Trout Baseline produced by the Lolo National Forest, Helena National Forest and Bureau of Land Management. The end product documented the bull trout and habitat condition for each federally owned 6th field HUC within the Blackfoot Watershed and determined that the overall habitat condition within the Blackfoot Section 7 Watershed is “Functioning at Risk” for bull trout. Since the completion of the plan in 2000, additional information has supplemented the information in this plan. (Note the baseline also applies to the Bureau of Land Management).

- *State and Private Forestry (S&PF) Program:* The S&PF program provides financial and technical forest management assistance and expertise to a diversity of landowners, including small woodlot, tribal, state, and federal, through cost-effective, non-regulatory partnerships. The staffs play a key role, along with others within the USFS and the Department of the Interior, in implementing the National Fire Plan to manage the impacts of wildland fires on communities and the environment.
- *Tri-County Resource Advisory Council:* Projects must be located within one of the three counties covered by the Tri-County RAC (Deer Lodge, Granite or Powell). Funds must be spent on projects that benefit federal land, although projects do not have to be located on federal land. Eligible projects include watershed restoration and maintenance; restoration, maintenance, and improvement of wildlife and fish habitat; or reestablishment of native species.

4.2.3.2 State Programs

Montana Department of Natural Resources and Conservation: MDNRC management and funding programs applicable to the Blackfoot Subbasin include:

- *MDNRC Trust Lands:* MDNRC Trust Lands Division manages activities on state trust lands throughout the Blackfoot Subbasin. Use of state trust lands includes agricultural use, harvest of forest products, mineral activities, and a number of other commercial uses. In addition the Trust Lands Division sponsors a variety of restoration activities ranging from fire and range rehabilitation to fisheries and stream restoration projects, including a number of projects in the Blackfoot (e.g., Blanchard Creek stream restoration project). MDNRC has also participated in the acquisition of Plum Creek Timber Company property in partnership with the Blackfoot Challenge and others. On Montana State Forests, forestry Best Management Practices (BMPs) are implemented to maintain water quality and reduce sediment input. Audits of forestry practices indicate a high degree of compliance. Grazing BMPs have also been developed and are being implemented on state grazing lands.
- *MDNRC Private Grants:* These funds are for projects relating to water where the quantifiable benefits exceed the costs.
- *MDNRC RDGP:* This program funds projects that reclaim lands damaged by mining. Projects must provide benefits in one or more of the following: reclamation, mitigation,

and research related to mining and exploration; identification and repair of hazardous waste sites, or research to assess existing or potential environmental damage.

- *MDNRC RRGL Planning Grant:* These grants fund the conservation, management, development, or protection of renewable resources in Montana. A 50% cash match is required unless the project is sponsored by a non-revenue producing entity.

Montana Department of Environmental Quality 319 Program: This program is for protection, improvement, or planning. Four categories of applications include: 1) Watershed TMDL Planning, 2) Watershed Restoration, 3) Groundwater, and 4) Information/Education.

Montana Fish, Wildlife and Parks (MFWP): MFWP programs focus on monitoring, research, and protection of habitat for threatened and endangered species and other wildlife of special interest to the public. Species of interest in the Blackfoot Subbasin include wolves, white-tailed deer, grizzly bears, elk, native fish (bull trout and westslope cutthroat trout) Bald Eagles, waterfowl and other birds of special interest. Public education is emphasized to avoid human/wildlife conflicts. Many efforts by MFWP to protect and restore native fish also incorporate protection of water quality in streams, rivers, and lakes critical to native fish. Projects involve stream bank restoration, removal of culverts, reduction of sediment runoff, and land acquisition. Mitigation funds are used to recover lost wildlife habitat. The *River Restoration Program*, for example, funds stream corridor improvements, including fencing and bank stabilization. Other MFWP programs include:

- *Access Montana Program:* The goal of Access Montana is to improve hunting access to public lands and resolve public land access conflicts. MFWP works with landowners, hunters, and land management agencies to attempt to resolve public land access conflicts. FWP also works with willing landowners to develop public land access agreements, which may include incentives such as fencing, cattle guards, culverts, gates, signing or maps to identify land ownership boundaries, increased MFWP enforcement, and in some cases, compensation.
- *Future Fisheries Improvement Program:* This program was passed by the 1995 Montana Legislature to restore essential habitats for the growth and propagation of wild fish populations in lakes, rivers, and streams. Funds used to implement the program originate from the sale of Montana fishing licenses. Nearly a million dollars per year are presently allocated to the program. Program funding may be provided for costs of design, administration, construction, maintenance and monitoring of projects that restore or enhance habitat for wild fishes. Preference is given to projects that restore habitats for native fishes. In addition to restoring habitat, projects must eliminate or significantly reduce the original cause of the habitat degradation.
- *Habitat Montana Program:* The goal of Habitat Montana is to preserve and restore important habitat for fish and wildlife. Under the program, landowners interested in using a conservation easement to protect traditional farm and ranch land and to preserve natural resources such as wildlife habitat, may partner with MFWP. A variety of funding sources enable MFWP to protect seriously threatened habitats and provide recreational

opportunities through purchased or donated conservation easements and purchases of land. Annually, about \$4 million from several sources goes to fund projects selected by the MFWP Commission from among those recommended by the MFWP staff. In addition to monetary compensation, landowners may: realize tax benefits from a conservation easement; gain help in pursuing habitat-friendly agricultural practices; and ensure the protection of scenic and open spaces.

Montana Natural Heritage Program (MTNHP): MTNHP is Montana's clearinghouse for information on Montana's native species and habitats, emphasizing those of conservation concern. The program collects, validates and distributes this information and assists natural resource managers and others in applying it effectively. Established by the Montana State Legislature in 1983, the program is located in the Montana State Library, where it is part of the Natural Resource Information System.

4.2.3.3 County Programs

Missoula, Powell, and Lewis and Clark County Conservation Districts: County Conservation Districts (located in NRCS field offices) provide handouts to the general public with information and management recommendations for water, riparian and wetlands protection and restoration. All conservation district boards are made up of local landowners who work closely with their respective NRCS field offices to implement conservation programs. Conservation districts also work with NRCS to determine annual priorities (e.g., grazing, forestry, multiple use) for county projects. All three districts conduct weed control programs and administer 310 permits in cooperation with MFWP. The North Powell Conservation District has taken a proactive role by contracting a full-time Land Steward who works closely with private landowners and watershed partners to plan and develop grassroots resource conservation projects aimed at improving water quality and fisheries, grazing resources, forest health, and irrigation use. The North Powell Conservation District has a number of watershed restoration efforts in the Nevada Creek drainage, including stream/riparian restoration, grazing management, forest thinning, and irrigation improvement efforts.

Missoula, Powell, and Lewis and Clark County Extension Offices: Extension offices in each county offer a wide variety of programs and services that support resource management and landowners in the subbasin, including education and assistance for topics such as nutrition, agriculture, livestock and 4-H. Weed Districts run through the Extension Offices assist in mapping and inventory of weeds, leadership in identifying and controlling noxious weeds, and facilitation of grant programs in Weed Management Areas.

Missoula, Powell, and Lewis and Clark County Planning Offices and Health Departments: The county planning offices and health departments are responsible for applying zoning regulations, conducting growth planning, regulating air quality and providing permits for land subdivision and new septic systems.

Missoula County Open Space Program: Missoula County voters approved a \$10 million dollar bond in November 2006 for the purpose of preserving open space in Missoula County, with half allocated to Missoula County and half allocated to the City of Missoula for use in the urban area. The County's Open Lands Citizen Advisory Committee (OLC), in addition to its other

responsibilities, reviews and makes recommendations to the Board of County Commissioners (BCC) about projects in its jurisdictional area. The OLC, appointed by the BCC, includes 13 members and 4 alternates from across the County. It bases its recommendations on project evaluation criteria established by BCC resolution. To date, the County portion of the bond money has been used to help purchase seven conservation easements throughout the county, including three in the Blackfoot Subbasin that protect a combined 4,041 acres.

Lewis and Clark County Open Space Program: Lewis and Clark County voters approved a \$10 million dollar bond in November 2008 for the purpose of preserving open-space lands in the County, including working lands and land for protecting water and wildlife, by providing funds to acquire conservation easements or other property interests from willing sellers and to pay costs associated with the sale and issuance of bonds, for any one or more of the following reasons: protecting drinking water sources and ground water quality; protecting water quality in and along rivers and streams; conserving working farm, ranch and forest lands; protecting wildlife areas; preserving open lands and natural areas; providing for recreation; and managing growth and development. The County is in the process of developing a proposal process and evaluation criteria for potential projects.

4.2.3.4 Institutions, Non-Profit Organizations, and Private Funding

The Big Blackfoot Chapter of Trout Unlimited (BBCTU): The mission of BBCTU is to restore and protect the coldwater fishery of the Blackfoot Subbasin. It embarked upon this effort in partnership with state, federal and local agencies and private entities and individuals in the late-1980s. Since that time it has been heavily involved in a growing watershed-wide restoration effort that has included a wide variety of stream and riparian restoration projects. It currently employs a full-time restoration biologist to oversee its restoration project work.

The Blackfoot Challenge: The Blackfoot Challenge is a landowner-based group that coordinates management of the Blackfoot River, its tributaries and adjacent lands. The mission of the Blackfoot Challenge is to coordinate efforts that will enhance and conserve the natural resources and rural way of life of the Blackfoot River Valley for present and future generations. The Challenge works with over 500 partners and has secured funding for restoration and conservation projects through cooperative agreements and leveraging of public/private funds. See www.blackfootchallenge.org for a comprehensive list of all partners engaged in conservation and restoration activities and a complete overview of funding partners.

The Clearwater Resources Council (CRC): The mission of the CRC is to initiate and coordinate efforts that will enhance, conserve and protect the natural ecosystems and rural lifestyle of the Clearwater River region for present and future generations. Among its accomplishments, the CRC has conducted a landscape assessment of the Clearwater Valley Planning area (CRC 2008). In addition, it has been key in the development of a Fuel Mitigation Task Force consisting of the CRC, local fire and land management agencies, and the Bitterroot Resource Conservation and Development program. The goal of the Task Force is to provide professional consultation to landowners when they embark on fuel thinning efforts.

Five Valleys Land Trust (FVLT): Five Valleys Land Trust is a community-supported non-profit conservation organization with a mission to “preserve and protect western Montana’s natural

legacy—our river corridors, wildlife habitat, agricultural lands, and scenic open spaces.” FVLT works with landowners and other partners to craft unique, collaborative solutions to conservation challenges and opportunities. FVLT currently holds 19 conservation easements on 11,469 acres throughout the Blackfoot Subbasin and played a key role in the collaborative effort to protect the Blackfoot Clearwater Wildlife Management Area. In the months and years ahead, FVLT will be working with several landowners and with The Nature Conservancy to permanently protect thousands of additional acres in the Blackfoot.

The Montana Land Reliance (MLR): The MLR mission is to "provide permanent protection for private lands that are ecologically significant for agricultural production, fish and wildlife habitat, and scenic open space. MLR's goal is to affirm the positive relationship between well-managed, productive lands and the integrity of wildlife habitat, watersheds, and open space in a way that benefits both the landowner and the community." MLR's goal is to protect 1 million acres of private lands through conservation easements in all of Montana by 2010. To date, MLR has acquired conservation easements on 16,463 acres in the Blackfoot Subbasin.

The Montana Nature Conservancy (TNC): The Montana Nature Conservancy's goal is to protect unique habitat, areas rich in biodiversity, and areas critical for rare, threatened or endangered species. TNC has a number of land holdings in the Blackfoot Subbasin and has been actively engaged in a variety of conservation efforts within the subbasin for many years. The Blackfoot is a key component of its 10 million-acre effort known as the "Crown of the Continent" initiative that spans from the Blackfoot in Montana to the Elk River Valley in southern British Columbia. Most recently TNC's efforts have included both its collaboration with the Blackfoot Challenge and private and public partners on the 89,215-acre Blackfoot Community Project and the designation of the Blackfoot Community Conservation Area (see Section 4.2.1.3). In 2008, The Nature Conservancy and The Trust for Public Land entered into an agreement with Plum Creek Timber Company to purchase 312,500 acres of timberland in western Montana called the Montana Legacy Project. As part of this project, a total of 71,754 acres in the Clearwater and Potomac valleys of the Blackfoot Subbasin will be purchased and resold to public agencies and/or private buyers. A majority of the lands that are part of this project in the Blackfoot Subbasin are intended to be re-sold to the USFS or MDNRC.

Rocky Mountain Elk Foundation (RMEF): RMEF and its partners have contributed more than \$4.6 million to protecting the Blackfoot-Clearwater Wildlife Management Area through a combination of land acquisition and trades. These efforts have resulted in over 5,500 acres that have been protected as elk and mule deer habitat.

Tri-State Water Quality Council: In response to water quality concerns expressed by citizens within the Clark Fork-Pend Oreille watershed, the U.S. Congress added a section to the 1987 Clean Water Act (Section 525), which directed the EPA to conduct a comprehensive water quality study across the three-state watershed (Montana, Idaho, and Washington). That study was completed and a watershed management plan was developed by the study's steering committee (comprised of two EPA regions and the state water quality agencies of the three states). The first priority in the management plan was to create a Tri-State Council to carry out the various action items in the plan. The Council first met in October of 1993. The Tri-State Water Quality Council is a partnership of diverse community interests—including citizens, business, industry, tribes,

government, and environmental groups—working together to improve and protect water quality throughout the 26,000 square mile watershed.

Private Foundations and Individuals: Private foundation grants and individual contributions have played a critical role in funding conservation and restoration in the Blackfoot Subbasin. These private sources of funds have provided not only project funding but often the difficult to obtain capacity for partners (e.g., personnel, travel, etc.). This capacity is central to project implementation and securing project funding. These private partners and their funding provide incredible support in terms of leveraging funds, resources, and expertise. In addition, many private landowners have donated conservation easements where the appraised value of the donated private right is used as matching funds to secure public sources of funding for additional conservation outcomes for public benefit.

4.3 Restoration and Conservation Projects

4.3.1 BPA-Funded Restoration Projects in the Blackfoot Subbasin

To date, the only BPA funding source in the Blackfoot Subbasin has been the Columbia Basin Water Transaction Program (CBWTP). The CBWTP came into being in 2002 specifically to support innovative voluntary grassroots water transactions to improve tributary flows in the Columbia Basin. Table 4.1 lists completed BPA-funded CBWTP projects in the Blackfoot Subbasin.

4.3.2 Non-BPA-Funded Restoration Projects in the Blackfoot Subbasin

Table 4.2 lists restoration projects that were supported by a variety of non-BPA funding sources, including private donors, foundations, private landowners, conservation groups, license dollars, D-J funds, Future Fisheries, various NRCS funds and cooperative agreements with other state and federal agencies. The status of projects completed, projects pending and projects planned is constantly changing as pending projects reach completion and new projects are begun. The projects described in this section represent only those that were completed as of December 31, 2008.

4.3.3 Ongoing and Potential Restoration Projects on TMDL Streams

Numerous potential restoration projects have been identified to address TMDLs in the Blackfoot Subbasin. These projects are listed in Table 4.3.

Table 4.1 Completed BPA-Funded CBWTP Projects in the Blackfoot Subbasin.

Project Name	Project Description
1. Poorman Creek Riparian Habitat and Stream Flow Restoration	This project entailed removal of culverts, a grazing management plan and associated riparian restoration, and irrigation improvements to reconnect lower Poorman Creek with the Blackfoot River near Lincoln. The goal of this project is to improve conditions for migration of spawning bull trout and westslope cutthroat trout into Poorman Creek. CBWTP contributed \$10,000 to the total project cost of \$110,000.
2. North Fork Blackfoot Water Rights Lease (Weavers)	This water conservation project involved an instream flow lease of 18.4 cfs of water from the Weaver Ranch on the North Fork of the Blackfoot, a key bull trout spawning and rearing stream in the Blackfoot Subbasin. This project entailed the change in point of diversion from a ditch in a losing reach of the North Fork to a point of diversion in a gaining reach and conversion from a gravity system to a pump and pipeline, reducing the irrigator's diversion from as much as 20.5 cfs to 2.0 cfs.
3. Rock Creek (Hoxworth) single-season diversion-reduction agreement	This agreement was a single-season agreement by an irrigator on Rock Creek to refrain from diverting water from Rock Creek for one irrigation season, in 2003. CBWTP contributed \$2950 to secure the agreement. This agreement was a pre-cursor to a long-term lease of an instream flow water right from the irrigator.
4. Rock Creek (Hoxworth) water conservation project	This project involved a change from a flood irrigation operation to a pump, pipe, and center pivot, leading to an instream water lease of 1.5 cfs in Rock Creek, a tributary to the North Fork of the Blackfoot in order to enhance the migration of westslope cutthroat trout to the upper reaches of Rock Creek. The agreement leases 1.5 cfs for 25 years. This project is part of a much larger habitat restoration project on Rock Creek which entailed channel restoration, riparian habitat restoration, and reconnection of the stream with its floodplain from its headwaters to the mouth. CBWTP contributed \$10,000 to the \$64,000 cost of this project.
5. Rock Creek/North Fork (Talan, Inc.) single-season diversion reduction agreement	This agreement was a precursor of a long-term agreement (30 years) for a lease of water rights on the North Fork of the Blackfoot. The approval of that long-term agreement is pending before the Montana MDNRC. The long-term agreement is part of efforts to improved streamflows in the North Fork of the Blackfoot. CBWTP contributed \$3,500 to securing of this agreement.
6. Murphy Spring Creek single-season, split-season diversion-reduction agreements	These agreements (2004-2007) between three irrigators who divert water from Murphy Spring Creek, a tributary to the North Fork of the Blackfoot for 2.2 cfs minimum flow in the creek, are designed to maintain minimum passages flows and rearing habitat for both westslope and bull trout. These single-season agreements are pending a longer-term lease. Water lease for 2.2 cfs. CBWTP, over the life of these agreements, has contributed \$20,240.
7. Wasson Creek (Mannix Brothers Ranch) single-season diversion-reduction agreements	These agreements with the Mannix Brothers Ranch were designed to keep at least 0.5 cfs water flowing in lower Wasson Creek pending a long-term lease, which was completed in 2006. The purpose of these agreements is to keep a minimum flow in the lower two miles of Wasson Creek during the irrigation season to allow the migration a pure-strain population of west slope cutthroat from upper Wasson Creek into a newly restored spring creek into which Wasson Creek flows. CBWTP contributed \$15,000 to secure these agreements.
8. Wasson Creek (Mannix Brothers Ranch) long-term lease	See item 7 above. This ten-year lease secures a minimum flow of 0.75 cfs in Wasson Creek. CBWTP contributed \$45,000 to the \$75,000 price for this lease.

Table 4.2 Completed Restoration Projects in the Blackfoot Subbasin.

Stream Name	Number of Projects	Number of Landowners	Projects^{1, 2, 3}
Arrastra Creek	1	2	Fish passage improvements(a)
Ashby Creek	10	2	Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Water Conservation(b;d); Improve wetlands; Improve range/riparian habitat; Upgrade diversion structure; Fish passage improvements(a;b); Prevent fish entrainment (fish screen); Conservation easement
Basin Spring Creek	12	2	Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Water Conservation(d); Improve wetlands; Improve range/riparian habitat; Improve irrigation(b); Remove streamside feedlots; Conservation easement
Bear Creek (RM 12.2)	11	3	Fish passage improvements(a;c); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Water Conservation(b;d); Improve range/riparian habitat; Improve irrigation; Remove streamside feedlots
Beaver Creek	17	2	Fish passage improvements(b;e); Water Conservation(b); Channel restoration; Improve wetlands; Conservation easement
Belmont Creek	3	1	Fish passage improvements(a); Spawning habitat protection; Improve range/riparian habitat
Blackfoot River (Clearwater to mouth)	7	5	Water Conservation(a;b;c); Conservation easement
Blackfoot River (North Fork to Clearwater)	13	11	Improve instream flows; Improve wetlands; Improve range/riparian habitat; Conservation easement
Blackfoot River (Lincoln to North Fork)	50	24	Channel restoration; Riparian vegetation improvements; Water Conservation(a;b); Improve wetlands; Improve range/riparian habitat; Remove streamside feedlots; Prevent fish entrainment; Improve diversion structure(a); Conservation easement
Blanchard Creek	4	1	Fish passage improvements(a;b;d;e); Riparian vegetation improvements; Improve range/riparian habitat; Water Conservation(a;b)
Chamberlain Creek	22	4	Fish passage improvements(a;b;c;d;e); Water Conservation(a;b;c;d); Improve diversion structures(a;b); Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Remove streamside feedlots; Conservation easement
Chamberlain Creek (West Fork)	1	1	Improve range/riparian habitat
Clearwater River	6	2	Water Conservation(a;b;c); Improve range/riparian habitat; Conservation easement
Cottonwood Creek (RM 43)	24	5	Fish passage improvements(a;b;d;e); Water Conservation(a;b;c); Improve irrigation structure(a); Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Remove streamside feedlots; Conservation easement

Table 4.2 (continued).

Stream Name	Number of Projects	Number of Landowners	Projects^{1, 2, 3}
Cottonwood Creek (Nevada)	6	1	Fish passage improvements(b;e); Channel restoration; Riparian vegetation improvements; Improve range/riparian habitat; Improve diversion structure(a); Remove streamside feedlots
Dick Creek	34	10	Fish passage improvements(a;b;c;d;e); Water Conservation(b); Improve diversion structure(a;c); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Prevent fish entrainment; Remove streamside feedlots; Conservation easement
Douglas Creek	6	2	Fish passage improvements(d;e); Riparian vegetation improvements; Improve range/riparian habitat; Conservation easement
Dry Creek	4	1	Riparian vegetation improvements; Improve range/riparian habitat; Remove streamside feedlots; Conservation easement
Dunham Creek	11	4	Fish passage improvements(a;b;c); Water Conservation(d); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat; Improve diversion structure(a)
Elk Creek	4	1	Channel restoration; Fish habitat improvement; Improve wetlands; Improve range/riparian habitat
East Twin Creek	1	1	Fish passage improvements(a)
Enders Spring Creek	8	2	Fish passage improvements(c;d); Water Conservation(c;d); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat;
Gold Creek	2	2	Fish habitat improvement
Grantier Spring Creek	11	1	Fish passage improvements(c); Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat
Hoyt Creek	19	4	Fish passage improvements(a;b;c;d); Water Conservation(b;d); Improve diversion structures(a;b;c); Channel Restoration; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Fish habitat improvement; Conservation easement
Jacobsen Spring Creek	16	2	Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Water Conservation(d); Improve range/riparian habitat; Improve diversion structures(b); Fish passage improvements(a;c;d); Remove streamside feedlots; Conservation easement
Johnson Creek	1	1	Fish passage improvements(a)
Keep Cool Creek	6	1	Riparian vegetation improvements; Improve range/riparian habitat; Improve wetlands; Remove streamside feedlot; Conservation easement
Kleinschmidt Creek	26	6	Fish passage improvements(a;c); Water Conservation(a;d); Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Remove streamside feedlots; Conservation easement

Table 4.2 (continued).

Stream Name	Number of Projects	Number of Landowners	Projects ^{1, 2, 3}
Lincoln Spring Creek	13	1	Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat; Fish passage improvements(a,b,c,d); Water Conservation(b,c,d); Improve diversion structure(a;c).
Lodgepole Creek	1	1	Fish passage improvements(a)
McElwain Creek	2	1	Improve range/riparian habitat; Remove streamside feedlots; Water Conservation(b)
McCabe Creek	15	2	Fish passage improvements(a;b;c;d); Water Conservation(a;b;c;d); Improve diversion structures(a;b;c); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat; Prevent fish entrainment; Conservation easement
Monture Creek	27	6	Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Water Conservation(b;c); Improve wetlands; Improve range/riparian habitat; Improve diversion structures(a); Remove streamside feedlots
Moose Creek	2	1	Fish passage improvements(a)
Morrell Creek	10	4	Fish passage improvements(b;c;d); Fish habitat improvement; Water Conservation(a;c); Channel restoration; Fish habitat improvement; Improve diversion structures(a); Prevent fish entrainment
Nevada Creek	20	5	Fish passage improvements(b,e); Channel restoration; Improve diversion structures(a); Conservation easement
Nevada Spring Creek	24	3	Fish passage improvements(a;b;c;d,e); Water Conservation(a;b;d); Improve diversion structures(a;b); Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Remove streamside feedlots; Conservation easement
North Fork Blackfoot River	31	14	Fish passage improvements(b;d); Fish habitat improvement; Water Conservation(a;b;c); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat; Improve diversion structures(a); Prevent fish entrainment; Conservation easement
Pearson Creek	20	2	Fish passage improvements(b;c;d,e); Water Conservation(d); Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Improve diversion structure(a); Remove streamside feedlots; Conservation easement
Poorman Creek	11	4	Fish passage improvements(a;b;c;d); Channel restoration; Water Conservation(a;b;c;d); Riparian vegetation improvements; Improve diversion structure(a;); Improve range/riparian habitat

Table 4.2 (continued).

Stream Name	Number of Projects	Number of Landowners	Projects ^{1, 2, 3}
Rock Creek	50	12	Fish passage improvements(a;b;c;d); Water Conservation(a;b;c;d); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Improve diversion structures(a;b;c); Remove streamside feedlots; Conservation easement
Salmon Creek	21	4	Fish passage improvements(a;b;c;d;e); Water Conservation(b;c;d); Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Improve diversion structures(a;c); Remove streamside feedlots; Conservation easement
Shanely Creek	6	2	Water Conservation(b); Riparian vegetation improvements; Improve range/riparian habitat; Improve diversion structures(a); Fish passage improvements(b); Conservation easement
Spring Creek (North Fork)	8	6	Fish passage improvements(a;b;d;e); Water conservation(a;b); Improve diversion structure(a); Improve wetlands; Prevent fish entrainment; Conservation easement
South Fork Rock Creek	5	1	Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Water conservation(d); Improve range/riparian habitat
Ward Creek	17	8	Improve range/riparian habitat; Remove streamside feedlots; Channel restoration; Riparian vegetation improvements; Improve diversion structures(a); Conservation easement
Warren Creek	39	9	Fish passage improvements(a;b;c;d;e); Water Conservation(d); Spawning habitat protection; Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve wetlands; Improve range/riparian habitat; Improve diversion structures(a;b); Remove streamside feedlots; Conservation easement
Wasson Creek	17	2	Fish passage improvements(b;c;d;e); Water Conservation(a;b;d); Channel restoration; Fish habitat improvement; Riparian vegetation improvements; Improve range/riparian habitat; Improve diversion structures(a); Remove streamside feedlots; Prevent fish entrainment; Conservation easement
West Twin Creek	1	1	Fish passage improvements(a)

Total project streams: 53

Total projects: 676

Total landowners: 193

¹ Fish passage improvement codes:

a = rd crossing upgrade
b = upgrade diversion
c = restoration
d = instream flows
e = fish ladder

² Water conservation codes:

a = water lease; conversion; single season agreement
b = conveyance
c = conversion
d = restoration

³ Improve diversion structure codes:

a = replace headgate
b = remove headgate
c = install headgate

Table 4.3 Potential Restoration Projects on TMDL Streams in the Blackfoot Subbasin.

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
BLACKFOOT HEADWATERS PLANNING AREA						
Blackfoot River from Headwaters to Landers Fork	Mine waste removal from floodplain	From the Anaconda/Beartrap Creeks confluence downstream 1 mile	Reduce metals loading; Improve habitat	Mixed private/public	Scheduled to be completed as part of Mike Horse Mine cleanup	Yes - High
Blackfoot River from Landers Fork to Nevada Ck	None identified at this time				Water quality restoration measures identified in TMDL	Yes – High/Moderate
Arrastra Creek	Culvert Replacement	Approximately 3 miles upstream of confluence with the Blackfoot River	Improve fish passage and flow/sediment conveyance	Public	Completed in 2005	Yes-Moderate
	Bridge installation	Approx 1 mi upstream of above culvert replacement		Private	Preliminary	
Beartrap Creek from Mike Horse Creek to mouth	Mine waste removal from floodplain	Beartrap Creek from Mike Horse Creek to mouth	Reduce metals loading; Improve habitat	Mixed private/public	Scheduled to be completed as part of Mike Horse Mine cleanup	No
Mike Horse Creek	Mine waste removal from floodplain	From Mike Horse Mine to confluence with Beartrap Ck	Reduce metals loading; Improve habitat	Mixed private/public	Private land work completed in 2006/2007. Public land work scheduled to be completed as part of Mike Horse Mine cleanup	No

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>BLACKFOOT HEADWATERS PLANNING AREA (CONT.)</i>						
Poorman Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes-High
Sandbar Creek	None identified at this time				Water quality restoration measures identified in TMDL	No
Willow Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes – High
<i>NEVADA CREEK PLANNING AREA</i>						
Washington Creek (upper)	None identified at this time.				Water quality restoration measures identified in TMDL	Yes – Low
Washington Creek (lower)	None identified at this time				Water quality restoration measures identified in TMDL	Yes – Low
Jefferson Creek (upper)	None identified at this time				Water quality restoration measures identified in TMDL	Yes – Low

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>NEVADA CREEK PLANNING AREA (CONT.)</i>						
Jefferson Creek (lower)	None identified at this time				Water quality restoration measures identified in TMDL	Yes – Low
Gallagher Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes – Low
Buffalo Gulch	None identified at this time				Water quality restoration measures identified in TMDL	Yes – Low
Braziel Creek	Stream channel reconstruction, grazing management, riparian area protection, irrigation diversion improvement	About ½ mile from mouth	Restore instream and riparian habitat	Private	Scheduled to be completed in 2009/2010	No
Nevada Creek (headwaters to Nevada Lake)	Stream channel reconstruction/stabilization, grazing management, riparian plantings	At confluence with Halfway Ck	Restore instream and riparian habitat. Reduce sediment from bank erosion	Private	Completed in 2007	Yes - Moderate
	Grazing management, irrigation diversion structure	Just upstream of USGS gage station	Sediment reduction, Instream flows	Private	Completed in 2007	Yes - Moderate
Nevada Creek (Nevada Lake to Blackfoot River)	Stream restoration and grazing management	Approx 1 mile downstream of reservoir	Prevent avulsion, reduce sediment from bank erosion, improve riparian area and uplands	Private	Scheduled for implementation in 2009	Yes – Low

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>NEVADA CREEK PLANNING AREA (CONT.)</i>						
Nevada Creek (Nevada Lake to Blackfoot River) (cont)	Streambank stabilization where encroaching on Helmville ditch berm, grazing management	Approx 3 miles downstream of reservoir	Prevent Creek from undercutting berm toe, reduce sediment from bank erosion, improve riparian area and uplands	Private	Scheduled for implementation in 2009	Yes – Low
	Channel restoration, grazing management, riparian area protection, irrigation conveyance improvement	Immediately below reservoir	Demonstration project	Private	Under development	Yes - Low
Nevada Spring Creek	Fencing and off-site water development		Habitat enhancement; Sediment/temperature reduction	Private	Completed in 2006	Yes - Moderate
Black Bear Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Moderate
Murray Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Low
Douglas Creek (upper)	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Moderate
Douglas Creek (lower)	Grazing Management: off-stream water development, fencing	Approx 2 miles upstream of NV Ck	Habitat enhancement; Sediment/temperature nutrient reduction	Private	Completed by landowner 2006	Yes - Moderate
	Irrigation diversion improvement	Downstream end of previous project	Reduce sediment loading; remove fish barrier	Private	Unknown	Yes - Moderate

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>NEVADA CREEK PLANNING AREA (CONT.)</i>						
Cottonwood Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Low
McElwain Creek	Channel maintenance, spring development for livestock	Approx 1 mile above mouth	Mitigate gorging of channel, conserve instream flows	Private	Completed in 2007/2008	Yes - High
<i>MIDDLE BLACKFOOT PLANNING AREA</i>						
Yourname Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes – Moderate
Frazier Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Low
Wales Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes -Moderate
Ward Creek	Riparian enhancement, grazing management, offsite watering, fencing, revegetation	Approx ¼ mile above Dead Man’s Lake	Improve habitat; Sediment/temperature reduction/, increase instream flow	Private	Completed in 2005	Yes - Low
Rock Creek	Riparian revegetation	South Fork Rock Creek, middle and lower reaches	Temperature reduction, bank stability, cover, habitat improvements	Private	Completed in 2008	Yes - High

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>MIDDLE BLACKFOOT PLANNING AREA (CONT.)</i>						
Rock Creek (cont)	Riparian revegetation	Upper reach from Salmon and Dry Creek confluence to State lands	Re-establish riparian willow and shrub communities	Private	Completed in 2008	Yes - High
Kleinschmidt Creek	Channel reconstruction, grazing management, off-site watering, fencing	Above final Highway 200 crossing	Reduce sediment, nutrients and temperature	Private	Completed in 2006	Yes – High
	Grazing management, off-site water development, fencing	Below final Highway 200 crossing	Reduce sediment, nutrients and temperature	Private	Scheduled for completion in 2010	
Warren Creek	Riparian enhancement, grazing management, offsite watering	Above Highway 200	Improve habitat; Sediment/temperature reduction/increase instream flow	Private	Completed in 2005	Yes - High
Monture Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - High
Cottonwood Creek	Culvert replacement		Improve fish passage, improve sediment/flow conveyance	USFS	Completed in 2007	
Blanchard Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - High
Buck Creek	None identified at this time				Water quality restoration measures identified in TMDL	No

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>MIDDLE BLACKFOOT PLANNING AREA (CONT.)</i>						
Deer Creek	None identified at this time				Water quality restoration measures identified in TMDL	No
West Fork Clearwater River	None identified at this time				Water quality restoration measures identified in TMDL	No
Richmond Creek	None identified at this time				Water quality restoration measures identified in TMDL	No
Blackfoot River (Nevada Creek to Monture Creek)	None identified at this time				Water quality restoration measures identified in TMDL	Yes – High/Moderate
Blackfoot River (Monture Creek to Clearwater River)	None identified at this time				Water quality restoration measures identified in TMDL	Yes – Moderate
LOWER BLACKFOOT PLANNING AREA						
Belmont Creek	None identified at this time				Water quality restoration measures identified in TMDL	

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>LOWER BLACKFOOT PLANNING AREA (CONT.)</i>						
Blackfoot River (Clearwater River to Belmont Cr)	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Moderate
Blackfoot River (Belmont Cr to mouth)	Grazing management	Between Roundup Bridge and Elk Creek confluence	Protect stream banks and riparian area	Private	Under development	Yes – Moderate
Camas Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Low
Day Gulch	None identified at this time				Water quality restoration measures identified in TMDL	No
East Fork Ashby Creek	None identified at this time				Water quality restoration measures identified in TMDL	No
Elk Creek (headwaters to Stinkwater Cr)	None identified at this time				Water quality restoration measures identified in TMDL	Yes-High
Elk Creek (Stinkwater Cr to mouth)	Grazing Management, some channel reconstruction/stabilization	Lower 4 to 5 miles	Improve riparian area, protect past stream restoration	Private	Completed in 2008	Yes - High

Table 4.3 (continued).

Listed Water	Project(s)	Location	Objective(s)	Land Ownership	Status	On Fisheries Prioritization List?
<i>LOWER BLACKFOOT PLANNING AREA (CONT.)</i>						
Keno Creek	None identified at this time				Water quality restoration measures identified in TMDL	No
Union Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Moderate
Washoe Creek	None identified at this time				Water quality restoration measures identified in TMDL	Yes - Low
West Fork Ashby Creek	None identified at this time				Water quality restoration measures identified in TMDL	No

4.4 Gap Assessment

As illustrated in the Blackfoot Subbasin Assessment and Inventory, the Blackfoot Subbasin has been and continues to be the focal point of much conservation and restoration work. This has been especially true during the last two decades, when emphasis has been placed on the restoration and protection of native aquatic and terrestrial species. Most of the factors threatening the viability of subbasin conservation targets and associated nested targets (Sections 3.3 and 3.4) have received some level of attention in an effort to abate them, but the extent of actions varies widely. While conservation accomplishments have been significant, the Blackfoot Subbasin threat assessment (Section 3.4) illustrates that much work remains to be done. The purpose of this section is to review the areas of accomplishment for each conservation target and the areas of remaining need in terms of resource conservation and restoration in the subbasin.

Native Salmonids: At the inception of the current restoration effort in the early 1990s, various conservation partners made a decision to focus their efforts in the lower subbasin, from the North Fork of the Blackfoot downstream. These early efforts did not focus heavily on the Clearwater drainage. Part of this early emphasis was driven by the fact that fisheries investigations identified critically important bull trout and westslope cutthroat trout habitats within the Monture, North Fork, and nearby drainages. Willingness of many landowners to address fisheries problems in these areas was also an important factor. While native fish habitat continues to improve in the lower Blackfoot subbasin, the focus of native fish restoration work has begun to shift toward the upper subbasin and the Clearwater drainage (Pierce et al. 2008).

Historic mining activity and abandoned mine discharge has resulted in extensive water quality impairment in the subbasin. While there has been a long-term effort to address abandoned mine discharge in the headwaters of the subbasin, that effort is incomplete. To address nonpoint source impairments resulting from roads, unplanned residential and resort development, and incompatible forestry, irrigation, and livestock practices, the entire subbasin has undergone the TMDL designation process and primary pollutants have been identified for each reach of the river. Some of the causes of nonpoint-source pollution, such as nutrient enrichment and thermal and sediment pollution, are being addressed by ongoing habitat restoration projects. Significant nonpoint sources remain unaddressed, however, including those in the upper subbasin in and near the town of Lincoln and in the lower Nevada Creek drainage. Restoration projects are proceeding in both the lower Nevada Creek and upper Blackfoot areas that will improve water quality through partnerships with private landowners, government agencies, and conservation groups.

Access to and from important native fish habitats has been impaired by roads and drainage/diversion systems across the Blackfoot Subbasin. Projects to restore biological connectivity in tributaries and to restore native fish habitat have been completed throughout much of the lower and middle subbasin. There has been an extensive effort throughout the subbasin to remove culverts and other road crossings that have blocked migration into tributaries. A number of irrigation diversions have been modified or retrofitted to allow for fish passage. In a related effort, a substantial number of fish screens have been installed on irrigation diversions in key tributaries throughout much of the subbasin. Despite this work, there are still a number of tributaries in the lower Nevada Creek drainage which continue to

have access and connectivity impairments resulting from road crossings and drainage/diversion systems.

Channel alteration has caused water quality and physical habitat impairments in the subbasin. Restoration of physical habitat throughout much of the subbasin has been completed, especially in the lower and middle subbasin. The restoration efforts have focused on channel reconfiguration and reconnection of channels with their floodplains. Nonetheless, because many of the impairments occur on private land, the pace at which restoration can occur is uneven. This is especially true in parts of the lower Nevada Creek drainage. In the past few years, the pace of restoration here and in the upper subbasin, including the Copper Creek drainage, has increased.

Incompatible forestry practices, drainage and diversion systems, and, most recently, extended drought and climate change have all contributed to an altered hydrologic regime in the subbasin. The long-term restoration effort has been reasonably successful at addressing dewatering on many tributaries through a combination of both habitat and flow restoration strategies. Experience indicates that a coordinated, comprehensive approach that addresses not only physical water diversions but also the restoration of channel and floodplain integrity is the most effective way to address hydrologic alteration. Despite the success with restoration on many streams throughout the subbasin, much remains to be done to restore hydrologic function, especially in the middle Blackfoot and in the Nevada Creek drainage.

The historic introduction of non-native fish species (e.g., rainbow trout, brook trout and brown trout), along with the more recent illegal introduction of unwanted fish such as northern pike and yellow perch, is a high-ranked threat to native salmonids in certain waters of the Blackfoot Subbasin. Tools to eradicate or control some of these fish species are often not feasible. Habitat restoration that reduces water temperature and/or sediment and nutrient loading within moving waters may help control of some species. Public interest in maintaining a sport fishery in the Blackfoot precludes the eradication of recreationally important species, such as brown and rainbow trout.

Whirling disease, caused by the exotic parasite *Myxobolus cerebralis*, has been documented to varying degrees of severity throughout the low elevations the Blackfoot Subbasin. Although there remains a great deal to learn regarding the ecology of the parasite and effects of the disease, it is evident that degraded habitats with elevated levels of fine sediments and warm temperatures and/or nutrient enrichment can contribute to the severity of infection in certain waters. Recent research shows that riparian restoration and habitat enhancement with emphasis on migratory native fish within and upstream of the whirling disease pathogen may buffer fish from the effects of the disease (Pierce et al. 2009).

Herbaceous Wetlands/Native Grassland/Sagebrush Communities/ Moist Site and Riparian Vegetation: Conservation and restoration accomplishments pertaining to these vegetation targets include a variety of public and private programs, projects and protections. Land protection has been the primary strategy used to conserve these targets. Numerous conservation easements on private land and fee title acquisition resulting in public land ownership, such as the designation of Waterfowl Production Areas, Wildlife Management

Areas and the Blackfoot Community Conservation Area, have resulted in protection of wetlands, riparian areas, grasslands, and other vegetation communities. In 2002, the Blackfoot Challenge initiated a three-phase landscape-level effort to protect, restore, and enhance 37,000 acres of biologically significant wetlands (5,310 acres) and associated uplands (31,690 acres) for migratory birds and other wildlife species by 2015. The Blackfoot Watershed I, Montana Project was completed in 2007, resulting in protection, restoration and enhancement of a total of 16,794 acres (3,027 acres of wetland and 13,767 acres of associated upland). The Blackfoot Watershed II, Montana Project is in process.

Restoration activities implemented by the BBCTU targeted at native salmonids and aquatic habitat have also played a critical role in conservation of moist site and riparian vegetation communities. Revegetation projects in the riparian zone range from the simple cessation or reduction of grazing to replanting of native riparian vegetation associated with grazing management. These revegetation efforts nearly always include grazing management agreements with the riparian landowners. While there are some notable successes, partners have identified the need to tighten provisions in agreements with private landowners and enhance compliance monitoring.

Cooperative weed management efforts by public and private partners have contributed to healthy grassland/rangeland and riparian areas. Partners in cooperative weed management seek to manage for a diversity of species and to prevent dense monocultures of noxious weeds using a combination of chemical, biological, and cultural controls. In recent years, conservation partners have initiated restoration projects focused on reducing Douglas-fir encroachment into native grassland/sagebrush communities.

Despite these efforts, much work remains to be done to conserve/restore these vegetation types in the subbasin. Significant information gaps exist for each vegetation target, making it difficult to develop quantifiable conservation objectives. To this end, many of the strategic actions outlined for subbasin vegetation targets in the Subbasin Management Plan (Section 5.0) focus on filling these information gaps. To ensure the effectiveness of future conservation and restoration work, baseline information on the historic extent and condition of each vegetation target is needed. This baseline information will be used to analyze the degree of departure from historic conditions in each vegetation type and to prioritize restoration and conservation action. Once sites are identified for conservation and/or restoration, it will be necessary to determine conservation goals and tools and to establish monitoring protocol that will permit adaptive management over time.

Low Elevation Ponderosa Pine/Western Larch Forest/Mid to High Elevation

Coniferous Forest: Conservation and restoration accomplishments pertaining to subbasin forest conservation targets also include a variety of public and private programs, projects and protections. Forest protection strategies are diverse, ranging from Wilderness areas, where no forest management occurs, to conservation easements on working forest lands. In 2003, the Blackfoot Challenge and The Nature Conservancy purchased 89,215 acres of land from Plum Creek Timber Company. Known as the Blackfoot Community Project, this transaction protected that land from future inappropriate development. It also led to the establishment of the Blackfoot Community Conservation Area, a cooperatively-managed working forest.

These types of conservation accomplishments reflect the important connections between working forests and forest protection in the Blackfoot Subbasin.

Commercial logging has been an economic mainstay in the Blackfoot Valley since 1885. For the first 100 years, the emphasis was on producing logs for the area mills and not necessarily on the environmental consequences of timber stand treatments, logging systems, and forest road construction. As a result, there are countless restoration opportunities on previously harvested lands within the subbasin. Recently, forest restoration, both on USFS land and across ownerships, has been the focus of several collaborative efforts. The Lolo Restoration Committee, a multi-interest advisory group, is working with the USFS on two restoration projects on the Seeley Lake Ranger District. A similar effort is underway on the Lincoln Ranger District. Forest restoration is a major component of recent federal legislation introduced by Montana Senator Jon Tester. The USFS, two state agencies, private landowners and the Blackfoot Challenge have signed a Memorandum of Understanding for cooperative restoration projects across property lines on the 43,000-acre Blackfoot Community Conservation Area. The unintended negative impacts of historic logging activity will be mitigated in these cooperative efforts.

Climate change, the lack of natural fire on the landscape, and the worst bark beetle infestation on record have combined to present the largest threat to forested land within the subbasin. The current world-wide recession has exacerbated the problem by severely limiting market opportunities for the dead and dying timber. However, land management agencies, lumber mills, and private landowners are again working collaboratively with experienced loggers to help mitigate the potential extreme threat of uncontrolled wildfire to rural communities. Programs are in place to identify major wildfire threats to the individual communities, identify cross-boundary treatment areas and establish local task forces to lead the mitigation effort in each community. Federal funding is being provided through programs such as Jump Start, Western Forestry Initiative and the Redesign Competitive Grant. Many of these programs support ecologically sustainable forest stand treatments on low elevation ponderosa pine stands. The cooperators are also establishing new markets for forest thinning and dead trees that will enable the required treatments to continue on a sustained basis.

Although motorized vehicle use on public lands has been a contentious issue that impacts subbasin forest targets, various interest groups are finding solutions through collaboration versus litigation. For example, the Montana Wilderness Association and local snowmobile clubs agreed on a common set of recommendations for motorized use in the revision to the Lolo National Forest Plan. The progressive user groups realize that continued effective collaboration is the only way to successfully address inappropriate motorized vehicle use on public lands.

Grizzly Bears: A variety of regulatory documents (e.g., USFWS 1993, MFWP 1993, MFWP 2006) guide grizzly bear recovery in the NCDE. Because the major threats to grizzly bears in the Blackfoot Subbasin are related to human-bear conflicts that occur primarily on privately owned and leased lands, however, voluntary actions have been instrumental in abating threats to grizzly bears. In the Blackfoot Subbasin, wildlife managers, the Blackfoot Challenge, landowners and others have worked hard in recent years to mitigate these threats. Hundreds

of community members take part in a variety of programs that have reduced grizzly bear-human conflicts by 84% between 2003 and 2008. No grizzly bears have been killed by wildlife management authorities since 2004 and no grizzlies have been trapped/relocated since 2005 for management related purposes in the core project area in the subbasin. This portion of the NCDE is likely serving as important stepping stone habitat facilitating grizzly bear dispersal to the south. Programmatic efforts here are laying the groundwork for population-level connectivity for grizzlies to the Greater Yellowstone Ecosystem and Central Idaho.

The Blackfoot Challenge's Wildlife Committee (WC) has been a leader in the subbasin to help improve management of human-wildlife interactions. The WC has focused on grizzly bear conservation and management since its inception in 2003. The WC has three official work groups: the Landowner Advisory Group, the Neighbor Network Group, and the Waste Management and Sanitation Work Group. The WC has developed an extensive programmatic effort to reduce human-grizzly bear conflicts and improve grizzly bear conservation and management. Maintaining this official committee of the Blackfoot Challenge is an important mechanism for furthering grizzly bear conservation in the watershed. Future actions will continue to focus on working cooperatively with livestock producers, managers, landowners, agencies, and other partners on a variety of conflict mitigation strategies to reduce grizzly bear mortality in the Blackfoot Subbasin.

A major focus of WC work with the USFWS, MFWP, landowners and all partners has been on changing specific land use practices and human behaviors that lead to conflicts with bears. Rather than trying to change the way people think about bears, the WC has focused on trying to change the way people live, work and recreate around bears. When subbasin residents can learn to live with bears, attitudes and or perceptions of bears may improve. WC coordinator Seth Wilson documented the attitudes of more than 30 ranchers throughout the subbasin in 2003 as a baseline to measure future changes in attitudes.

The efforts of MFWP, USFWS, the WC and all partners over the past six years have focused squarely on "attractant security" or making artificial food sources off limits to grizzly bears. MFWP and the WC's Neighbor Network program play a critical role in helping to make attractants such as household garbage, livestock feed, birdfeed and other artificial food sources secure from grizzly bears. New Neighbor Networks are being developed in Lincoln, Woodworth and in the Avon-Helmville area to address attractants and other sanitation issues. Nearly all high-risk calving areas in the subbasin have electric fences (41,000 feet of fencing have been installed) and, on average, 225 livestock carcasses are removed annually from ranches in the subbasin. All ranches located in core grizzly bear habitat in the subbasin participate in the livestock carcass removal effort. Ninety-five percent of all beehives in the subbasin are protected with electric fences. All road killed deer and livestock composting facilities are protected with electric fences, and plans are underway to protect two of the three transfer stations in the subbasin with electric fences. The Blackfoot Challenge has dozens of trash resistant garbage cans to loan to residents each year. A network of 120 residents monitors both grizzly and wolf activity in the subbasin.

The WC has taken an indirect approach to reduce illegal or poaching related mortality of grizzly bears through widespread education and outreach efforts. These actions may help account for the relatively few, if any instances of malicious killing activity. Over the past six years there have no known instances of malicious killing of grizzly bears in the core project area of the subbasin. MFWP and USFWS law enforcement are the lead agencies that address malicious or vandal killing. If poaching or malicious killing activities increase in the subbasin, the WC could devise an appropriate response for improving the situation. The WC has also played an indirect role in reducing mistaken identity killings of grizzly bears (the killing of grizzly bears by black bear hunters or hunters in general). Typically these types of incidents occur in remote, backcountry settings and managing hunter behavior is a challenging task. If MFWP and the USFWS were interested in working in partnership to address this cause of grizzly bear mortality, the WC could assist with education and outreach efforts.

Since self-defense related mortality is a relatively small proportion of overall annual grizzly bear mortality in the NCDE, this has not been a high priority for the WC. However, early season elk hunters have fairly regular encounters with grizzly bears. In some situations these encounters can be problematic for both hunters and grizzlies. There are a variety of activities that MFWP, USFWS and the WC could collectively work on including improving access to hunter-safety education in the Blackfoot Subbasin, providing workshops to improve hunter knowledge of bear behavior and targeting education efforts during poor food years to prevent conflicts resulting from increased probability of hunter-grizzly encounters.

Improving habitat connectivity for grizzly bears in the Blackfoot Subbasin is largely a function of reducing the lethality of the landscape. Large portions of the Blackfoot Subbasin are currently available or potentially available habitat for grizzlies. However, road densities, road access, and habitat alteration, loss and degradation are important cumulative factors that impair functional habitat connectivity.

To reduce physical road and highway impact mortality to grizzly bears and other wildlife, the WC can assist the Montana Department of Transportation in wildlife mitigation measures as future highway improvements are planned. The WC has begun this process with the ITEEM planning effort for Highway 83 and will assist where needed as the planning process unfolds. Additionally, the WC has assisted recently in the development of a set of wildlife movement areas maps that can help plan for potential crossing structures and other wildlife mitigation should those actions be useful in the future. Additional work can be done to address road densities, access and travel management through the USFS, BLM and DNRC public planning processes and public involvement through the NEPA and MEPA processes. The WC will also continue to work on reducing the presence of bear attractants along roads and in other areas that impede migration and movement.

Motorized vehicle use and impacts to grizzly bears and bear habitat on public lands found in the subbasin are best addressed through public land management agency public involvement processes. The WC could facilitate communication and facilitate discussion among stakeholders should motorized vehicle use become a major factor for grizzly bears. While non-motorized recreational use-conflicts with grizzly bears in the watershed have been

relatively few, MFWP and the WC could play a positive role should this become a more pressing issue. Education and outreach efforts and improved knowledge about grizzly bear behavior could help river recreationists, hikers, bikers, fishers, hunters, mushroom pickers and others learn how to safely recreate and work in bear country. This may become a more serious issue in the future as growth, development, and human population pressures increase levels of recreation in grizzly bear habitat.

Unplanned residential and resort development could present significant risk to grizzly bears in the subbasin. However, the Blackfoot Challenge has historically helped to mitigate this threat through a proactive approach to land conservation through its Conservation Strategies Committee and intensive work by partners. Future growth and development are important issues that the Blackfoot Challenge will continue to grapple with in the future.

New mining activity in the subbasin poses a potential threat to grizzly bears. The Blackfoot Challenge can serve as the forum in the watershed to foster civil and productive dialogue about existing or potential resource extraction and impacts to grizzly bears. The Blackfoot Challenge does not advocate a specified position on such issues such as mine site development etc, but can serve as a forum for thoughtful dialogue among all invested stakeholders.

Loss of whitebark pine due to the exotic pathogen white pine blister rust and to climate change jeopardizes an important grizzly bear food source in the Blackfoot Subbasin and throughout the NCDE. There have been significant declines in white bark pine mast throughout portions of the NCDE. No direct action has been taken to mitigate this threat, although grizzly bears may be successfully adapting to these changes in food availability

The Blackfoot Subbasin Gap Assessment illustrates the range of conservation/restoration accomplishments in the subbasin and the scope of work that lies ahead. Private and public partners in the subbasin will continue to address threats to fish, wildlife and habitats through proactive conservation and restoration strategies. New/emerging opportunities include: 1) further development of land planning tools to minimize habitat fragmentation (e.g., county zoning, transferable development rights, and cluster development), 2) human-predator conflict abatement focused on wolves, 3) prevention of new exotic species invasions, 4) expansion of aquatic habitat restoration in the Clearwater and upper portions of the Blackfoot Subbasin, 5) efforts to address climate change and 6) efforts to mitigate the impacts of fire exclusion on subbasin vegetation communities.

5.0 Management Plan

5.1 Background

The Management Plan is the heart of the Blackfoot Subbasin Plan. It consists of five elements: 1) a vision for the subbasin, 2) conservation objectives, 3) strategic actions, 4) research, monitoring and evaluation and 5) consistency with the Endangered Species Act and Clean Water Act. The Blackfoot Subbasin Management Plan is a living document that is based on a 10-15 year planning horizon. It reflects current understanding of conditions in the Blackfoot Subbasin and will be updated through an adaptive management process as knowledge of ecological processes and socioeconomic conditions in the subbasin grows. It is designed to serve as an iterative, community-based and science-driven document and we anticipate that additional objectives and strategies will emerge over time.

The Blackfoot Subbasin Management Plan will serve as a guide for partners working to sustain ecological, economic and cultural values and resources in the Blackfoot Subbasin. This document was developed collaboratively by the subbasin technical work groups which are comprised of a wide range of stakeholders including private landowners, public agencies, and non-profit organizations. Consensus among this diverse group will promote effective and collaborative implementation of the strategic actions outlined in Section 5.3.

5.2 Subbasin Vision

The vision for the Northwest Power and Conservation Council's Fish and Wildlife Program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem and providing the benefits from fish and wildlife valued by the people of the region (NPCC 2009). The vision for the Blackfoot Subbasin is based on this overarching vision for the entire Columbia River Basin. It describes the desired future condition of the subbasin and incorporates the values and priorities of a wide spectrum of stakeholders:

The vision for the Blackfoot Subbasin is for a place characterized by dynamic natural processes that create and sustain diverse and resilient communities of native fish and wildlife and the aquatic and terrestrial habitats on which they depend, thereby assuring substantial ecological, economic and cultural benefits. The efforts to conserve and enhance those natural resources will be implemented through a cooperative partnership between public and private interests that will seek to sustain not only those natural resources, but the rural way of life of the Blackfoot River Valley for present and future generations.

The Blackfoot Subbasin Assessment illustrates, both quantitatively and qualitatively, that ecological conditions in the subbasin are generally very good. At the subbasin scale, there are large, intact landscapes comprised of wilderness, natural areas and other federal or state-owned lands linked to protected and/or sustainably managed private working lands typically located in

the valley bottom. Due to a legacy of conservation and restoration partnerships led by private landowners since the 1970s, residential, resort and commercial development is limited to certain areas and native biodiversity, from wide-ranging mammals to localized rare plant populations, is largely intact. These characteristics, coupled with continued strong public-private partnerships, have resulted in identification of the Blackfoot Subbasin as a high priority site for conservation action by international, national and local partners. The Blackfoot Subbasin Vision will guide prioritization and implementation of conservation objectives and strategic actions to ensure the continued viability of ecological and human communities in the subbasin.

5.3 Conservation Objectives and Strategic Actions

The core of the Blackfoot Subbasin Management Plan consists of a comprehensive set of conservation objectives and strategic actions.³³ Conservation objectives and strategic actions were developed based on the results of the Blackfoot Subbasin threat assessment (Section 3.4). In most cases, the critical subbasin threats stem from incompatible human uses of land, water or natural resources. The conceptual framework for conservation objectives and strategic actions assumes that abating the critical threats in the subbasin will alleviate current or future stresses, resulting in healthy, viable conservation targets.³⁴ However, in many instances, a target has been degraded by historical threats that require some form of active restoration. In these situations, restoration strategies that directly enhance or restore the viability of the target are considered.

Conservation objectives and strategic actions were developed based on the following criteria: 1) economic, social and ecological feasibility, 2) existing partnerships or future cooperative opportunities to implement actions, 3) benefits to multiple targets and 4) the scope of threat abatement. Table 5.1 outlines the relationship between conservation targets, threats and conservation objectives in the subbasin.

³³ Conservation objectives are distinct from what BPA refers to as “biological objectives.” Conservation objectives are general guiding principles that provide a framework for specific and measurable strategic actions. Quantitative “biological objectives” for each conservation target are presented in the subbasin viability assessments (Section 3.3.3).

³⁴ A detailed discussion of Blackfoot Subbasin conservation targets and conservation target viability is provided in Section 3.3.3. Information on stresses and threats is provided in Section 3.4.

Table 5.1 Strategy Development Reference Table.

Threat ¹	Conservation Targets Affected ²	Objective Number
Unplanned Residential and Resort Development (VH)	native salmonids (H) moist site and riparian vegetation (H) native grassland/sagebrush communities (H) low elevation ponderosa pine/western larch forest (VH) mid to high elevation coniferous forest (M) grizzly bears (H) rural way of life (VH)	1, 2a, 2b, 2c, 3, 5, 6, 7, 8, 9a, 9b, 9c, 10
Climate Change (VH)	native salmonids (VH) herbaceous wetlands (H) moist site and riparian vegetation (H) native grassland/sagebrush communities (H) low elevation ponderosa pine/western larch forest (VH) mid to high elevation coniferous forest (H) grizzly bears (H) rural way of life (H)	1, 2a, 2b, 2c, 4, 5, 6, 7, 8, 9a, 9b, 9c, 10
Exotic/Invasive Species (H)	native salmonids (H) herbaceous wetlands (H) moist site and riparian vegetation (M) native grassland/sagebrush communities (H) low elevation ponderosa pine/western larch forest (H) mid to high elevation coniferous forest (H) grizzly bears (M) rural way of life (H)	1, 2a, 2b, 2c, 3, 4, 5, 6, 7, 8, 9a, 10
Lack of Fire (H)	moist site and riparian vegetation (H) native grassland/sagebrush communities (H) low elevation ponderosa pine/western larch forest (VH) mid to high elevation coniferous forest (M) rural way of life (H)	5, 6, 7, 8, 10
Incompatible Forestry Practices (H)	native salmonids (H) herbaceous wetlands (L) low elevation ponderosa pine/western larch forest (VH) mid to high elevation coniferous forest (M)	2a, 2b, 2c, 4, 7, 8, 10
Physical Road Issues (H)	native salmonids (H) low elevation ponderosa pine/western larch forest (H) mid to high elevation coniferous forest (M) grizzly bears (H)	1, 2a, 2b, 2c, 7, 8, 9a, 9b, 10
Conversion to Agriculture (H)	herbaceous wetlands (H) moist site and riparian vegetation (M) native grassland/sagebrush communities (H)	1, 4, 5, 6, 10
Mining (H)	native salmonids (H) grizzly bears (H)	2a, 2b, 2c, 9a, 10
Motorized Vehicle Use (M)	moist site and riparian vegetation (M) native grassland/sagebrush communities (M) low elevation ponderosa pine/western larch forest (M) mid to high elevation coniferous forest (M) grizzly bears (H)	5, 6, 7, 8, 9a, 9b, 10

Table 5.1 (continued).

Threat ¹	Conservation Targets Affected ²	Objective Number
Incompatible Grazing (M)	native salmonids (H) herbaceous wetlands (M) moist site and riparian vegetation (M) native grassland/sagebrush communities (M) grizzly bears (L)	2a, 2b, 2c, 4, 5, 6, 9a, 9b, 9c, 10
Drainage and diversion Systems (M)	native salmonids (H) herbaceous wetlands (M) moist site and riparian vegetation (M)	2a, 2b, 2c, 4, 5, 10
Channel Alteration (M)	native salmonids (H) moist site and riparian vegetation (M)	2a, 2b, 2c, 5, 10
Epidemic Levels of Native Insects and Pathogens (M)	low elevation ponderosa pine/western larch forest (H) mid to high elevation coniferous forest (M)	7, 8, 10
Non-motorized Recreational Use (M)	native salmonids (H) grizzly bears (M)	2a, 2b, 2c, 9a, 9b, 9c, 10
Existing Crop Production (L)	herbaceous wetlands (M)	4, 10
Filling of Wetlands (L)	herbaceous wetlands (M)	1, 4, 10
Lack of Human Tolerance (L)	grizzly bears (M)	9a, 9b, 9c, 10
Human-Caused Mortality (L)	grizzly bears (M)	9a, 9b, 9c, 10
Altered Wildlife Use Patterns (L)	native grassland/sagebrush communities (L)	1, 5, 10
Presence of Bear Attractants (L)	grizzly bears (L)	9a, 9b, 9c, 10

¹ Abbreviations in parentheses indicate the threat rank: VH = Very High; H = High; M = Medium; L = Low.

² Abbreviations in parenthesis indicate threat ranks by target.

For each conservation objective outlined in the following pages, we list the conservation targets affected and the set of strategic actions that will be employed by conservation and restoration partners in the subbasin to achieve the objective. Strategic actions consist of new actions that will enhance conservation and restoration in the subbasin as well as programs and projects already being implemented by agencies and private organizations. A number of strategies currently implemented by the Blackfoot Challenge, for example, are already addressing some of the key threats identified in the Blackfoot Subbasin Plan. Coordinated implementation and regular updating of this set of conservation objectives and strategic actions, as well as monitoring measures proposed in Section 5.4, will ensure that the most effective fish, wildlife and habitat conservation in the Blackfoot Subbasin will be achieved.

Conservation Objective 1 – Maintain the large, intact working landscapes that sustain the natural resources and rural way of life in the Blackfoot Subbasin through support to local communities, counties and land conservation partners.

Conservation Targets Affected: All eight conservation targets: native salmonids, herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest, grizzly bears, rural way of life

Strategic Actions:

1. Through the Conservation Strategies Committee (CSC), maintain the Blackfoot Challenge Conservation Resource Database, watershed map and other GIS-based resources to prioritize areas and pool resources for conservation, stewardship and land-use planning efforts.
 - a. Integrate baseline data, objectives and strategic actions for vegetation targets and other data associated with the subbasin plan into future conservation and stewardship activities.
 - b. Provide these resources as requested to Missoula, Powell, and Lewis and Clark Counties and local communities and/or host community forums pertaining to land-use planning efforts.
2. Through the Blackfoot Challenge’s CSC and Conservation Easement Work Group, continue coordinating conservation easements to address conservation targets, adaptive management and coordinated monitoring; utilize the conservation easement brochure as a clearinghouse for information.
3. Continue coordinating with partners working at the regional level on conservation and stewardship projects (e.g., Cooperative Conservation Agreement for the Blackfoot Watershed, Montana Legacy Project, Missoula County Practical Landscape Assessment for Conservation and Enhancement (PLACE) Project, Seeley-Swan-Blackfoot Stewardship Summit, Crown of the Continent, Partners for Conservation).
4. Research and explore innovative conservation tools, such as the transfer of development rights and other incentives that reward sustainable residential development, and their compatibility with the communities, practices and resources in the Blackfoot Subbasin.
5. Explore/identify the qualities that define the rural way of life for communities across the subbasin and connections to public-private conservation, restoration and stewardship practices. Explore/identify community-benefit indicators to monitor effectiveness of programs for the long-term.

Conservation Objective 2a – Maintain and/or restore viable populations of bull trout within the three major population groups³⁵ in the Blackfoot Subbasin.³⁶

Conservation Objective 2b – Maintain and/or restore viable populations of migratory (fluvial and adfluvial) westslope cutthroat trout within each of the three major population groups³⁷ within the Blackfoot Subbasin.

Conservation Objective 2c – Maintain and/or restore viable populations of resident westslope cutthroat trout within each of the three major population groups within the Blackfoot Subbasin.³⁸

Conservation Targets Affected: Native salmonids (bull trout; westslope cutthroat trout). These species are widely distributed and represent the broad range of aquatic environments found in the Blackfoot. Conservation and restoration of these target species and their habitats will also provide benefits for other native fishes, aquatic organisms and riparian plant communities found throughout the subbasin.

Strategic Actions:

1. Continue to restore physical instream habitat suitable to native salmonids.
 - a. Continue to restore instream habitat connectivity by removing barriers (e.g., diversion barriers, culverts, temperature and pollution barriers) except where maintaining barriers is desirable to maintain physical and genetic isolation.

³⁵ The three major bull trout population groups in the Blackfoot Subbasin are 1) Upper Blackfoot Basin upstream of Nevada Creek, 2) Clearwater River Basin, and 3) Lower Blackfoot Basin (outside of the Clearwater) below Nevada Creek.

³⁶ The Bull Trout Draft Recovery Plan (USFWS 2002) lists four recovery objectives for the Clark Fork Recovery Unit. The Blackfoot Subbasin Plan is consistent with those objectives which are as follows: (1) maintain current distribution of bull trout and restore distribution in previously occupied areas within the Clark Fork Recovery Unit; (2) maintain stable or increasing trends in abundance of bull trout in each subunit of the Clark Fork Recovery Unit; (3) restore and maintain suitable habitat conditions for all bull trout life history stages and strategies; and (4) conserve genetic diversity and provide opportunity for genetic exchange.

³⁷ The three major westslope cutthroat population groups in the Blackfoot Subbasin are 1) Upper Blackfoot Basin upstream of Nevada Creek, 2) Clearwater River Basin, and 3) Lower Blackfoot Basin (outside of the Clearwater) below Nevada Creek.

³⁸ Implicit in this objective is to protect and enhance resident, spawning and rearing habitats for isolated populations of genetically pure westslope cutthroat trout and to protect these populations from genetic introgression by non-native species.

- b. Continue to implement instream restoration projects that restore proper pattern, profile and dimensions to impacted channels.
 - c. Continue to implement water conservation/instream flow projects, particularly those that retain or enhance perennial flows over the long term or during low flow periods, and conserve cold waters necessary for native salmonids.
 - d. Continue to implement water quality improvement projects, particularly those that reduce water temperatures, instream sediment levels and other pollutants that are deemed harmful to native salmonids.
 - e. Continue to protect and restore riparian vegetation.
 - f. Continue to implement grazing and livestock management projects that benefit riparian and instream habitat.
2. Continue work to reduce the threat of non-native fish interactions.
- a. Promote restoration and/or maintenance of natural habitat and stream flow conditions that should lead to a competitive advantage for native fish over non-native species.
 - b. Promote and support public policy that favors native species and their habitats.
 - c. Coordinate efforts to identify the distribution of non-native fish, invertebrates and plants in aquatic habitats and how these species affect native salmonids.
 - d. Monitor the status of new invasive species in the area surrounding the Blackfoot Subbasin and promote the use of the state's response strategy for non-native species.
 - e. Continue to monitor, educate and devise strategies to prevent the introduction of non-native and/or invasive aquatic species to the subbasin.
 - f. Conduct public education/outreach about non-native species that threaten native salmonid populations in the subbasin.
3. Use existing climate models to assess how a climate change will affect the subbasin hydrologic regime.
- a. Adapt or extend existing climate-hydrology models (e.g., Crozier et al. 2008, Issak et al. *in review*) to scale at the subbasin level and, if possible, to the three major fish population areas within the Blackfoot Subbasin. Use this information to inform stakeholders of potential changes in hydrology, water availability and water temperature and to guide and prioritize conservation and restoration efforts.
 - b. Exploit any long-term data sets that exist in the subbasin to refine and validate the "downsized" climate projections.
4. Promote the continuation and expansion of long-term data sets with a repository accessible to the public and research partners.
- a. Reestablish and expand significant long-term data sets in the Blackfoot Subbasin that have been truncated due to lack of agency funding (e.g., stream discharge, water temperature, air temperature, and fisheries population data).
 - b. Continue historic data sets and create new data sets necessary for tracking impacts of climate change in river, tributary and lake habitats. Support long-term data collection efforts by public agencies (e.g., MFWP, USFS, BLM, DEQ, USGS).

These long-term data sets are essential to adaptive management and conservation efforts.

- c. Augment citizen based monitoring with Blackfoot Challenge coordinating consistent data gathering on private lands to complete data sets and improve management.
5. Develop a viability assessment based on the sixth code HUC level. Complete the aquatic species viability assessment (Section 3.3.3.1) for each bull trout and westslope cutthroat trout population described above based on a more complete sixth code HUC level data set that incorporates data from all public agencies and private organizations.
 6. Coordinate implementation of native salmonid conservation objectives/strategic actions with terrestrial species and upland/wetland objectives/strategic actions. Integrity of terrestrial ecosystems influences and constrains aquatic systems. Integrated implementation of the Blackfoot Subbasin Plan will advance management and allow leveraging of limited resources by recognizing and resolving convergent and potentially conflicting objectives.
 - a. Conduct a spatially explicit assessment of terrestrial and aquatic resources and management conditions that will support development of integrated goals, objectives and opportunities for collaboration in conservation activities and recognition of joint restoration priorities.
 - b. Develop a water budget that acknowledges the interaction between surface water and groundwater. Subbasin wetland, stream and lake habitats are closely linked. An integrated hydrologic assessment is needed to manage any of these habitats effectively. This assessment would:
 - i. catalog existing information on groundwater-surface water interactions
 - ii. support development of a water budget
 - iii. include potential changes in water volume and temperature predictions based on climate change models

Conservation Objective 3 – Control existing noxious and invasive³⁹ plant species abundance and distribution and prevent establishment of all new noxious and invasive species in the Blackfoot Subbasin. Emphasis should be placed on protecting the highest quality habitats, which should be identified and prioritized by 2012.⁴⁰

Conservation Targets Affected: herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest

Strategic Actions:

1. Expand current noxious and invasive weed management efforts by coordinating and cooperating with partners on an ecologically and economically sustainable approach to integrated weed management through the Blackfoot Challenge Weed Steering Committee.
 - a. Continue organization and facilitation of landowner-led Cooperative Weed Management Areas.
 - b. Emphasize prevention of new invaders and develop strategies for early detection and eradication.
 - c. Dedicate resources to education, awareness and outreach through one-on-one contact with landowners, resource users and the general public.
 - d. Coordinate efforts to eradicate, contain or control noxious weeds with conservation of rare plant species that occur in the subbasin (i.e., avoid or minimize impacts to known rare plant populations).
 - e. Monitor and evaluate effectiveness of weed program.
 - f. Continue building private and public partnerships for a sustainable approach to integrated weed management.
2. Develop a Blackfoot Watershed Weed Management Plan (utilize USFS-Region 1 Noxious Weed Risk Assessment and coordinate with other land management planning efforts).
 - a. Utilize baseline data for vegetation targets associated with the subbasin plan to inform the plan.
 - b. Coordinate efforts to work in the highest quality native plant habitats, contain existing invasive species to their present extent and attempt to restore native communities.

³⁹ May include pasture grasses in some areas, e.g., wetlands, riparian areas, and native grasslands/sagebrush communities. Definitions of “noxious” and “invasive” plants are provided in Section 3.2.7.3.

⁴⁰ The Blackfoot Challenge will be instrumental in accomplishing this objective at the subbasin scale.

3. Through the Blackfoot Challenge Weed Steering Committee, develop an Invasive Species Strike Team that will be collectively funded and organized. The team will provide coordinated integrated weed identification, management and control and will emphasize long-term biological control. However, the team will initially emphasize the use of all integrated pest management tools (chemical, biological, mechanical, vegetation management, etc.).
 - a. Estimate costs of assembling a strike team.
 - b. Determine how to share the costs (e.g., fee per acre that needs treatment) and obtain sources of outside funding to support/subsidize the effort.
 - c. Engage participation by as many private and public landowners as possible.
4. Address non-native pasture grasses on a site specific basis, where they are invasive and threatening native plant communities.
5. Incorporate weed management practices in forestry activities (e.g., use of minimal soil disturbing methods and equipment, reseeding with non-invasive and/or native mixes, equipment washing).
6. Increase emphasis on biological control of weeds by making more bio-control agents available and increasing funding for bio-control development and implementation.
7. Increase awareness among small acreage landowners about the importance of controlling noxious and invasive species on their property. (See conservation objective 10 for more information on how this strategic action will be implemented).
8. Use the Blackfoot Community Conservation Area and other sites to establish demonstration plots to explore, practice and transfer invasive species abatement strategies.
9. Partner with universities and other public and private entities interested in noxious weed research.
10. Use stewardship outreach with conservation easement holders to explore, practice, and export invasive species abatement strategies to other landscapes (e.g., the Centennial Valley and Rocky Mountain Front).
11. Integrate the Blackfoot Challenge weed program and Conservation Easement Work Group to develop a consistent, watershed-wide approach to monitoring and managing invasive plants on lands with conservation easements.

Conservation Objective 4 – Maintain or restore the viability of priority⁴¹ herbaceous wetlands based on historic conditions across the Blackfoot Subbasin.

Conservation Targets Affected: herbaceous wetlands

Strategic Actions:

1. Develop a baseline of historic and current vegetation communities.
 - a. Request proposals for baseline development.
 - b. Assemble team of experts to determine best methodology for developing a baseline (e.g., interpretation of historic aerial photographs; analysis stratified by vegetation type, temperature/moisture regimes).
 - c. Determine the acceptable level of departure from historic conditions (see parameters outlined in viability assessment, Table 3.12).
 - d. Conduct field inventory to classify existing and potential vegetation condition and to identify high-quality existing sites.
2. Analyze the degree of departure from historical conditions overlain with a baseline of developed, converted or otherwise altered areas where it is not feasible to restore and/or maintain those plant communities.
3. Develop a priority map for protection of intact areas and restoration of disturbed areas in critical native plant community areas. Coordinate this effort with actions/needs for other conservation targets, such as grizzly bears/wildlife linkage zones.
4. Determine a wetland community conservation goal (total area conserved) and timeline for achieving the goal.
5. Develop tools for maintaining healthy sites identified in the inventory and planning process, outlined above, and restore high priority degraded sites.⁴²
 - a. Address water manipulation and management in wetlands: timing, depth (draining wetlands or using as irrigation water storage devices).
 - b. Work with willing landowners of prioritized wetlands on water management plans.
 - c. Use the Blackfoot Community Conservation Area and other project sites to test and demonstrate restoration techniques.

⁴¹ “Priority” sites will be determined based on HRV analysis outlined in strategic actions. Significant information gaps exist for each of the Blackfoot Subbasin vegetation/forest targets, making it difficult to develop quantifiable objectives. Thus, many of the strategic actions in conservation objectives 4-8 are focused on filling these information gaps.

⁴² The 2008 USFS Restoration Policy (USFS 2008) defines *ecological restoration* as the process of assisting the recovery of resilience and adaptive capacity of ecosystems that have been degraded, damaged, or destroyed. Restoration focuses on establishing the composition, structure, pattern, and ecological processes necessary to make terrestrial and aquatic ecosystems sustainable, resilient, and healthy under current and future conditions.

6. Encourage sustainable development near priority herbaceous wetlands.
7. Monitor for viability of nested targets (herbaceous wetland-associated bird, plant, amphibian, and invertebrate Species of Concern). Develop action items if necessary for nested target protection. See Section 3.3.3.2 for more information on nested targets.
8. Coordinate with other land management planning efforts (e.g., the USFS National Forest Plans and BLM, DNRC, USFWS and MFWP planning updates).
9. Incorporate incentives for restoration and protection in private, public and interagency land management plans.
10. Evaluate, monitor and plan in an iterative way (adaptive management). Through ongoing monitoring and data gathering, refine viability indicator ratings (Table 3.12) necessary to maintain or restore the viability of priority wetland communities.

Conservation Objective 5 – Maintain or restore the viability of priority moist site and riparian vegetation based on historic conditions across the Blackfoot Subbasin.

Conservation Targets Affected: moist site and riparian vegetation

Strategic Actions:

1. Develop a baseline of historic and current vegetation communities.
 - a. Request proposals for baseline development.
 - b. Assemble team of experts to determine best methodology for developing a baseline (e.g., interpretation of historic aerial photographs; analysis stratified by vegetation type, temperature/moisture regimes).
 - c. Determine the acceptable level of departure from historic conditions (see parameters outlined in viability assessment, Table 3.13).
 - d. Conduct field inventory to classify existing and potential vegetation condition and to identify high-quality existing sites.
2. Analyze degree of departure from historical conditions overlain with a baseline of developed, converted or otherwise altered areas where it is not feasible to restore and/or maintain those plant communities.
3. Develop a priority map for protection of intact areas and restoration of disturbed areas in critical native plant community areas. Coordinate this effort with actions/needs for other conservation targets, such as grizzly bears/wildlife linkage zones.
4. Determine a moist site and riparian community conservation goal (total area conserved) and timeline for achieving the goal.
5. Develop tools for maintaining healthy sites identified in the inventory and planning process, outlined above, and restore high priority degraded sites.
 - a. Maintain sites closest to historic condition using fire or other vegetation management tools.
 - b. Use such tools as: NRCS Riparian Forest Buffers⁴³ and Riparian Proper Functioning Condition.⁴⁴

⁴³ A riparian forest buffer is an area of trees and shrubs located adjacent to streams, lakes, ponds and wetlands. Riparian forest buffers of sufficient width intercept sediment, nutrients, pesticides and other materials in surface runoff and reduce nutrients and other pollutants in shallow subsurface water flow. Woody vegetation in buffers provides food and cover for wildlife, helps lower water temperatures by shading waterbody and slows out-of-bank flood flows. In addition, the vegetation closest to the stream or waterbody provides litter fall and large woody debris important to aquatic organisms. Also, the woody roots increase the resistance of streambanks and shorelines to erosion caused by high water flows or waves (NRCS).

⁴⁴ Riparian Proper Functioning Condition (PFC) is a qualitative assessment of riparian conditions. A qualitative assessment is defined as “the process of estimating or judging the value or functional status of ecological processes (e.g., ecosystem health) in a location during a moment in time” (Pellant et al. 2005). A standard checklist of riparian attributes (amount, function etc.) is assessed by an interdisciplinary team along a selected reach (for lotic

- c. Use BBCTU's priority list, the Basin-Wide Restoration Action Plan for the Blackfoot Watershed, and other key plans.
 - d. Use the Blackfoot Community Conservation Area and other project sites to test and demonstrate moist site and riparian community restoration techniques.
6. Encourage sustainable development near priority moist site and riparian vegetation areas.
7. Monitor for viability of nested targets (riparian dependent birds). Develop action items if necessary for nested target protection. See Section 3.3.3.3 for more information on nested targets.
8. Increase awareness about the important role of fire and other ecological processes in the maintenance of moist site and riparian systems.
9. Coordinate with other land management planning efforts (e.g., the USFS National Forest Plans and BLM, DNRC, USFWS, and MFWP planning updates).
10. Incorporate incentives for restoration and protection in private, public and interagency land management plans.
11. Evaluate, monitor and plan in an iterative way (adaptive management). Through ongoing monitoring and data gathering, refine viability indicator ratings (Table 3.13) necessary to maintain or restore the viability of priority moist site and riparian communities.

assessments) or wetland (for lentic assessments). Although PFC is not a monitoring or inventory tool, it can be used to diagnose function and determine whether additional, quantitative data need to be collected. The assessment results in designating the system as one of the following: Proper Functioning Condition, Functioning-at-Risk, or Non-Functioning.

Conservation Objective 6 - Maintain or restore the viability of priority native grassland and sagebrush communities based on historic conditions across the Blackfoot Subbasin.

Conservation Targets Affected: native grassland/sagebrush communities

Strategic Actions:

1. Develop a baseline of historic and current vegetation communities.
 - a. Request proposals for baseline development.
 - b. Assemble team of experts to determine best methodology for developing a baseline (e.g., interpretation of historic aerial photographs; analysis stratified by vegetation type, temperature/moisture regimes).
 - c. Determine the acceptable level of departure from historic conditions (see parameters outlined in viability assessment, Table 3.14).
 - d. Conduct field inventory to classify existing and potential vegetation condition and to identify high-quality existing sites.
2. Analyze the degree of departure from historical conditions overlain with a baseline of developed, converted or otherwise altered areas where it is not feasible to restore and/or maintain those plant communities. Include an assessment of the extent of tree encroachment into native grasslands/sagebrush communities due to fire suppression.
3. Develop a priority map for protection of intact areas and restoration of disturbed areas in critical native plant community areas. Coordinate this effort with actions/needs for other conservation targets.
4. Determine a native grassland/sagebrush community conservation goal (total area conserved) and timeline for achieving the goal.
5. Develop tools for maintaining healthy sites identified in the inventory and planning process, outlined above and restore high priority degraded sites.
 - a. Maintain sites closest to historic condition using fire or other vegetation management tools.
 - b. Develop specific tools for maintaining the Three-tip Sagebrush–Rough Fescue Association.
 - c. Use the Bandy Ranch and Blackfoot Community Conservation Area to test and demonstrate grassland restoration techniques.
6. Encourage sustainable development in priority native plant community areas.
7. Monitor for viability of nested targets (grassland/sagebrush-associated bird and plant Species of Concern; ungulate winter range). Develop action items if necessary for nested target protection. See Section 3.3.3.4 for more information on nested targets.

8. Capitalize on wildland-urban interface funding and the need to restore grasslands and/or sagebrush communities within the forest/grassland-shrubland interface to historic condition.
9. Increase awareness about the important role of fire and other ecological processes in the maintenance of native grassland/sagebrush communities.
10. Coordinate with other land management planning efforts (e.g., the USFS National Forest Plans and BLM, DNRC, USFWS, and MFWP planning updates).
11. Incorporate grassland/sagebrush protection and restoration, including prescribed fire burn plans and incentives for the use of managed fire, into private, public and interagency land management plans.
12. Evaluate, monitor and plan in an iterative way (adaptive management). Through ongoing monitoring and data gathering, refine viability indicator ratings (Table 3.14) necessary to maintain or restore the viability of priority native grassland and sagebrush communities.

Conservation Objective 7 - Maintain or restore the viability of low severity fire regime ponderosa pine/western larch forest communities⁴⁵ based on historic stand conditions across the Blackfoot Subbasin.

Conservation Targets Affected: low elevation ponderosa pine/western larch forest

Strategic Actions:

1. Develop a baseline of historic and current vegetation communities.
 - a. Request proposals for baseline development.
 - b. Assemble team of experts to determine best methodology for developing a baseline (e.g., interpretation of historic aerial photographs; analysis stratified by vegetation type, temperature/moisture regimes).
 - c. Include analysis of wildlife linkage areas and forest carnivore (Canada lynx, fisher) needs.⁴⁶
 - d. Determine the acceptable level of departure from historic conditions (see parameters outlined in viability assessment, Table 3.15).
 - e. Conduct field inventory to classify existing and potential vegetation condition, including understory vegetation, and to identify high-quality existing sites.
2. Analyze the degree of departure from historical conditions overlain with a baseline of developed, converted or otherwise altered areas where it is not feasible to restore and/or maintain those plant communities. In HRV analysis, emphasize the low elevation forest types if resources are limited.
3. Develop a priority map for protection of intact areas and restoration of disturbed areas in critical native plant community areas. Coordinate this effort with actions/needs for other conservation targets, such as grizzly bears/wildlife linkage zones.
4. Determine a low elevation ponderosa pine/western larch forest community conservation goal (total area conserved) and timeline for achieving the goal.
5. Develop tools for maintaining healthy sites identified in the inventory and planning process, outlined above, and restore high priority degraded sites using appropriate vegetation management tools (e.g., fire, mechanical treatments).
 - a. Maintain sites closest to historic condition using fire or other vegetation management tools.
 - b. Seek opportunities to restore forest stands to historic conditions where it overlaps with the needs of public safety within the wildland-urban interface.

⁴⁵ This includes mostly low-elevation, dry forest types, but may include more mesic stands, particularly larch-dominated stands in Clearwater drainage.

⁴⁶ The Blackfoot Subbasin planning team intends to focus future attention on wildlife habitat linkage and connectivity across and between nonfederal and federal lands, including strategies for coordinated management.

- c. Use Lubrecht Experimental Forest, the Blackfoot Community Conservation Area, and other project sites to test and demonstrate low elevation forest restoration techniques.
6. Promote forestry practices (e.g., thinning) that enhance resilient and sustainable stand conditions.
 - a. Consider effects of forest roads on hydrology, wildlife security, weed introductions, etc.
 - b. Through the Blackfoot Challenge Forestry Committee, coordinate fuels mitigation work in the wildland-urban interface to enhance sustainable stand conditions in conjunction with creating fire safety zones.
7. Maintain the viability of the local wood products industry through increased local production of wood products generated from restoration treatments. For example, support:
 - a. Construction and use of small co-gen plants for local energy production (burning chips, pellets)
 - b. Locally-produced pine/fir furniture
 - c. Small-diameter fir/larch flooring
8. Monitor for viability of nested targets (low elevation ponderosa pine/western larch forest-associated birds; ungulate winter range). Develop action items if necessary for nested target protection. See Section 3.3.3.5 for more information on nested targets.
9. Increase awareness about the important role of fire and other ecological processes in the maintenance of forest systems.
10. Coordinate with other land management planning efforts (e.g., the USFS National Forest Plans and BLM, DNRC, USFWS and MFWP planning updates).
11. Coordinate with Montana Forest Stewardship Steering Committee, UM Applied Forest Management Program and others to gain support for projects and funding on private lands.
12. Incorporate prescribed fire burn plans and incentives for the use of managed fire, as well as forest protection and restoration, into private, public and interagency land management plans.
13. Coordinate with Montana Forest Restoration Committee to gain support for projects and funding on USFS lands.
14. Evaluate, monitor and plan in an iterative way (adaptive management). Through ongoing monitoring and data gathering, refine viability indicator ratings (Table 3.15) necessary to maintain or restore the viability of priority low elevation ponderosa pine/western larch forest communities.

Conservation Objective 8 - Maintain or restore the viability of mid to high elevation coniferous forest communities based on historic stand conditions across the Blackfoot Subbasin.

Conservation Targets Affected: mid to high elevation coniferous forest

Strategic Actions:

1. Develop a baseline of historic and current vegetation communities.
 - a. Request proposals for baseline development.
 - b. Assemble team of experts to determine best methodology for developing a baseline (e.g., interpretation of historic aerial photographs; analysis stratified by vegetation type, temperature/moisture regimes).
 - c. Include analysis of wildlife linkage areas and forest carnivore (Canada lynx, fisher) needs.
 - d. Determine the acceptable level of departure from historic conditions (see parameters outlined in viability assessment, Table 3.16).
 - e. Conduct field inventory to classify existing and potential vegetation condition, including understory vegetation, and to identify high-quality existing sites.
2. Analyze the degree of departure from historical conditions overlain with a baseline of developed, converted or otherwise altered areas where it is not feasible to restore and/or maintain those plant communities. In HRV analysis, emphasize the low elevation forest types if resources are limited (see Conservation Objective 7).
3. Develop a priority map for protection of intact areas and restoration of disturbed areas in critical native plant community areas. Coordinate this effort with actions/needs for other conservation targets, such as wildlife linkage zones and critical Canada lynx habitat.
4. Determine a mid to high elevation coniferous forest community conservation goal (total area conserved) and timeline for achieving the goal.
5. Develop tools for maintaining healthy sites identified in the inventory and planning process, as outlined above, and restore high priority degraded sites using appropriate vegetation management tools (e.g., fire, mechanical treatments).
 - a. Maintain sites closest to historic condition using fire or other vegetation management tools.
 - b. Seek opportunities to restore forest stands to historic conditions where it overlaps with the needs of public safety within the wildland-urban interface.
 - c. Use Lubrecht Experimental Forest, Blackfoot Community Conservation Area and other project sites to test and demonstrate mid to high elevation forest restoration techniques.
 - d. Support the federal and state agency partners in their whitebark pine restoration efforts.
6. Promote forestry practices that enhance resilient sustainable stand conditions.

- a. Consider effects of forest roads on hydrology, wildlife security, weed introductions, etc.
 - b. Use the Blackfoot Challenge Forestry Committee to coordinate fuels mitigation work in the wildland-urban interface to enhance sustainable stand conditions in conjunction with creating fire safety zones.
7. Maintain the viability of the local wood products industry through increased local production of wood products generated from restoration treatments.
 - a. Pursue construction and use of small co-gen plants for local energy production (burning chips, pellets)
 - b. Locally-produced pine/fir furniture
 - c. Small-diameter fir/larch flooring
8. Monitor for viability of nested targets (mid to high elevation coniferous forest-associated birds; forest carnivores; whitebark pine). Develop action items if necessary for nested target protection. See Section 3.3.3.6 for more information on nested targets.
9. Increase awareness about the important role of fire and other ecological processes in the maintenance of forest systems.
10. Coordinate with other land management planning efforts (e.g., the National Forest plan revisions and BLM, DNRC, USFWS and MFWP planning updates).
11. Coordinate with Montana Forest Stewardship Steering Committee, UM Applied Forest Management Program and others to gain support for projects and funding on private lands.
12. Incorporate prescribed fire burn plans & incentives for the use of managed fire, as well as forest protection and restoration, into private, public and interagency land management plans.
13. Coordinate with Montana Forest Restoration Committee to gain support for projects and funding on USFS lands.
14. Evaluate, monitor and plan in an iterative way (adaptive management). Through ongoing monitoring and data gathering, refine viability indicator ratings (Table 3.16) necessary to maintain or restore the viability of priority mid to high elevation coniferous forest communities.

Conservation Objective 9a – Maintain functional connectivity for grizzly bears across biologically suitable habitats in the Blackfoot Subbasin.⁴⁷

Conservation Targets Affected: grizzly bears

Strategic Actions:⁴⁸

1. Address physical road issues (e.g., migration barriers, mortality) and recreational road use impacts through county planning efforts, private landowner stewardship projects, cooperative demonstration projects like the BCCA and travel management processes on public lands (NEPA and MEPA).
2. Address wildlife movement across Highway 200 and Highway 83.
 - a. Assist Montana Department of Transportation (MDT) in wildlife mitigation measures (Integrated Transportation and Ecosystem Enhancements for Montana (ITEEM) process, etc.).
 - b. Plan for potential road crossing structures and other wildlife mitigation using wildlife movement areas maps developed in January 2009.
3. Reduce presence of attractants. In partnership with MFWP, USFWS, USFS, other public land management agencies and the Blackfoot Challenge’s Wildlife Committee, continue work on “attractant security,” or making artificial food sources (e.g., household garbage, backcountry camps, livestock feed, birdfeed) unavailable to grizzly bears. Continue the Blackfoot Challenge’s “Neighbor Network” phone tree program and expand the program to Lincoln, Woodworth and the Avon-Helmville area to address attractants and other sanitation issues on private lands.
4. Address impacts of motorized recreational use on grizzly bears through USFS, BLM and DNRC public planning and public involvement in the NEPA and MEPA processes.⁴⁹
5. Address impacts of non-motorized recreation on grizzly bears through education and outreach efforts. Use new knowledge about grizzly bear behavior to help river

⁴⁷ It should be noted that while certain habitat types are preferred by grizzly bears and are seasonally influenced by food availability, improving habitat level connectivity for grizzly bears in a place like the Blackfoot Subbasin is largely a function of reducing the risk of mortality in the portions of this landscape that support grizzly bear life history needs. Large portions of the Blackfoot Subbasin are currently available or potentially available habitat for grizzlies. However, road densities, road access, and habitat alteration, loss and degradation are important cumulative factors that can impair functional habitat connectivity, largely through human-caused mortality.

⁴⁸ The Blackfoot Challenge’s Wildlife Committee has been and will continue to be pivotal in implementing strategic actions designed to improve management of human-wildlife interactions in the Blackfoot Subbasin.

⁴⁹ The BCCA Council has developed a motorized recreation use plan that addresses potential impacts to wildlife including grizzly bears.

recreationists, hikers, bikers, fishers, hunters, mushroom pickers, etc. learn how to safely live, recreate and work in bear country.⁵⁰

6. Address impacts of resource extraction on grizzly bears. The Blackfoot Challenge can serve as a forum for thoughtful dialogue among all invested stakeholders on mine site development and other resource extraction issues.
7. Use USFS Cumulative Effects Model (CEM) to determine amount and distribution of available grizzly bear habitat in the Blackfoot Subbasin.
8. Coordinate with public land management agencies (e.g., USFS, BLM, DNRC, MFWP) to identify public and non-federal lands that may be important wildlife linkage habitat necessary to sustain life history needs of species like grizzly bears. Emphasis should be placed on identifying potential acres of habitat that serve as important linkage zones and securing attractants that may be present in these same areas. This ensures that there is stable habitat and that the habitat is permeable or less lethal to species like grizzly bears.

⁵⁰ While non-motorized recreational use conflicts with grizzly bears in the watershed have been relatively few, this may become a more serious issue in the future as growth, development, and human population pressures increase levels of recreation in grizzly bear habitat.

Conservation Objective 9b – Reduce human-caused grizzly bear mortality in the Blackfoot Subbasin.

Conservation Targets Affected: grizzly bears

Strategic Actions:

1. Maintain and/or establish partnerships between the Blackfoot Challenge’s Wildlife Committee, livestock producers, managers, landowners, USFWS, MFWP, NRCS, DNRC and other partners throughout the subbasin to improve livestock production practices and reduce the risk of domestic livestock depredation and property damage by grizzlies.
2. Continue to systematically prioritize high risk areas (conflict hotspots) using GIS spatial analysis and expert opinion of MFWP to focus conflict abatement in geographically targeted areas in the most cost effective manner possible.
3. Continue to implement proven non-lethal deterrent practices to remove or secure attractants, e.g., electric fencing of calving areas, beehives, garbage; livestock carcass removal; and sanitation at the household and municipal levels.
4. Continue to work collaboratively with the community on a variety of education/outreach efforts through the Neighbor Network to better understand how to live, work and recreate safely in grizzly bear country.
5. Reduce direct mortality of grizzly bears.
 - a. Reduce illegal (including poaching) killing of grizzly bears through education and outreach efforts. MFWP and USFWS law enforcement are the lead agencies that address malicious or vandal killing.
 - b. Assist MFWP and the USFWS as requested to address mistaken identity killing of grizzly bears by black bear hunters.
 - c. Reduce self defense-related mortality of grizzly bears.
 - i. Improve access to hunter-safety education in the Blackfoot
 - ii. Provide workshops to improve hunter knowledge of bear behavior
 - iii. Target specific education efforts during poor bear food years to prevent hunter-grizzly conflicts resulting from more widely dispersed grizzly bear foraging activity.
 - d. Work with MDT to reduce direct highway mortality of grizzly bears related to vehicle collisions and highway attractants (e.g., garbage at rest stops, road-killed animals, tractor-trailer cargo spills, and roadside enhanced vegetation such as berries and grass).
 - i. Work with MDT to reduce/mitigate highway attractants.
 - ii. Work with MDT to improve wildlife passage across highways.

- iii. Work with MDT to mitigate the effects of potential highway improvements (e.g., construction of four-lane highways) on wildlife in the Blackfoot Subbasin.
- e. Reduce management action-related mortality of grizzly bears.⁵¹
- f. Reduce research and management (e.g., trapping)-related mortality of grizzly bears (MFWP/USFWS are primarily responsible for this).

⁵¹ The efforts of MFWP, USFWS, the WC, landowners and all partners over the past six years have helped to reduce reported and verified human-grizzly bear conflicts that can lead to “management removals” or grizzly mortality.

Conservation Objective 9c – Improve human acceptance of grizzly bears and wolves by building a community-supported conservation and management process that reflects the interests and values of residents and landowners throughout the Blackfoot Subbasin.

Conservation Targets Affected: grizzly bears

Strategic Actions:

1. Continue to maintain regular communication with community members and all stakeholders through inclusive decision making process⁵² using the Blackfoot Challenge’s Wildlife Committee and associated work groups and forums, e.g., Landowner Advisory Work Group, Sanitation and Waste Management Work Group, Neighbor Network training, and one-on-one visits with landowners.
2. Continue to engage with landowners and ranchers on participatory projects
 - a. Continue to use on-the-ground projects (e.g., electric fencing) as a positive way to improve tolerance for grizzly bears by reducing livestock depredation risk (also applies to wolves).
 - b. Select specific fencing projects to showcase during field tours to increase awareness of how this technology can deter grizzly bears in a non-lethal manner.
3. Conduct a survey on Blackfoot area rancher tolerance for grizzly bears (baseline data was collected in 2003 through a survey. If needed, a follow up survey could document possible changes or improvements in human tolerance for grizzly bears).
4. Continue community wolf monitoring/surveys
 - a. Document presence/absence of wolves and estimate distribution and relative abundance in subbasin.
 - b. Maintain annual surveys (begun in 2008-2009) into future
5. Use range riders to monitor livestock and wolves and reduce risk of livestock losses
 - a. Use human presence as a deterrent to wolves
 - b. Increase human vigilance of livestock to reduce depredation risk, implement non-lethal deterrent practices, confirm predation events and predator type, remove carcasses when detected and reduce the need for compensation to ranchers
6. Explore applied research opportunities
 - a. Improve husbandry practices to make cattle herds more robust to wolves
 - b. Test effectiveness of non-lethal deterrent strategies
 - c. Examine indirect economic costs of wolf presence on ranches and improve compensation policies

⁵² A major focus of WC work with USFWS, MFWP, landowners, and partners has been on changing specific land use practices and human behaviors that lead to conflicts with bears. Rather than trying to change the way people think about bears, the focus has instead been on trying to change the way people live, work and recreate around bears. When we as a community learn to live with bears, then attitudes and or perceptions of bears may improve.

Conservation Objective 10 – Increase public awareness and education about conserving and enhancing the natural resources and rural way of life in the Blackfoot Subbasin.

Conservation Targets Affected: All eight conservation targets: native salmonids, herbaceous wetlands, moist site and riparian vegetation, native grassland/sagebrush communities, low elevation ponderosa pine/western larch forest, mid to high elevation coniferous forest, grizzly bears, rural way of life

Strategic Actions:

1. Promote opportunities to engage private and public partners in implementation of the subbasin plan and future resource stewardship. Increase public awareness related to:
 - a. The important role of fire and other processes in the maintenance of forest systems and other vegetation communities.
 - b. The importance of controlling non-native and invasive species and each landowner's responsibility in managing noxious weeds on his/her property.
 - c. The top-ranked threats in the Blackfoot Subbasin Plan (unplanned residential and resort development; climate change; exotic/invasive species; lack of fire; incompatible forestry practices, physical road issues, conversion to agriculture, mining).
2. Promote the Rural Living Institute (RLI) to the all residents of the Blackfoot Subbasin. The RLI is a venue for providing information to new and current landowners through the Challenge by providing online informational resources, workshops and courses for aspects related to living in the Blackfoot Subbasin and being a good land steward.
3. Through the Blackfoot Challenge Education Committee and its partners, prepare and distribute new and progressive materials and engage partners in learning more about resource stewardship. Examples include video, website, field-based tours, targeted education brochures/magazines (for small acreage landowners, realtors, etc.), community meetings, etc.
4. Promote conservation measures and/or sustainable practices that strengthen rural economic sectors of the Blackfoot.
 - a. Promote energy efficiency particularly in the agricultural irrigation sector and assist landowners in implementing energy conservation projects.
 - b. Provide education on practices such as irrigation scheduling or sustainable timber harvesting that can provide economic benefits while conserving natural resources.
 - c. Provide education on links between economic stability and land stewardship.
 - d. Encourage exploration of alternative markets and other opportunities to diversify economic base of rural communities.

5.4 Monitoring, Evaluation, and Research Plan

While the Blackfoot Subbasin Monitoring and Evaluation Plan has not been fully developed as of the completion of Blackfoot Subbasin Plan, substantial components have been implemented and are ongoing. These include:

The Blackfoot River Valley Conservation Area Draft Plan (TNC and BC 2007)

Part of the Blackfoot Subbasin Monitoring and Evaluation Plan will be based on the draft monitoring plan contained in the Blackfoot River Valley Conservation Area Plan (Appendix H). The results of the Blackfoot Subbasin viability assessments that describe the current and desired viability ratings for a variety of indicators for each conservation target (see Section 3.3) will complement the Conservation Area Plan efforts by providing valuable baseline and restoration target information. These measures will provide a framework for monitoring and evaluation of progress toward achieving conservation objectives in the subbasin.

A Basin-Wide Restoration Action Plan for the Blackfoot Watershed (BC 2005a)

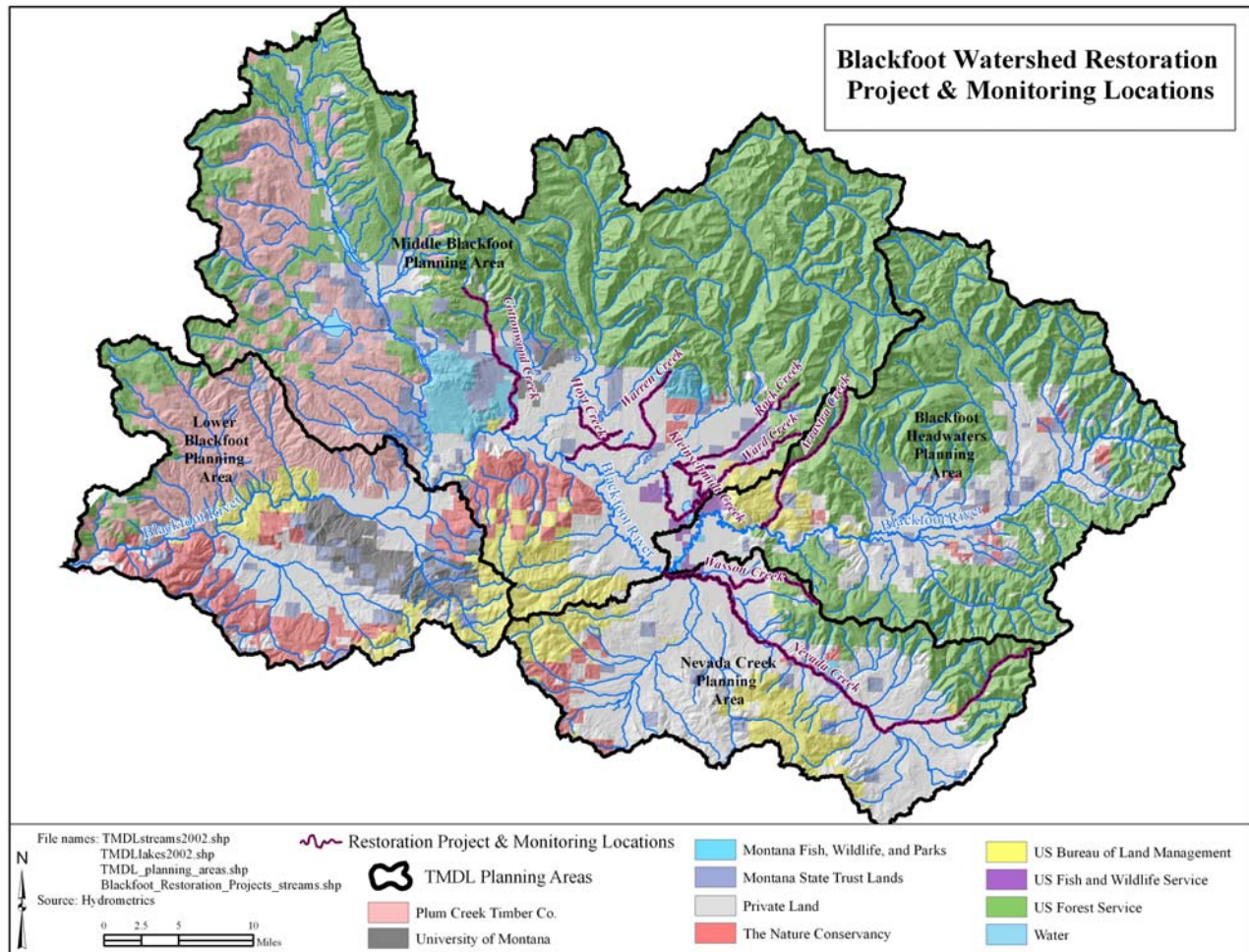
A conceptual plan for restoration effectiveness monitoring in the Blackfoot Watershed, contained in A Basin-Wide Restoration Action Plan for the Blackfoot Watershed, will also be incorporated into the Blackfoot Subbasin Monitoring and Evaluation Plan. The purpose of this document, entitled Restoration Effectiveness Monitoring Protocol for the Blackfoot Watershed, is to provide a common reference for restoration planners to determine appropriate monitoring parameters/activities and protocol to utilize on a given restoration project. To view this document, please visit the Blackfoot Challenge website (www.blackfootchallenge.org). Specific objectives of this document include:

- Promoting inclusion of appropriate pre- and post-restoration monitoring in all stream and riparian area restoration projects within the watershed;
- Establishing monitoring protocol and procedures to be employed for restoration monitoring to ensure consistency in data collection efforts between projects and between various organizations/agencies involved with stream and riparian area restoration; and
- Providing a tool for use in the planning and design phase of restoration projects throughout the watershed.

Current Long-Term Water Quality Monitoring Efforts in the Blackfoot Subbasin

In addition to the monitoring efforts described above, the Blackfoot Subbasin hosts an ongoing, long-term water quality monitoring program (see Blackfoot Watershed Restoration Project and Monitoring Locations map below). There are three major water quality monitoring programs in the Blackfoot: water quality assessment, restoration effectiveness, and status and trends. The monitoring programs are complimentary but are implemented for different reasons. Water quality assessment monitoring gives a basic understanding of streams and what water quality concerns are present. For example, assessment monitoring might identify stream bank erosion as a major source of sediment or illustrate that the highest nutrient concentrations in a certain stream are found in the valley bottom. Assessment monitoring also opens the door to restoration as the data are reviewed to identify potential solutions to these concerns.

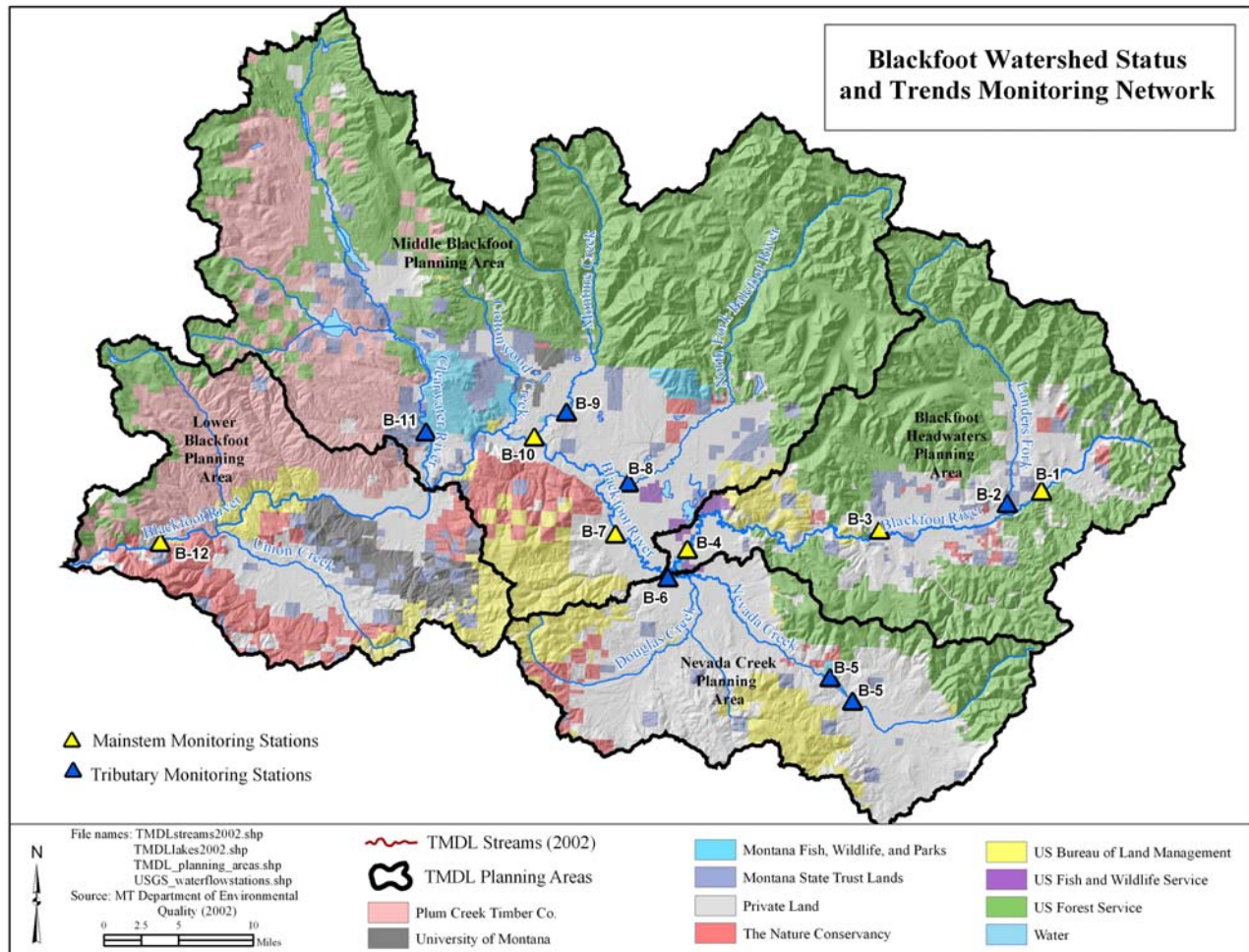
Figure 3.29 Blackfoot Watershed Restoration Project & Monitoring Locations



If a restoration project occurs, it is important to understand how that project changed water quality conditions, if project goals were met, whether restoration practices need to be adjusted, and what else could be done. Restoration effectiveness monitoring does that as well as giving insight into expectations of future restoration efforts. When multiple restoration efforts have occurred on a stream or in a specific area, status and trends monitoring helps to understand the cumulative effects of restoration work on water quality in the Blackfoot River and its tributaries (see Blackfoot Watershed Status and Trends Monitoring Network Map below).

Completion of the Blackfoot Subbasin Monitoring and Evaluation Plan will: 1) provide a framework for measuring conservation target viability over time, 2) ensure that strategic actions are abating the critical threats to conservation targets, and 3) verify that the stresses and threats identified in the Subbasin Assessment are, in fact, the factors that are limiting the viability of each conservation target. Through this process, existing strategies will be modified and new strategies will be developed. The process will also generate a cooperative research agenda to address management uncertainties and fill information gaps related to subbasin objectives and strategies.

Figure 3.30 Blackfoot Watershed Status and Trends Monitoring Network.



5.5 Endangered Species Act and Clean Water Act Requirements

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).

ESA: The relationship of the Blackfoot Subbasin to ESA Planning Units and the status of threatened and endangered species in the subbasin are discussed in the Section 3.2.6.2 of the Subbasin Assessment. Nine of the Blackfoot Subbasin conservation objectives directly or indirectly address threatened and endangered species (grizzly bear, Canada lynx, bull trout) in the subbasin. Many of the strategic actions listed under these objectives directly support goals and objectives in relevant ESA recovery plans. Each of the conservation objectives will also support conservation of one or more Montana Species of Concern, which are listed Tables 3.5 and 3.6.

CWA: Water quality conditions in the Blackfoot Subbasin are discussed in the Section 3.2.5 of the Subbasin Assessment. Many of the Blackfoot Subbasin conservation objectives incorporate strategic actions that will help to satisfy CWA objectives in the subbasin. The salmonid

objectives and many of the vegetation-related objectives, in particular, address the CWA by including strategic actions that address forestry practices, road issues, livestock management, riparian vegetation, channel alteration, drainage systems and other factors that impact water quality in the subbasin.

Table 5.2 illustrates how the Blackfoot Subbasin conservation objectives are reflective of and integrated with recovery goals of ESA recovery plans and where they are supportive of and consistent with the CWA.

Table 5.2 Relationship of Blackfoot Subbasin Conservation Objectives to the ESA and CWA.

Conservation Objective	Addresses ESA	Addresses CWA
Conservation Objective 1 – Maintain the large, intact working landscapes that sustain the natural resources and rural way of life in the Blackfoot Subbasin through support to local communities, counties and land conservation partners.	√	√
Conservation Objective 2a – Maintain and/or restore viable populations of bull trout within the three major population groups in the Blackfoot Subbasin.	√	√
Conservation Objective 2b – Maintain and/or restore viable populations of migratory (fluvial and adfluvial) westslope cutthroat trout within each of the three major population groups within the Blackfoot Subbasin.		√
Conservation Objective 2c – Maintain and/or restore viable populations of resident westslope cutthroat trout within each of the three major population groups within the Blackfoot Subbasin.		√
Conservation Objective 3 – Control existing noxious and invasive plant species abundance and distribution, and prevent establishment of all new noxious and invasive species in the Blackfoot Subbasin. Emphasis should be placed on protecting the highest quality habitats, which should be identified and prioritized by 2012.		√
Conservation Objective 4 – Maintain or restore the viability of priority herbaceous wetlands based on historic conditions across the Blackfoot Subbasin.		√
Conservation Objective 5 - Maintain or restore the viability of priority moist site and riparian vegetation based on historic conditions across the Blackfoot Subbasin.		√
Conservation Objective 6 – Maintain or restore the viability of priority native grassland and sagebrush communities based on historic conditions across the Blackfoot Subbasin.	√	√
Conservation Objective 7 – Maintain or restore the viability of low severity fire regime ponderosa pine/western larch forest communities based on historic stand conditions across the Blackfoot Subbasin.	√	√
Conservation Objective 8 - Maintain or restore the viability of mid to high elevation coniferous forest communities based on historic stand conditions across the Blackfoot Subbasin.	√	√

Table 5.2 (continued).

Conservation Objective	Addresses ESA	Addresses CWA
Conservation Objective 9a - Maintain functional connectivity for grizzly bears across biologically suitable habitats in the Blackfoot Subbasin.	√	
Conservation Objective 9b – Reduce human-caused grizzly bear mortality in the Blackfoot Subbasin.	√	
Conservation Objective 9c –Improve human acceptance of grizzly bears and wolves by building a community-supported conservation and management process that reflects the interests and values of residents and landowners throughout the Blackfoot Subbasin.	√	
Conservation Objective 10 – Increase public awareness of the Blackfoot Watershed and the subbasin/conservation planning process, emphasizing the need to conserve the rural life, values and natural resources of the Blackfoot Subbasin.	√	√

6.0 References

- Agee, J. K. 1993. Fire ecology of Pacific Northwest forests. Island Press, Covelo, California, USA.
- Allendorf, F.W. and C. Servheen. 1986. Genetics and the conservation of grizzly bears. *Trends in Ecology and Evolution* 1: 88-89.
- Alt, D. and D.W. Hyndman. 1986. *Roadside Geology of Montana*. Mountain Press Publishing Company, Missoula, MT.
- Altman, B. 1997. Olive-sided Flycatcher in western North America: Status review. U.S. Fish and Wildlife Service, Portland, Oregon. 59 p.
- Baker, W. L., T. T. Veblen, and R. L. Sherriff. 2007. Fire, fuels and restoration of ponderosa pine-Douglas fir forests in the Rocky Mountains, USA. *Journal of Biogeography* 34: 251–269.
- Baty, R. 1995. Resource Partitioning and Browse Use by Sympatric Elk, Mule Deer, and White-tailed Deer on a Winter Range in Western Montana. M.S. Thesis, University of Montana, Missoula.
- Baxter, C.V., K. D. Fausch, M. Murakami, and P. L. Chapman. 2004. Fish invasion restructures stream and forest food webs by interrupting reciprocal prey subsidies. *Ecology* 85(10): 2656-2663.
- Baxter, C.V., K. D. Fausch, M. Murakami, and P. L. Chapman. 2007. Invading rainbow trout usurp a terrestrial prey subsidy from native charr and reduce their growth and abundance. *Oecologia* 153: 461-470.
- Baxter, C.V., K.D. Fausch, and W.C. Saunders. 2005. Tangled webs: reciprocal flows of invertebrate prey link streams and riparian zones. *Freshwater Biology* 50: 201-220.
- Blackfoot Challenge (BC). 2005a. A Basin-Wide Restoration Action Plan for the Blackfoot Watershed. Prepared for: Montana Department of Natural Resources and Conservation Renewable Resource Grant & Loan Program and The Blackfoot Watershed Restoration and Monitoring Partners. Prepared by: The Blackfoot Challenge in partnership with the Big Blackfoot Chapter of Trout Unlimited, Montana Fish, Wildlife and Parks, Hydrometrics Inc., and other partners.
- BC. 2005b. The Blackfoot Watershed: State of the Basin Report. Understanding Our Natural Resources and Rural Lifestyle. Blackfoot Challenge, Ovando, MT.
- BC. 2005c. Water Quality Status and Trends in the Big Blackfoot Watershed: 2004 Summary Report and Technical Appendices (draft December 2005). Blackfoot Challenge, Ovando, MT.

- Blackfoot Community Conservation Area (BCCA) Council and BC. 2008. Blackfoot Community Conservation Area: Management Plan for the Core. Blackfoot Community Conservation Area Council and Blackfoot Challenge, Ovando, MT.
- Behnke, R. 1992. Native trout of western North America. American Fisheries Society monograph 6. American Fisheries Society. Bethesda, MD.
- Behnke, R. 2002. Trout and salmon of North America. Chanticleer Press, New York.
- Belsky, J. 2009. Presentation at Seeley-Swan-Blackfoot Summit , April 15-16, 2009.
- Best, L. B., H. Campa, III, K. E. Kemp, R. J. Robel, M. R. Ryan, J. A. Savidge, H. P. Weeks, Jr., and S. R. Winterstein, 1997. Bird abundance and nesting in CRP fields and cropland in the Midwest: a regional approach. *Wildlife Society Bulletin* 25: 864-877.
- Bicak, T.K., R.L. Reymond, and D.A. Jenni. 1982. Effects of grazing on Long-billed Curlew (*Numenius americanus*) breeding behavior and ecology in southwestern Idaho. In J.M. Peck and R. D. Dalke (eds), *Wildlife Livestock Management: Proceedings 10*. University of Idaho, Forest Wildlife and Range Experiment Station, Moscow, ID pp.74-85.
- Bisson, P.A., B.E. Rieman, C. Luce, P.F. Hessburg, D.C. Lee, J.L. Kershner, G.H. Reeves, and R.E. Gresswell 2003 . Fire and aquatic ecosystems of the western USA: Current knowledge and key questions. *Forest Ecology and Management* 178 (1-2): 213-229.
- Bock, C.E. 1970. The ecology and behavior of the Lewis's Woodpecker (*Asyndesmus lewis*). *University of California Zoological Publications* 92: 1100.
- Bradley, B.A., M. Oppenheimer, and D.S. Wilcove. 2009. Climate Change and Plant Invasion: Restoration Opportunities Ahead? *Global Change Biology* 15: 1511-1521.
- Brown, D.E. 1985. The grizzly bear in the Southwest. University of Oklahoma Press, Norman , Oklahoma, USA.
- Brown, P. M., M. R. Kaufmann, and W. D. Shepperd. 1999. Long-term, landscape patterns of past fire events in a montane ponderosa pine forest of central Colorado. *Landscape Ecology* 14: 513–532.
- Burcham, M.G., C.L. Marcum, D. McCleery, M. Thompson. 2000. Final Report: Study of Sympatric Moose and Elk in the Garnet Range of Western Montana.
- Burcham, M.G., C.L. Marcum, L.J. Lyon, K.T. Weber, and W.D. Edge. 1998. Final Report: Chamberlain Creek Elk Studies 1977-1983 and 1993-1996. School of Forestry, University of Montana. 260 pp.
- Campbell, E.M., and J.A. Antos. 2000. Distribution and severity of white pine blister rust and mountain pine beetle on whitebark pine in British Columbia. *Can. J. For. Res.* 30: 1051-1059.

- Campbell, F. 2004. White pine blister rust. From: Gallery of Pests: Pests and Pathogens that are Widespread. The Nature Conservancy's Global Invasive Species Team. Website available at: www.invasive.org/gist/products/gallery/crori1.html.
- Caprio, J.M. and P. Farnes (unknown date). Montana Interagency Plant Materials Handbook, Chapter One – Climate of Montana. Montana State University Animal and Range Science Extension Services. Website available at: www.animalrangeextension.montana.edu/Articles/Forage/MIPMH-chptr-1.htm.
- CFTF (Clark Fork Task Force). 2004. Clark Fork River Basin Watershed Management Plan. Montana Department of Natural Resources and Conservation: Water Resources Division.
- CFC (Clark Fork Coalition). 2009. Clark Fork Coalition website available at: www.clarkfork.org.
- Clark, T.W., A.H. Harvey, R.D. Dorn, D.L. Genter, and C. Groves, eds. 1989. Rare, sensitive, and threatened species of the Greater Yellowstone Ecosystem. Northern Rockies Conservation Cooperative, Montana Natural Heritage Program, The Nature Conservancy, and Mountain West Environmental Services. 153 p.
- Cox, B., T. Gignoux and R. McCulloch. 1998. Economic Geology in the Western Montana Portion of the Blackfoot River Region: Discussion and Field Trip Guide. Abstract. Northwest Geology, v.28, p 101-109.
- Craighead, F.C. and J.J. Craighead. 1972. Data on grizzly bear denning activities and behavior obtained by using wildlife telemetry. Bears and their Biology: International Conference On Bear Research and Management 2: 84-106.
- CRC (Clearwater Resource Council). 2008. Landscape Assessment for the Clearwater Valley of Montana. CSeeley Lake, MT.
- Cromartie, J.B. and J.N. Wardwell. 1999. Migrants settling far and wide in the rural West. Rural Development Perspectives 14(2): 2-8.
- Crozier, L.G., R.W. Zabel, and A.F. Hamlet. 2008. Predicting differential effects of climate change at the population level with life-cycle models of spring Chinook salmon. Global Change Biology 14: 1-14.
- Curtis, S. 2005. Meeting the challenge head-on: how a nationally recognized, landowner-led conservation group is protecting both the natural resources and rural lifestyle of the Blackfoot Valley. Montana Outdoors March–April.
- Decker, P.R. 2001. “The Death of John Wayne and the Rebirth of a Code of the West.” In Across the Great Divide: Explorations in Collaborative Conservation and the American West, edited by Philip Brick, D. Snow, and S. Van De Wetering. Washington , D.C. : Island Press, 2001.

- Dixon, R. D., and V. A. Saab. 2000. Black-backed Woodpecker (*Picoides arcticus*). Pages 1–20 in A. Poole and F. Gill, editors. *Birds of North America*. Birds of North America, Inc., Philadelphia, Pennsylvania, USA.
- Dood, A. R., S.J. Atkinson, and V.J. Boccadori. 2006. Grizzly Bear Management Plan for Western Montana: Final Programmatic Environmental Impact Statement 2006-2016. Montana Fish, Wildlife and Parks, Helena, 163 pp.
- Ducey, J. and L. Miller. 1980. Birds of an agricultural community. *Nebraska Bird Review* 48: 5868.
- Dunham, J. B., and B.E. Rieman. 1999. Metapopulation structure of bull trout: influences of physical, biotic, and geometrical landscape characteristics. *Ecological Applications* 9(2): 642-655.
- Dunham, J.B., S.B. Adams, R.E. Schroeter, and D.C. Novinger. 2002. Alien invasions in aquatic ecosystems: toward an understanding of brook trout invasions and potential impacts on inland cutthroat trout in western North America. *Reviews in Fish Biology and Fisheries* 12: 373-391.
- Dunham, J.B., B.E. Rieman, and J.T. Peterson. 2002. Patch-based models to predict species occurrence: lessons from salmonid fishes in streams. Pages 327-334 in J.M. Scott, P.J. Heglund, M. Morrison, M. Raphael, J. Haufler, and B. Wall, editors. *Predicting Species Occurrences: Issues of Scale and Accuracy*. Island Press. Covelo, CA
- Edelman, M.A. and S.C. Burke. 2004. Iowa Communities of Distinction: A Summary Analysis of Lessons Learned, Best Practices, and Community Vitality Indicators from In-Depth Studies of Selected Iowa Communities. Report prepared for Community Vitality Center, Ames, Iowa.
- Ehrhart, R.C. and P.L. Hansen. 1998. Successful Strategies for Grazing Cattle in Riparian Zones. Montana BLM Riparian Technical Manual No. 4. USDI Bureau of Land Management.
- Fausch, K.D., Y. Taniguchi, S. Nakano, G.D. Grossman, and C.R. Townsend. 2001. Flood disturbance regimes influence rainbow trout invasion success. *Ecological Applications* 11(5): 1438-1455.
- Fausch, K. D., B. E. Rieman, M. K. Young, and J. B. Dunham. 2006. Strategies for conserving native salmonid populations at risk from nonnative fish invasions: tradeoffs in using barriers to upstream movement. USDA Forest Service, General Technical Report RMRS-GTR-174. Rocky Mountain Research Station, Fort Collins, Colorado.
- Fischer, W.C. and A.F. Bradley. 1987. Fire Ecology of Western Montana Forest Habitat Types. USDA Forest Service, Intermountain Research Station. General Technical Report INT-223.
- Fitzgerald G. 1997. Analysis and inventory of riparian vegetation along Nevada and Monture Creeks using ADAR imagery. M.S. Thesis, University of Montana, Missoula.

- Fraley, J. J. and B. B. Shepard. 1989. Life History, Ecology, and Population Status of Migratory Bull Trout (*Salvelinus confluentus*) in the Flathead Lake River System, Montana. *Northwest Science* 63(4): 133-143.
- Gardner, C.L, W. Ballard, and R.H. Jessup. 1986. Long distance movement by an adult wolverine. *J. Mammal* 67: 603.
- Gentry D.J., and K.T. Vierling. 2007. Old burns as source habitats for Lewis's woodpeckers breeding in the Black Hills of South Dakota. *Condor* 109: 122-131.
- Goggans, R., R.D. Dixon, C. Seminara. 1988. Habitat use by three-toed and Black-backed Woodpeckers, Deschutes National Forest, Oregon. Nongame Rep. 87302. Oregon Department of Fish and Wildlife; Deschutes National Forest.
- Griffin, P.C. 2004. Landscape ecology of snowshoe hares in Montana. PhD Dissertation, University of Montana. Missoula, Montana.
- Griffin, P.C., and L.S. Mills. 2007. Precommercial thinning reduces snowshoe hare abundance in the short term. *Journal of Wildlife Management* 71: 559-564.
- Hammond, C. 2009. Conservation Plan for Common Loons in Montana. Common Loon Working Group of Montana.
- Hanna, D., L. Bay, and E. Bergman. 2009. Proposed Climate Change Case Statement for The Nature Conservancy in Montana.
- Harris, N.C. 2007. Monitoring Survival of Young in Ungulates: A Case Study with Rocky Mountain Elk. M.S. Thesis, University of Montana
- Hayward, G.D. and R.E. Escano. 1989. Goshawk nest site characteristics in western Montana and northern Idaho. *Condor* 91: 476-479.
- Hayward, G.D., T. Holland and R.E. Escano. 1990. Goshawk habitat relationships. In: N.M. Warren (ed.). Old growth habitats and associated wildlife species in the northern Rocky Mountains. Report R19042. USDA Forest Service, Wildlife Habitat Relationships Program, Northern Region, Missoula, Montana. 47 p.
- Helzer, C.J. 1996. The effects of wet meadow fragmentation on grassland birds. M.S. Thesis. University of Nebraska, Lincoln. 65p.
- Herkert, J.R. 1994. The effects of habitat fragmentation on midwestern grassland bird communities. *Ecological Applications* 4: 461-471.
- Hessburg, P. F., K. M. Reynolds, R. E. Keane, K. M. James, and R. Salter. 2007. Re-examining fire severity relations in pre-management era mixed conifer forests: inferences from landscape patterns of forest structure. *Landscape Ecology* 22: 5-24.

- Hilborn, R., T.P. Quinn, D.E. Schindler, and D.E. Rogers. 2003. Biocomplexity and fisheries sustainability. *Proceedings of the National Academy of Science* 100(11): 6564-6568.
- Hoff, R. and S. Hagle. 1989. Diseases of whitebark pine with special emphasis on white pine blister rust. In: Schmidt, W.C. and K. J. McDonald, Compilers. *Proceedings - Symposium on Whitebark Pine Ecosystems: Ecology and Management of a High-Mountain Resource*. Bozeman, MT. March 29-31, 1989. pp. 179-190.
- Holt, D.W. and J.M. Hillis. 1987. Current status and habitat associations of forest owls in western Montana. Pages 281-288 in R.W. Nero, R.J. Clark, R.J. Knapton, and R.H. Hamre (eds.), *Biology and conservation of northern forest owls: symposium proceedings*, Feb. 37, Winnipeg, Manitoba. General Technical Report RM142. USDA, Forest Service; Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 309 p.
- Holt, D.W., J.A. Hoy, and P.L. Wright. 1987. Occurrence and first nest record of Flammulated Owls in Montana. *J. Raptor Res.* 21 (3): 121-124.
- Hornocker, M.G., and H.S. Hash. 1981. Ecology of the wolverine in northwestern Montana. *Can. J. Zool.* 59: 1286-1301.
- Hunt, R.S. 2002. Relationship between early family-selection traits and natural blister rust cankering in western white pine families. *Can. J. Plant Path.* 24: 200-204.
- Hurley, M.A. 1994. Summer-Fall Ecology of the Blackfoot-Clearwater Elk Herd of Western Montana. M.S. Thesis, University of Montana, Missoula.
- Hutto, R.L. 1995a. USFS Northern Region songbird monitoring program: Distribution and habitat relationships. USFS Contract #R19505, Second report. 120 p.
- Hutto, R.L. 1995b. Composition of bird communities following stand-replacement fires in Northern Rocky Mountain (U.S.A.) conifer forests. *Conserv. Biol.* 9(5): 1041-1058.
- Hutto, R.L. 2008. The ecological importance of severe wildfires: some like it hot. *Ecological Applications* 18(8): 1827-1834.
- Hutto, R.L., and J.S. Young. 1999. Habitat relationships of landbirds in the Northern Region, USDA Forest Service. General Technical Report RMRS GTR32. USDA Forest Service, Rocky Mountain Research Station, Ogden, UT.
- Hutto, R. L., and J. S. Young. 2002. Regional landbird monitoring: perspectives from the northern Rocky Mountains. *Wildlife Society Bulletin* 30: 738-750.
- IGBC (Interagency Grizzly Bear Committee). 1986. *Interagency Grizzly Bear Guidelines*.
- IGBC. 1994. *Interagency Grizzly Bear Committee Taskforce Report*.
- IGBC. 1998. *Interagency Grizzly Bear Committee Taskforce Report*.

- Ingman, G.L., M.A. Kerr, and D.L. McGuire. 1990. Water quality investigations in the Blackfoot River drainage, Montana. A report to the Big Blackfoot River and Oakbrook, Illinois, chapters of Trout Unlimited. Montana Department of Health and Environmental Sciences, Water Quality Bureau, Helena.
- Isaak, D.J., C.H. Luce, B.E. Rieman, D.E. Nagel, E.E. Peterson, D.L. Horan, S. Parkes, and G.L. Chancler (submitted). Effects of climate change and wildfire on stream temperature and thermal habitat for two salmonids in a mountain river network. Submitted to Ecological Monographs.
- ISAB (Independent Scientific Advisory Board). 2007. Climate Change Impacts on Columbia Basin River Fish and Wildlife.
- Jackson-Smith, J., U. Kreuter and R.S. Krannich. 2005. Understanding the multidimensionality of property rights orientations: Evidence from Utah and Texas rancher. *Society and Natural Resources* 18:587-610.
- Jaramillo, A., and P. Burke. 1999. New World Blackbirds. The Icterids. Princeton, NJ: Princeton University Press; 413 p.
- Johnson, S.J., and D.E. Griffel. 1982. Sheep losses on grizzly bear range. *Journal of Wildlife Management*. 46: 786-790.
- Jonkel, J.J. 2006. Preliminary overview of grizzly bear management and mortality 1998-2005. Living with Predators Project Working Paper 0004. Montana Fish, Wildlife and Parks Region 2 Preliminary Report.
- Jorgensen, C.J. 1983. Bear-sheep interactions, Targhee National Forest. International Conference on Bear Research and Management. 5: 191-200.
- Karr, J.R., and I.J. Schlosser. 1978. Water resources and the land-water interface. *Science* 201: 229-234.
- Kendall, K.C. and S.F. Arno. 1989. Whitebark pine - an important but endangered wildlife species. In Schmidt, W. C. and K. J. McDonald (compilers). Proceedings - Symposium on Whitebark Pine Ecosystem: Ecology and Management of a High-Mountain Resource. Bozeman, MT. March 29-31, 1989. pp. 264-273.
- Kendall, K.C., J.B. Stetz, J. Boulanger, A.C. Macleod, D. Paetkau, and G.C. White. 2009. Demography and Genetic Structure of a Recovering Grizzly Bear Population. *Journal of Wildlife Management* 73(1): 3-17.
- Kenyon, P. 2005. Building Rural Communities Through Innovation. Presentation available at: <http://www.torc.on.ca/documents/BuildingRuralCommunitiesThroughInnovation-PKenyon.pdf>

- Kinsella, S. 2008. Trout In Trouble: The Impacts of Global Warming on Trout in the Interior West, citing S. Saunders, et al., Hotter and Drier: The West's Changed Climate, The Rocky Mountain Climate Organization/Natural Resources Defense Council.
- Kitano, S., K. Hasegawa, and K. Maekawa. 2009. Evidence for interspecific hybridization between native white-spotted charr *Salvelinus leucomaenis* and non-native brown trout on Hokkaido Island Japan. *Journal of Fish Biology* 74: 467-473.
- Knight, R.R., and S.J. Judd. 1983. Grizzly bears that kill livestock. *International Conference on Bear Research and Management*. 5: 186-190.
- Kolbe, J.A., and J.R. Squires. 2007. Circadian activity patterns of Canada lynx in western Montana. *Journal of Wildlife Management* 71: 1607-1611.
- Kolbe, J.A., J.R. Squires, D.H. Pletscher, and L.F. Ruggiero. 2007. The effect of snowmobile trails on coyote movements within lynx home ranges. *Journal of Wildlife Management* 71: 1409-1418.
- Leary, R.F., F.W. Allendorf, and K.L. Knudsen. 1983. Consistently high meristic counts in natural hybrids between brook trout and bull trout. *Systematic Zoology*. 32: 369-376.
- Lenard, S., J. Carlson, J. Ellis, C. Jones, and C. Tilly. 2003. P. D. Skaar's Montana Bird Distribution, 6th Edition. Montana Audubon, Helena, Montana. 144 pp.
- Lesica, P. 1994. The distribution of plant community diversity associated with glacial wetlands in the Ovando Valley, Montana. Unpublished report on file with The Nature Conservancy, 32 S. Ewing, Helena, Montana. 26 pp.
- Lewis R.S. 1998. Geologic Map of the Butte 1o X 2o Quadrangle, Southwestern Montana.
- Liknes, G.A. 1984. The present status and distribution of the westslope cutthroat trout (*Salmo clarki lewisi*) east and west of the Continental Divide in Montana. Final Report to the Montana Fish, Wildlife and Parks, Helena.
- Liknes, G.A. and P.J. Graham. 1988. Westslope cutthroat trout in Montana: life history, status, and management. *American Fisheries Society Symposium* 4: 53-60.
- Lindenmayer, D., R.J. Hobbs, and R. Montague-Drake. 2008. A checklist for ecological management of landscapes for conservation. *Ecology Letters* 11: 78-91.
- Linder, K.A. 1994. Habitat utilization and behavior of nesting Lewis's Woodpeckers (*Melanerpes lewis*) in the Laramie range, southeast Wyoming. M.S. Thesis, University of Wyoming, Laramie.
- Lolo National Forest. 2000. Proposed Designated Backcountry Snowmobile Areas Biological Assessment (draft). Seeley Lake Ranger District, May 26.

- Lolo National Forest. 2003. Biological Assessment for Grizzly Bears: Clearwater Roads Project (draft). Seeley Lake Ranger District, August 26.
- Low, Greg. 2003. Landscape-Scale Conservation: A Practitioner's Guide (Fourth Edition). Efrogmson Fellowship Program, The Nature Conservancy, Arlington, VA.
- Mace, R.D. and T.L. Manley. 1992. South Fork Flathead River Grizzly Bear Project: Progress Report for 1992. Montana Fish, Wildlife and Parks.
- Mace, R.D. and J.S. Waller. 1998. Demography and population trend of grizzly bears in the Swan Mountains, Montana. *Conservation Biology*. 12(5): 1005-1016.
- Mace, R.D., J.S. Waller, T.L. Manley, L.J. Lyon, and H. Zuuring. 1996. Relationships among grizzly bears, roads, and habitat in the Swan Mountains, Montana. *J. Apl. Ecol.* 33:1395-1404.
- Mantas, M. 2003. Evaluating Risk to Native Plant Communities from Selected Exotic Species. The Nature Conservancy of Montana, and U.S. Forest Service Cohesive Strategy Team, Kalispell, Montana.
- Marler, M. 1997. Riparian health and inventory of the Blackfoot River between Nevada Creek and the North Fork Confluence: A GIS mapping project. Report to Montana Fish, Wildlife and Parks, Missoula, MT.
- Marlow, C.B. and T.M. Pogacnik. 1985. Time of grazing and cattle-induced damage to streambanks. In: *Riparian ecosystems, and their management: reconciling conflicting uses*. R. Roy Johnson, Charles D. Ziebell, David R. Patton, Peter F. Folliott, and R. H. Hamre (technical coordinators). First North American riparian conference, April 16-18, Tucson, AZ. USDA Forest Service General Technical Report RM-120. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.
- Mattson, D.J. 1990. Human impacts on bear habitat use. *International Conference on Bear Research and Management*. 8: 33-56.
- Mattson, D.J., S. Herrero, R.G. Wright, and C.M. Pease. 1996. Designing and managing protected areas for grizzly bears: How much is enough? In: R.G. Wright (ed). *National parks and protected areas: Their role in environmental protection*. Cambridge, MA : Blackwell Science.
- MBEWG (Montana Bald Eagle Working Group). 1991. Habitat management guide for Bald Eagles in northwestern Montana. Montana Bald Eagle Working Group: 29 p.
- MBTRT (Montana Bull Trout Restoration Team). 2000. Restoration plan for bull trout in the Clark Fork River Basin and Kootenai River Basin Montana. A report to Governor Marc Racicot from the Montana Bull Trout Restoration Team, c/o Montana Fish, Wildlife and Parks, Helena, Montana.

- MBTSG (Montana Bull Trout Scientific Group). 1995. Blackfoot River drainage bull trout status report. Prepared by the Montana Bull Trout Scientific Group for the Montana Bull Trout Restoration Team, Montana Fish, Wildlife and Parks, Helena.
- McCallum, D.A. 1994. Flammulated Owl (*Otus flammeolus*). In: A. Poole and F. Gill (eds). *The Birds of North America*, No. 93. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.
- McCarthy, J. 2001. A landowners' guide to Montana wetlands: revised 2001 edition. Montana Watercourse, Bozeman, MT.
- McClelland, B.R., and P. T. McClelland. 1999. Pileated woodpecker nest and roost trees in Montana : links with old growth and forest "health." *Wildlife Society Bulletin* 27:846-857.
- McIntyre, J.D., and B.E. Reiman. 1995. Westslope WSCT. Pages 1-15 in M.K. Young, editor. Conservation assessment for inland WSCT. U.S. Forest Service General Technical Report. RM-256.
- McLellan, B.N, F.W. Hovey, R.D. Mace, J.G. Woods, D.W. Carney, M.L. Gibeau, W.L. Wakkinen, and W.F. Kasworm. 1999. Rates and causes of grizzly bear mortality in the interior mountains of BC, AB, MT, WA, and ID. *Journal of Wildlife Management*. 63(3): 911-920.
- MDEQ (MT Department of Environmental Quality). 2003. Water Quality Restoration Plan for Metals in the Blackfoot Headwaters TMDL Planning Area. Montana Department of Environmental Quality, Helena, MT. Available online at: <http://www.deq.state.mt.us/wqinfo/TMDL/finalReports.asp>.
- MDEQ. 2004. Blackfoot Headwaters Planning Area Water Quality and Habitat Restoration Plan and TMDL for Sediment. Montana Department of Environmental Quality, Helena, MT. Available online at: <http://www.deq.state.mt.us/wqinfo/TMDL/finalReports.asp>.
- MDEQ. 2008a. Middle Blackfoot-Nevada Creek Total Maximum Daily Loads and Water Quality Improvement Plan: Sediment, Nutrient, Trace Metal and Temperature TMDLs. Montana Department of Environmental Quality, Helena, MT. Available online at: <http://www.deq.state.mt.us/wqinfo/TMDL/finalReports.asp>.
- MDEQ. 2008b. Lower Blackfoot Total Maximum Daily Loads and Water Quality Improvement Plan: Sediment, Nutrient, Trace Metal and Temperature TMDLs. Public Review Draft, December 2008. Montana Department of Environmental Quality, Helena, MT.
- MDHES (Montana Department of Health and Environmental Sciences). 1994. Montana water quality 1994. The Montana 305(b) Report. Montana Department of Health and Environmental Sciences, Water Quality Division. Helena, MT.
- Meehan, W. R. (editor). 1991. Influence of forest and rangeland management on salmonid fishes and their habitats. *American Fisheries Society Special Publication* 19.

- MFIS (Montana Fisheries Information System). 2009. Montana Fish, Wildlife and Parks. Helena. Website available at: fwp.mt.gov/fishing/mfish/.
- MFWP (MT Fish, Wildlife and Parks). 1993. Five year update of the programmatic environmental impact statement: The grizzly bear in northwestern Montana 1986-1990. Montana Fish, Wildlife and Parks, Helena.
- MFWP. 1994. Management of Black Bears in Montana. Montana Fish, Wildlife and Parks, Helena.
- MFWP. 1996. Management of Mountain Lions in Montana – Final Environmental Impact Statement. Montana Fish, Wildlife and Parks, Helena.
- MFWP. 2004a. Montana Gray Wolf Conservation and Management Plan. Montana Fish, Wildlife and Parks, Helena.
- MFWP. 2004b. Montana Statewide Elk Management Plan. Montana Fish, Wildlife and Parks, Helena.
- MFWP. 2005. Montana's Comprehensive Fish and Wildlife Conservation Strategy. Montana Fish, Wildlife and Parks, Helena.
- MFWP. 2006. Grizzly Bear Management Plan for Western Montana: Final Programmatic Environmental Impact Statement 2006-2016. Montana Fish, Wildlife and Parks, Helena.
- MFWP. 2008. Blackfoot River Recreation Management Annual Report. Montana Fish, Wildlife and Parks, Missoula.
- MFWP. 2009. Blackfoot River Recreation Management Plan (preliminary draft). Montana Fish, Wildlife and Parks, Missoula.
- Missoula County. 2008. Missoula County Subdivision Regulations, as amended Nov 1, 2008 by Resolution 2008-125.
- Mitchell, C.D. 1994. Trumpeter Swan (*Cygnus buccinator*). In: Poole, A. and F. Gill (eds). The Birds of North America No. 105. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.
- MTNHP (Montana Natural Heritage Program). 2009a. Natural Resource Information System search results for the Blackfoot Subbasin. Montana Natural Heritage Program, Helena, MT.
- MTNHP. 2009b. Montana Field Guide, available at: www.nhp.nris.mt.gov. Montana Natural Heritage Program, Helena, MT.
- Montana ANS Technical Committee. 2002. Montana aquatic nuisance species (ANS) management plan (final). Produced by the Montana ANS Steering Committee.

- Montana Summit Steering Committee and Weed Management Task Force. 2005. Montana Weed Management Plan. Compiled by C.A. Duncan. Helena, MT.
- Montana Water Center. 2009. Whirling disease initiative. Montana State University, Bozeman. Website available at: whirlingdisease.montana.edu.
- Moore, J.N., S.N. Luoma, and D. Peters. 1991. Downstream effects of mine effluent on an intermontane riparian system. *Canadian Journal of Fisheries and Aquatic Sciences* 48: 222-232.
- Morgan, P., S. Bunting, A. Black, T. Merrill, and S. W. Barrett. 1998. Fire regimes in the Interior Columbia River Basin: Past and Present. Pp. 77-82 In Proc. Fire mgt. under fire (adapting to change); 1994 Interior West Fire Council Meeting, Internatl. Assoc. Wildland Fire, Fairfield, WA.
- Mosconi, S.L., and R.L. Hutto. 1982. The effects of grazing on land birds of a western Montana riparian habitat. In: *Wildlife-Livestock Relationships Symposium*. Forest, Wildlife and Range Experiment Station, Moscow, ID: University of Idaho: 221-233.
- Moskoff, W. 1995. Veery (*Catharus fuscescens*). In: A. Poole and F. Gill (eds). *The Birds of North America*, No. 142. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.
- Mudge M.R., R.L. Earhart, J.W. Whipple, and J.E. Harrison. 1982. *Geologic and Structure Map of the Choteau 1° x 2° Quadrangle, Western Montana*. Reston, VA: Montana Bureau of Mines and Geology, Department of the Interior, U.S. Geological Survey.
- Muhlfeld, Clint C., Steven T. Kalinowski, Thomas E. McMahon, Mark L. Taper, Sally Painter, Robb F. Leary, and Fred W. Allendorf. 2009. Hybridization rapidly reduces reproductive success of a native trout in the wild. *Biology Letters*.
- Murie, A. 1948. Cattle on grizzly bear range. *Journal of Wildlife Management* 12: 57-72.
- Naiman, R.J., and M.G. Turner. 2000. A future perspective on north America's freshwater ecosystems. *Ecological Applications* 10(4): 958-970.
- National Audubon Society. 2007. Audubon Watch List. Available at: <http://web1.audubon.org/science/species/watchlist/>.
- NCDE (Northern Continental Divide Ecosystem) Access Taskforce. 1995. *Interim Motorized Access Management Direction: Northern Continental Divide Recovery Zone*.
- Neuenschwander, L.F., J.W. Byler, A.E. Harvey, G.I. McDonald, D.S. Ortiz, H.L. Osborne, G.C. Snyder, and A. Zack. 1999. *White pine in the American West: a vanishing species - can we save it?* Gen. Tech. Rep. RMRS-GTR-35. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 20 p.

- Newby, F.E., and J.J. McDougal. 1964. Range extension of the wolverine in Montana. *J. Mammal* 45: 485-487.
- Newby, F.E., and P.L. Wright. 1955. Distribution and status of the wolverine in Montana. *J. Mammal* 36: 248-253.
- NPPC (Northwest Power Planning Council). 2000. Columbia River Basin Fish and Wildlife Program. Council document 2000-19. Northwest Power Planning Council, Fish and Wildlife Program. Portland, OR.
- NPPC. 2001. Technical Guide for Subbasin Planners. Council Document 2001-20. Northwest Power Planning Council, Fish and Wildlife Program. Portland, OR.
- NPPCC. 2009. Northwest Power and Conservation Council website. Available at: www.nwccouncil.org.
- Oakleaf, J.K., D.L. Murray, J.R. Oakleaf, E.E. Bangs, C.M. Mack, D.W. Smith, J.A. Fontaine, M.D. Jimenez, T.J. Meier, and C.C. Niemeyer. 2006. Habitat selection by recolonizing wolves in the Northern Rocky Mountains of the United States. *Journal of Wildlife Management* 70(2): 554-563.
- Olson, B.E. 1999. Impacts of Noxious Weeds on Ecologic and Economic Systems. Pages 4-18 *in* R.L. Sheley and J.K. Petroff, Eds. *Biology and Management of Noxious Rangeland Weeds*. Oregon State University Press, Corvallis, OR.
- Pampush, G.L. and R.G. Anthony. 1993. Nest success, habitat utilization and nest site selection of Long-billed Curlews in the Columbia Basin, Oregon. *Condor* 95: 954-967.
- Pease, C.M. and D.J. Mattson. 1999. Demography of the Yellowstone grizzly bears. *Ecology*. 80(3): 957-975.
- Pellant, M., P. Shaver, D.A. Pyke, and J.E. Herrick. 2005. Interpreting indicators of rangeland health, version 4. Technical Reference 1734-6. U.S. Department of the Interior, Bureau of Land Management, National Science and Technology Center, Denver, CO. 122 pp.
- Peters, D. J. 1990. Inventory of fishery resources in the Blackfoot River and major tributaries of the Blackfoot River. *Montana Fish Wildlife and Parks*, Missoula.
- Peters, D. and R. Pierce. 1995. Aquatic Restoration in the Blackfoot River and Rock Creek Drainages. *Montana Fish, Wildlife and Parks*, Missoula.
- Peters, D. J. and R. Spoon. 1989. Preliminary inventory of the Big Blackfoot River. *Montana Fish, Wildlife and Parks*, Missoula.
- Peterson, K.L., and L.B. Best. 1985. Brewer's Sparrow nest site characteristics in a sagebrush community. *Journal of Field Ornithology* 56: 2327.

- Petersen-Perlman, J. and D. Shively. 2009. Assessment of Municipal Water Rights in the Upper Clark Fork River Basin, University of Montana, Missoula.
- Pierce, R. 1991. A stream habitat and fisheries analysis for six tributaries to the Blackfoot River. Montana Fish, Wildlife and Parks, Missoula.
- Pierce, R., and D. Peters. 1990. Aquatic studies in the middle Blackfoot River, Nevada Creek, and Nevada Spring Creek corridors. Montana Fish, Wildlife and Parks, Missoula.
- Pierce R. and D. J. Peters. 1991. Aquatic investigation in the middle Blackfoot River, Nevada Creek and Nevada Spring Creek corridor. Montana Fish, Wildlife and Parks, Bozeman.
- Pierce, R. and C. Podner. 2000. Blackfoot River fisheries inventory, monitoring and restoration report. Montana Fish, Wildlife and Parks, Missoula.
- Pierce, R. and C. Podner. 2006. The Big Blackfoot River Fisheries Restoration Report for 2004 and 2005. Montana Fish, Wildlife and Parks, Missoula.
- Pierce, R. and D. Schmetterling. 1999. Blackfoot River Restoration Project: Progress and Monitoring Report 1997-1999. Montana Fish, Wildlife and Parks, Missoula.
- Pierce, R., R. Aasheim and C. Podner. 2005. An integrated stream restoration and native fish conservation strategy for the Big Blackfoot River basin. Montana Fish Wildlife and Parks, Missoula, Montana.
- Pierce, R., R. Aasheim and C. Podner. 2007. Fluvial westslope cutthroat trout movements and restoration relationships in the upper Blackfoot Basin, Montana. *Intermountain Journal of Sciences* Vol. 13(2).
- Pierce, R., R. Anderson and C. Podner. 2004. The Big Blackfoot River Restoration Progress Report for 2002 and 2003. Montana Fish, Wildlife and Parks, Missoula. 108pp.
- Pierce, R., D. Peters and T. Swanberg. 1997. Blackfoot River restoration progress report. Montana Fish, Wildlife and Parks, Missoula, Montana.
- Pierce, R., C. Podner, and M. Davidson. 2009. Correlation of fluvial rainbow trout spawning life history with severity of infection by *Myxobolus cerebralis* in the Blackfoot River Basin, Montana. *Transactions of the American Fisheries Society* 138: 251-263.
- Pierce R., C. Podner, M. Davidson, L. Knotek, and J. Thabes. 2008. The Big Blackfoot River Fisheries and Restoration Investigations for 2006 and 2007. Montana Department of Fish, Wildlife and Parks, Missoula.
- PIF (Partners In Flight). 2000. Partners in Flight Bird Conservation Plan Montana. Version 1.1.
- Platts, W.S. 1979. Livestock grazing and riparian/stream ecosystems. p. 39-45. In: *Proceedings, Forum-Grazing and Riparian/Stream Ecosystems*. Trout Unlimited, Inc., Vienna, VA.

- Pratt, K.L., and J.E. Huston. 1993. Status of bull trout (*Salvelinus confluentus*) in Lake Pend Oreille and the lower Clark Fork River. Draft. Prepared for Avista Corporation, Spokane, Washington.
- Power, T. 1996. *Lost Landscapes and Failed Economies: The Search for a Value of Place*. Washington, D.C. : Island Press.
- Rasker, R. 2001. "Your Next Job Will Be In Services. Should You Be Worried?" In *Across the Great Divide: Explorations in Collaborative Conservation and the American West*, edited by Philip Brick, D. Snow, and S. Van De Wetering. Washington , D.C.: Island Press, 2001.
- Reinhart, D.P., M.A. Haroldson, D.J. Mattson, and K.A. Gunther. 2001. Effects of exotic species on Yellowstone's grizzly bears. *Western N. Amer. Naturalist* 61: 277-288.
- Reynolds, R.T. and B.D. Linkhart. 1992. Flammulated owls in ponderosa pine: evidence of preference for old growth. In: Kaufmann, M.R., W.H. Moir, and R.L. Bassett, tech. coords. *Old-growth forests in the Southwest and Rocky Mountain regions: Proceedings of a workshop*. USDA For. Serv. General Technical Report RM213. Pp. 166-169
- Rice, P.M. 1997. INVADERS Database System (*invader.dbs.umt.edu*). Division of Biological Sciences, University of Montana, Missoula.
- Rice, P.M., Toney, C., and Saco, R. 1997. *Potential Exotic Plant Species Invading the Blackfoot Drainage: An Analysis*. University of Montana, Missoula.
- Riebsame, W.E. 2001. "Geographies of the New West." In *Across the Great Divide: Explorations in Collaborative Conservation and the American West*, edited by Philip Brick, D. Snow, and S. Van De Wetering. Washington , D.C. : Island Press, 2001.
- Rieman, B.E. and F.W. Allendorf. 2001. Effective population size and genetic conservation criteria for bull trout. *North American Journal of Fisheries Management* 21: 330-338.
- Rieman, B.E. and M. Birzell. 2008. *Adopt-A-Lake Monitoring Program Progress Report 2008*. Clearwater Resource Council.
- Rieman, B. E. and J.B. Dunham. 2000. Metapopulation and salmonids: a synthesis of life history patterns and empirical observations. *Ecology of Freshwater Fish* 9: 51-64.
- Rieman, B.E. and J.D. McIntyre. 1993. *Demographic and Habitat Requirements for Conservation of Bull Trout*. Gen. Tech. Rep. INT-302. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station, Boise, ID. 38p.
- Rieman, B.E., J.T. Peterson and D.L. Myers. 2006. Have brook trout (*Salvelinus fontinalis*) displaced bull trout (*Salvelinus confluentus*) along longitudinal gradients in central Idaho stream? *Canadian Journal of Aquatic Sciences* 63: 63-78.
- Ruediger, Bill, Jim Claar, Steve Gniadek, Bryon Holt, Lyle Lewis, Steve Mighton, Bob Naney, Gary Patton, Tony Rinaldi, Joel Trick, Anne Vandehey, Fred Wahl, Nancy Warren, Dick

- Wenger, and Al Williamson. 2000. Canada lynx conservation assessment and strategy. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Publication #R1-00-53, Missoula, MT. 142 pp.
- Ruggiero, L. F., K. B. Aubry, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski (eds). 1994. The Scientific basis for conserving forest carnivores: American Marten, Fisher, Lynx, and Wolverine in the Western United States. USDA Forest Service Gen. Tech. Rep. RM-254. Fort Collins, CO. 184 pp.
- Saab, V.A., and J.S. Marks. 1992. Summer habitat use by Columbian Sharp-tailed Grouse in western Idaho. *Great Basin Nat.* 52: 166-173.
- Saab, V.A., and K.T. Vierling. 2001. Reproductive success of Lewis's woodpecker in burned pine and cottonwood riparian forests. *Condor* 103: 491-501.
- Saab, V.A., R. Russell, and J.G. Dudley. 2007. Nest densities of cavity-nesting birds in relation to post-fire salvage logging and time since wildfire. *Condor* 109: 97-108.
- Sauer, J.R., J.E. Hines, G.Gough, I. Thomas, and B.G. Peterjohn. 1997. The North American Breeding Bird Survey: results and analysis. Version 96.3. Patuxent Wildlife Research Center, Laurel, MD.
- Schmetterling, D.A. 2000. Redd characteristics of fluvial westslope cutthroat trout in four tributaries to the Blackfoot River, Montana. *North American Journal of Fisheries Management* 20: 776-783.
- Schmetterling, D.A. 2001. Seasonal movements of fluvial westslope cutthroat trout in the Blackfoot River drainage, Montana. *North American Journal of Fisheries Management* 21: 507-520.
- Schmetterling, D.A. 2003. Reconnecting a fragmented river: movements of westslope cutthroat trout and bull trout after transport upstream of Milltown Dam, Montana. *North American Journal of Fisheries Management* 23: 721-731.
- Schmidt, W.C. 1992. Effects of White Pine Blister Rust on Western Wilderness. In *Society of American Foresters 1992 Annual Meeting, Proceedings*. SAF Publication 92-01.
- Schoennagel, T., T. T. Veblen, and W. H. Romme. 2004. The interaction of fire, fuels, and climate across Rocky Mountain forests. *BioScience* 54: 661-676.
- Servheen, C. and R. Klaver. 1983. Grizzly bear dens and denning activity in the Mission and Rattlesnake Mountains, Montana. *International Conference on Bear Research and Management* 5: 201-207.
- Servheen, C. and P. Sandstrom. 1993. Ecosystem management and linkage zones for grizzly bears and other large carnivores in the northern Rocky Mountains in Montana and Idaho. *Endangered Species Technical Bull* 18:10-13.

- Sheley, R., J. Petroff, M. Borman. 1999. Introduction to Biology and Management of Noxious Rangeland Weeds, Corvallis, OR.
- Shepard, B.B., B.E May and W. Urie. 2003. Status of westslope cutthroat trout (*Onchorhynchus clarki lewisi*) in the United States: 2002. A report to the Westslope Cutthroat Interagency Conservation Team.
- Shepard, B. B., B. E May and W. Urie. 2005. Status and conservation of westslope cutthroat trout within the Western United States. *North American Journal of Fisheries Management* 25: 1426-1440.
- Sherriff, R.L. and T.T. Veblen. 2007. A spatially-explicit reconstruction of fire regime types in ponderosa pine forests of the Colorado Front Range. *Ecosystems* 10: 311-323.
- Shinneman, D. J., and W. L. Baker. 1997. Nonequilibrium dynamics between catastrophic disturbances and old-growth forests in ponderosa pine landscapes of the Black Hills. *Conservation Biology* 11: 1276–1288.
- Skaar, D. 1990. Montana Common Loon management plan. Prep. by Montana Loon Society for USDA Forest Service. 27p.
- Smith, A.T. 1974. The distribution and dispersal of pikas: influences of behavior and climate. *Ecology*, 55: 1368-1376.
- Smith, R.L. 1968. Grasshopper Sparrow. Pages 725-745 in O. L. Austin, Jr., editor. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies, Part 2. Dover Publications, Inc., New York.
- Snieszko, R.A., A. Bower, and J. Danielson. 2000. A comparison of early field results of white pine blister rust resistance of sugar pine and western white pine. *Hort. Technology* 10: 519-522.
- Spence, L. 1975. Upper Blackfoot River Study: A premining inventory of aquatic and wildlife resources. Montana Department of Fish and Game in cooperation with The Anaconda Company.
- Squires, J.R. and L.F. Ruggiero. 2007. Winter prey selection of Canada lynx in northwestern Montana. *Journal of Wildlife Management* 71: 310-315.
- Squires, J.S., N.J. DeCesare, J.A. Kolbe, and L.F. Ruggiero. 2008. Hierarchical Den Selection of Canada Lynx in Western Montana. *Journal of Wildlife Management* 72(7): 1497–1506.
- Squires, J.R., N.J. DeCesare, J.A. Kolbe, and L.F. Ruggiero. In Prep. Seasonal Changes in Resource Use of Canada Lynx in Managed Southern Boreal Forests in the North-Central Rocky Mountains.
- Stenseth, N. 2004. Snow conditions may create an invisible barrier for lynx. *Proceedings of the National Academy of Science* 101(29): 10632–10634.

- Stohlgren, T.J., T.T. Veblen, K.C. Kendall, W.L. Baker, C.D. Allen, J.A. Logan, and K.C. Ryan. 2005. The heart of the Rockies: montane and subalpine ecosystems. In *Rocky Mountain Futures: An Ecological Perspective*, ed. J.S. Baron, 203-218. Washington, D.C.: Island Press.
- Stratus Consulting. 2007. Preliminary evaluation of injuries and damages: Upper Blackfoot Mining Complex, Lewis and Clark County, Montana, A report to the Natural Resources Damage Claim, Montana Department of Justice, Helena, MT.
- Swanberg, T.R. 1997. Movement of and Habitat Use by Fluvial Bull Trout in the Blackfoot River, Montana. *Transactions of the American Fisheries Society* 126:735-746. Thomas G, T. 1992. Status Report: Bull trout in Montana. A report to the Montana Department of Fish, Wildlife and Parks.
- Tainter, F.H., and F.A. Baker. 1996. *Principals of Forest Pathology*. John Wiley & Sons, Inc., New York. 805 pp.
- Tetra-tech. 2004. Final Geology and Mineral Potential Report for Blackfoot River Proposed Acquisition, Plum Creek Timber Lands, Phase I. Unpublished report on file with The Nature Conservancy, 32 S. Ewing, Helena, Montana. 29pp.
- Thomas, G. 1992. Status report: bull trout in Montana. Report prepared for Montana Department of Fish, Wildlife and Parks, Helena, Montana.
- TNC (The Nature Conservancy). 2003. *The Five-S Framework for Site Conservation: A Practitioner's Handbook for Site Conservation Planning and Measuring Conservation Success*. Volume I, Third Edition. The Nature Conservancy, Arlington, VA.
- TNC. 2006. *Conservation by Design, A Strategic Framework for Mission Success*. The Nature Conservancy, Arlington, VA.
- TNC and BC. 2007. *Blackfoot River Valley Conservation Area Draft Plan*. The Blackfoot Challenge and The Nature Conservancy of Montana.
- Tobalske, B.W., R.C. Shearer, and R.L. Hutto. 1991. Bird populations in logged and unlogged western larch/Douglas-fir forest in northwestern Montana. *USDA Forest Service, Int. Res. Sta., Research Paper INT442*. 12 p.
- Trombulak, S.C. and C.A. Frissell. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. *Conservation Biology*. 14: 18-30.
- Ulliman, M.J., A. Sands, and T. Hemker. 1998. Draft conservation plan for Columbian Sharp-tailed Grouse and its habitats in Idaho. Idaho Department of Fish and Game, Boise. 36 pp.
- UM Watershed Health Clinic and U.S. Fish and Wildlife Service. 2005. Trumpeter Swan Habitat Suitability Study in the Blackfoot River Watershed of Montana.

- USDI (US Department of the Interior). 1994. Montana Bald Eagle Management Plan. U.S. Department of the Interior, Bureau of Reclamation. Billings, MT.
- USGS (US Geological Survey). 2009. U.S. Geological Survey National Water Information System website available at: <http://waterdata.usgs.gov>.
- USFS (US Forest Service). 1991. Pest Risk Assessment of the Importation of Larch from Siberia and the Soviet Far East. U.S. Department of Agriculture, Forest Service Miscellaneous Publication No. 1495.
- USFS. 1996. Status of the Interior Columbia Basin: Summary of Scientific Findings. U.S. Department of Agriculture, Forest Service PNW-GTR-385: 144 p.
- USFS. 2008. Forest Service Manual, Chapter 2020, Interim Directive 2020-2008-1: Ecological Restoration and Resilience. U.S. Department of Agriculture, Forest Service, Washington, DC. 12 pp.
- USFWS (US Fish and Wildlife Service). 1987. Northern Rocky Mountain Wolf Recovery Plan. Prepared by the U.S. Fish and Wildlife Service in cooperation with the Northern Rocky Mountain Wolf Recovery Team.
- USFWS. 1982. Grizzly Bear Recovery Plan. U. S. Fish and Wildlife Service, Denver, CO.
- USFWS. 1993. Grizzly Bear Recovery Plan. U. S. Fish and Wildlife Service, Missoula, MT.
- USFWS. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Fish and Wildlife Service Office of Migratory Bird Management. U.S. Government Printing Office: 1996-404-911/44014. 22 pp.
- USFWS. 1996. Statement of Incidental Take. U. S. Fish and Wildlife Service.
- USFWS. 1998. Twelve month Administrative finding on petition to list the Northern Goshawk in the contiguous western United States under the Endangered Species Act. U.S. Fish and Wildlife Service, Portland, Oregon. 129 p.
- USFWS. 1999. Using resource selection functions to model cumulative effects in the Northern Continental Divide Ecosystem. U. S. Fish and Wildlife Service, Grizzly Bear Recovery Coordinator's Office, University of Montana, Missoula.
- USFWS. 2002. Draft Recovery Plan for Three of the Five Distinct Population Segments of Bull Trout (*Salvelinus confluentus*). Chapter 3 – Clark Fork Recovery Unit. U.S. Fish and Wildlife Service Region 1, Portland, OR.
- USFWS. 2003. Grizzly bear mortalities 1992-2003. Dataset provided by U.S. Fish and Wildlife Service Grizzly Bear Recovery Coordinator. Missoula, Montana.
- USFWS. 2006. NCDE human-caused mortality issues. Data from U.S. Fish and Wildlife Service Grizzly Bear Recovery Coordinator. Missoula, Montana.

- USFWS. 2009a. Montana Partners for Wildlife-Blackfoot River Watershed Focus Area. Website available at: www.fws.gov/mountain-prairie/pfw/montana/mt5b.htm.
- USFWS. 2009b. Endangered Species Program, U.S. Fish and Wildlife Service. Website available at: www.fws.gov/endangered/.
- Veblen, T. T. 2000. Disturbance patterns in southern Rocky Mountain forests. Pages 31–54 in R. L. Knight, F. W. Smith, S. W. Buskirk, W. H. Romme, and W. L. Baker, editors. Forest fragmentation in the southern Rocky Mountains. University Press of Colorado, Boulder, Colorado, USA.
- Verner, J. 1994. Current management situation of Flammulated Owls. In: Hayward, G.D., (ed). Flammulated, boreal, and Great Gray Owls in the United States: A technical conservation assessment. U.S. For. Serv. General Technical Report 253.
- Vickery, P.D. 1996. Grasshopper Sparrow (*Ammodramus savannarum*). In: A. Poole and F. Gill, editors. The Birds of North America, 239. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C. 24 p.
- Vierling, K.T. 1997. Habitat selection of Lewis's Woodpeckers in southeastern Colorado. Wilson Bulletin 109: 121-130.
- Vinkey, R.S., Schwartz, M.K., McKelvey, K.S., Foresman, K.R., Pilgrim, K.L., Giddings, B.J., and Lofroth, E.C. 2006. When reintroductions are augmentations: the genetic legacy of fishers (*Martes pennanti*) in Montana. Journal of Mammalogy 87(2): 265-271.
- Whiteley, A.R., P. Spruell, and F.W. Allendorf. 2004. Ecological and life history characteristics predict population genetic divergence of two salmonids in the same landscape. Molecular Genetics 13(12): 3675-3688.
- Whitson, T.D., L.C. Burrill, S.A. Dewey, D.W. Cudney, B.E. Nelson, R.D. Lee, and R. Parker. 2002. Weeds of the West, 9th Edition. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities Cooperative Extension Services and University of Wyoming, Jackson, Wyoming.
- Wittinger, W.T., J.S. Waller, A. Vandehey, A.M. Soukkala, R.D. Mace, R. B. Harris, D. Godtel, P. Dolan, and K. Ake. 1999. Managing Motorized Access to Grizzly Bear Habitat on Multiple-Use Lands. Draft for NCDE Access proposed guidelines. NCDE Access Task Group.
- Ward, R. L. 1999. The Occurance of Two Arboreal Lichens and Their Utilization by Deer and Elk on Selected Winter Ranges in West-Central Montana. M. S. Thesis, University of Montana, Missoula.
- Western Regional Climate Center. 2009. Website available at: www.wrcc.dri.edu/Climsum.html.
- Whipple, J.W., M.R. Mudge and R.L. Earhart. 1987. Geologic Map of the Rogers Pass Area, Lewis & Clark County, Montana. USGS Miscellaneous Investigation Series: Map I-1642.

- Whitson, T.D., L.C. Burrill, S.A. Dewey, D.W. Cudney, B.E. Nelson, R.D. Lee, and R. Parker. 2002. Weeds of the West, 9th Edition. The Western Society of Weed Science in cooperation with the Western United States Land Grant Universities Cooperative Extension Services and University of Wyoming, Jackson, Wyoming.
- Wiens, J.A., and J.T. Rotenberry. 1985. Response of breeding passerine birds to rangeland alteration in a North American shrub steppe locality. *Journal of Applied Ecology* 22: 655-668.
- Wilkinson, C.F. 1993. *Crossing the Next Meridian : Land, Water and the Future of the West*. Washington , D.C. : Island Press.
- Wilson, S.D., and J.W. Belcher. 1989. Plant and bird communities of native prairie and introduced Eurasian vegetation in Manitoba, Canada. *Conservation Biology* 3: 39-44.
- Wilson, S.M., J.A. Graham., D.J. Mattson, and M.J. Madel. 2006. Landscape conditions predisposing grizzly bears to conflict on private agricultural lands in the western U.S.A. *Biological Conservation* 130: 47-59.
- Wilson, S.M., M.J. Madel, D.J. Mattson, J.M. Graham., J.M. Belsky, and J.A. Burchfield. 2005. Landscape features, attractants, and conflict hotspots: A spatial analysis of human-grizzly bear conflicts. *Ursus* 16(1): 117-129
- Witkind, I.J. and W.M. Weber. 1982. Reconnaissance Geologic Map of the Bigfork-Avon Environmental Study Areas, Flathead, Lake, Lewis & Clark, Missoula and Powell Counties, Montana. U.S. Geological Survey Miscellaneous Investigations Map I-1380.

Appendix A. Dewatered Stream List for the Blackfoot Subbasin.

Stream Name	Affected Length	Natural	Human	Both
Arkansas Creek	2		2	
Ashby Creek	2		2	
Arrastra Creek (sm 4.5-2.0)	2.5	2.5		
Bear Creek (North Fork)	1	1	1	x
Blackfoot River (Seven-Up Pete-Poorman Creek)	11	11	3	x
Blackfoot River (54.1 - 84.9)	30.8		30.8	
Blanchard Creek	1.2		1.2	
Burnt Bridge Creek	1		1	
Chamberlain Creek	1		1	
Chimney Creek (Nevada Creek)	0.5		0.5	
Chimney Creek (Douglas Creek)	3.5		3.5	
Clearwater River	3.5		3.5	
Copper Creek	1	1		
Cottonwood Creek rm 43.0 (sm 10.0-4.4)	5.6	2.8	2.8	x
Cottonwood Creek (Douglas Creek)	5		5	
Dick Creek (sm 3.5-6.0)	2.5	2.5	2.5	x
Douglas Creek	14		14	
Dry Creek (trib to Rock Creek)	0.5	0.5		
Dry Fork (trib to North Fork)	2	2		
Dunham Creek	5	4	1	x
Elk Creek	3		3	
Fish Creek	0.3		0.3	
Frazier Creek	1.5		1.5	
Frazier Creek, North Fork	0.5		0.5	
Gallagher Creek	3		3	
Hoyt Creek	1		1	
Humbug Creek	1	1		
Jefferson Creek	1		1	
Keep Cool	2		2	
Landers Fork (3.6-4.5)	1	1		
McCabe Creek	2		2	
McElwain Creek	1		1	
Monture Creek (12.0-15.0)	3	3		
Murray Creek	3	3		
Nevada Creek (sm 31.7-6.4)	25.3		25.3	
Nevada Creek (sm 40.0-34)	6		6	
North Fork of Blackfoot River (rm 12.0-6.2)	5.8	5.8	5.8	x
Pearson Creek	2	2		
Poorman Creek	2	2	2	x
Rock Creek (1.4-7.0)	5.6	5.6	5.6	x
Shanley Creek	1.6		1.6	
Spring Creek (trib to Cottonwood Creek)	1		1	
Spring Creek (trib to North Fork)	2.5		2.5	
Snowbank Creek	0.4		0.4	

Appendix A (continued).

Stream Name	Affected Length	Natural	Human	Both
Stonewall Creek	2	1	1	x
Sucker Creek	1		1	
Union Creek (sm 7.0-0.5)	6.5		6.5	
Wales Creek	1.9		1.9	
Warm Springs Creek	1		1	
Warren Creek	6		6	
Washington Creek (Section 24 and 26)	1		1	
Wasson Creek	2		2	
Willow Creek (lower)	2		2	
Wilson Creek	0.8		0.8	
Yourname Creek	1		1	
Totals	196.3	51.7	164.5	

Appendix B. List of Wildlife Species.

The following list of wildlife species found in the Blackfoot Subbasin is based on records compiled by the Montana Natural Heritage Program (2009).

Common Name	Scientific Name
MAMMALS	
Masked Shrew	<i>Sorex cinereus</i>
Preble's Shrew	<i>Sorex preblei</i>
Vagrant Shrew	<i>Sorex vagrans</i>
Dusky or Montane Shrew	<i>Sorex monticolus</i>
Water Shrew	<i>Sorex palustris</i>
Pygmy Shrew	<i>Sorex hoyi</i>
Little Brown Myotis	<i>Myotis lucifugus</i>
Long-eared Myotis	<i>Myotis evotis</i>
Fringed Myotis	<i>Myotis thysanodes</i>
Long-legged Myotis	<i>Myotis volans</i>
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>
Silver-haired Bat	<i>Lasiorycteris noctivagans</i>
Big Brown Bat	<i>Eptesicus fuscus</i>
Hoary Bat	<i>Lasiurus cinereus</i>
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>
Pika	<i>Ochotona princeps</i>
Mountain Cottontail	<i>Sylvilagus nuttallii</i>
Snowshoe Hare	<i>Lepus americanus</i>
White-tailed Jack Rabbit	<i>Lepus townsendii</i>
Least Chipmunk	<i>Tamias minimus</i>
Yellow-pine Chipmunk	<i>Tamias amoenus</i>
Red-tailed Chipmunk	<i>Tamias ruficaudus</i>
Yellow-bellied Marmot	<i>Marmota flaviventris</i>
Hoary Marmot	<i>Marmota caligata</i>
Columbian Ground Squirrel	<i>Spermophilus columbianus</i>
Golden-mantled Ground Squirrel	<i>Spermophilus lateralis</i>
Red Squirrel	<i>Tamiasciurus hudsonicus</i>
Northern Flying Squirrel	<i>Glaucomys sabrinus</i>
Northern Pocket Gopher	<i>Thomomys talpoides</i>
Beaver	<i>Castor canadensis</i>
Deer Mouse	<i>Peromyscus maniculatus</i>
Bushy-tailed Woodrat	<i>Neotoma cinerea</i>
Southern Red-backed Vole	<i>Clethrionomys gapperi</i>
Heather Vole	<i>Phenacomys intermedius</i>
Meadow Vole	<i>Microtus pennsylvanicus</i>
Montane Vole	<i>Microtus montanus</i>
Long-tailed Vole	<i>Microtus longicaudus</i>
Muskrat	<i>Ondatra zibethicus</i>
Northern Bog Lemming	<i>Synaptomys borealis</i>
Western Jumping Mouse	<i>Zapus princeps</i>
Porcupine	<i>Erethizon dorsatum</i>

Common Name**Scientific Name****MAMMALS (CONT.)**

Coyote	<i>Canis latrans</i>
Gray Wolf	<i>Canis lupus</i>
Red Fox	<i>Vulpes vulpes</i>
Black Bear	<i>Ursus americanus</i>
Grizzly Bear	<i>Ursus arctos</i>
Raccoon	<i>Procyon lotor</i>
Marten	<i>Martes americana</i>
Fisher	<i>Martes pennanti</i>
Short-tailed Weasel	<i>Mustela erminea</i>
Long-tailed Weasel	<i>Mustela frenata</i>
Mink	<i>Mustela vison</i>
Wolverine	<i>Gulo gulo</i>
Badger	<i>Taxidea taxus</i>
Striped Skunk	<i>Mephitis mephitis</i>
Northern River Otter	<i>Lontra canadensis</i>
Canada Lynx	<i>Lynx canadensis</i>
Bobcat	<i>Lynx rufus</i>
Mountain Lion	<i>Puma concolor</i>
Elk or Wapiti	<i>Cervus canadensis</i>
Mule Deer	<i>Odocoileus hemionus</i>
White-tailed Deer	<i>Odocoileus virginianus</i>
Moose	<i>Alces alces</i>

BIRDS

Common Loon	<i>Gavia immer</i>
Pied-billed Grebe	<i>Podilymbus podiceps</i>
Horned Grebe	<i>Podiceps auritus</i>
Red-necked Grebe	<i>Podiceps grisegena</i>
Eared Grebe	<i>Podiceps nigricollis</i>
Western Grebe	<i>Aechmophorus occidentalis</i>
Clark's Grebe	<i>Aechmophorus clarkii</i>
American White Pelican	<i>Pelecanus erythrorhynchos</i>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>
American Bittern	<i>Botaurus lentiginosus</i>
Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Ardea alba</i>
White-faced Ibis	<i>Plegadis chihi</i>
Tundra Swan	<i>Cygnus columbianus</i>
Trumpeter Swan	<i>Cygnus buccinator</i>
Snow Goose	<i>Chen caerulescens</i>
Ross's Goose	<i>Chen rossii</i>
Canada Goose	<i>Branta canadensis</i>
Wood Duck	<i>Aix sponsa</i>
Green-winged Teal	<i>Anas crecca</i>
Mallard	<i>Anas platyrhynchos</i>
Northern Pintail	<i>Anas acuta</i>
Blue-winged Teal	<i>Anas discors</i>

Common Name**Scientific Name****BIRDS (CONT.)**

Cinnamon Teal	<i>Anas cyanoptera</i>
Northern Shoveler	<i>Anas clypeata</i>
Gadwall	<i>Anas strepera</i>
Eurasian Wigeon	<i>Anas penelope</i>
American Wigeon	<i>Anas americana</i>
Redhead	<i>Aythya americana</i>
Ring-necked Duck	<i>Aythya collaris</i>
Lesser Scaup	<i>Aythya affinis</i>
Harlequin Duck	<i>Histrionicus histrionicus</i>
Surf Scoter	<i>Melanitta perspicillata</i>
White-winged Scoter	<i>Melanitta fusca</i>
Common Goldeneye	<i>Bucephala clangula</i>
Barrow's Goldeneye	<i>Bucephala islandica</i>
Bufflehead	<i>Bucephala albeola</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>
Common Merganser	<i>Mergus merganser</i>
Red-breasted Merganser	<i>Mergus serrator</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>
Turkey Vulture	<i>Cathartes aura</i>
Osprey	<i>Pandion haliaetus</i>
Bald Eagle	<i>Haliaeetus leucocephalus</i>
Northern Harrier	<i>Circus cyaneus</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>
Cooper's Hawk	<i>Accipiter cooperii</i>
Northern Goshawk	<i>Accipiter gentilis</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Ferruginous Hawk	<i>Buteo regalis</i>
Rough-legged Hawk	<i>Buteo lagopus</i>
Golden Eagle	<i>Aquila chrysaetos</i>
American Kestrel	<i>Falco sparverius</i>
Merlin	<i>Falco columbarius</i>
Peregrine Falcon	<i>Falco peregrinus</i>
Prairie Falcon	<i>Falco mexicanus</i>
Gray Partridge	<i>Perdix perdix</i>
Ring-necked Pheasant	<i>Phasianus colchicus</i>
Spruce Grouse	<i>Falcapennis canadensis</i>
Dusky Grouse	<i>Dendragapus obscurus</i>
White-tailed Ptarmigan	<i>Lagopus leucura</i>
Ruffed Grouse	<i>Bonasa umbellus</i>
Greater Sage-Grouse	<i>Centrocercus urophasianus</i>
Sharp-tailed Grouse (Columbian)	<i>Tympanuchus phasianellus columbianus</i>
Wild Turkey	<i>Meleagris gallopavo</i>
Virginia Rail	<i>Rallus limicola</i>
Sora	<i>Porzana carolina</i>
Common Moorhen	<i>Gallinula chloropus</i>
American Coot	<i>Fulica americana</i>

Common Name**Scientific Name****BIRDS (CONT.)**

Sandhill Crane	<i>Grus canadensis</i>
Semipalmated Plover	<i>Charadrius semipalmatus</i>
Killdeer	<i>Charadrius vociferus</i>
Black-necked Stilt	<i>Himantopus mexicanus</i>
American Avocet	<i>Recurvirostra americana</i>
Greater Yellowlegs	<i>Tringa melanoleuca</i>
Lesser Yellowlegs	<i>Tringa flavipes</i>
Solitary Sandpiper	<i>Tringa solitaria</i>
Willet	<i>Tringa semipalmata</i>
Spotted Sandpiper	<i>Actitis macularius</i>
Long-billed Curlew	<i>Numenius americanus</i>
Marbled Godwit	<i>Limosa fedoa</i>
Least Sandpiper	<i>Calidris minutilla</i>
Long-billed Dowitcher	<i>Limnodromus scolopaceus</i>
Wilson's Snipe	<i>Gallinago delicata</i>
Wilson's Phalarope	<i>Phalaropus tricolor</i>
Red-necked Phalarope	<i>Phalaropus lobatus</i>
Franklin's Gull	<i>Leucophaeus pipixcan</i>
Ring-billed Gull	<i>Larus delawarensis</i>
California Gull	<i>Larus californicus</i>
Sabine's Gull	<i>Xema sabini</i>
Caspian Tern	<i>Hydroprogne caspia</i>
Common Tern	<i>Sterna hirundo</i>
Forster's Tern	<i>Sterna forsteri</i>
Black Tern	<i>Chlidonias niger</i>
Long-billed Murrelet	<i>Brachyramphus perdix</i>
Ancient Murrelet	<i>Synthliboramphus antiquus</i>
Rock Pigeon	<i>Columba livia</i>
Band-tailed Pigeon	<i>Patagioenas fasciata</i>
Mourning Dove	<i>Zenaida macroura</i>
Flammulated Owl	<i>Otus flammeolus</i>
Great Horned Owl	<i>Bubo virginianus</i>
Snowy Owl	<i>Bubo scandiacus</i>
Northern Hawk Owl	<i>Surnia ulula</i>
Northern Pygmy-Owl	<i>Glaucidium gnoma</i>
Barred Owl	<i>Strix varia</i>
Great Gray Owl	<i>Strix nebulosa</i>
Long-eared Owl	<i>Asio otus</i>
Short-eared Owl	<i>Asio flammeus</i>
Boreal Owl	<i>Aegolius funereus</i>
Northern Saw-whet Owl	<i>Aegolius acadicus</i>
Common Nighthawk	<i>Chordeiles minor</i>
Common Poorwill	<i>Phalaenoptilus nuttallii</i>
Black Swift	<i>Cypseloides niger</i>
Vaux's Swift	<i>Chaetura vauxi</i>
White-throated Swift	<i>Aeronautes saxatalis</i>
Black-chinned Hummingbird	<i>Archilochus alexandri</i>

Common Name**Scientific Name****BIRDS (CONT.)**

Calliope Hummingbird	<i>Stellula calliope</i>
Rufous Hummingbird	<i>Selasphorus rufus</i>
Belted Kingfisher	<i>Megasceryle alcyon</i>
Lewis's Woodpecker	<i>Melanerpes lewis</i>
Lewis's Woodpecker	<i>Melanerpes lewis</i>
Lewis's Woodpecker	<i>Melanerpes lewis</i>
Lewis's Woodpecker	<i>Melanerpes lewis</i>
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>
Red-naped Sapsucker	<i>Sphyrapicus nuchalis</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Hairy Woodpecker	<i>Picoides villosus</i>
Black-backed Woodpecker	<i>Picoides arcticus</i>
American Three-toed Woodpecker	<i>Picoides dorsalis</i>
Northern Flicker	<i>Colaptes auratus</i>
Northern Flicker (Red-shafted)	<i>Colaptes auratus cafer</i>
Pileated Woodpecker	<i>Dryocopus pileatus</i>
Olive-sided Flycatcher	<i>Contopus cooperi</i>
Western Wood-Pewee	<i>Contopus sordidulus</i>
Willow Flycatcher	<i>Empidonax traillii</i>
Least Flycatcher	<i>Empidonax minimus</i>
Hammond's Flycatcher	<i>Empidonax hammondii</i>
Dusky Flycatcher	<i>Empidonax oberholseri</i>
Cordilleran Flycatcher	<i>Empidonax occidentalis</i>
Say's Phoebe	<i>Sayornis saya</i>
Western Kingbird	<i>Tyrannus verticalis</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>
Scissor-tailed Flycatcher	<i>Tyrannus forficatus</i>
Horned Lark	<i>Eremophila alpestris</i>
Tree Swallow	<i>Tachycineta bicolor</i>
Violet-green Swallow	<i>Tachycineta thalassina</i>
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>
Bank Swallow	<i>Riparia riparia</i>
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>
Barn Swallow	<i>Hirundo rustica</i>
Gray Jay	<i>Perisoreus canadensis</i>
Steller's Jay	<i>Cyanocitta stelleri</i>
Blue Jay	<i>Cyanocitta cristata</i>
Clark's Nutcracker	<i>Nucifraga columbiana</i>
Black-billed Magpie	<i>Pica hudsonia</i>
American Crow	<i>Corvus brachyrhynchos</i>
Common Raven	<i>Corvus corax</i>
Black-capped Chickadee	<i>Poecile atricapillus</i>
Mountain Chickadee	<i>Poecile gambeli</i>
Boreal Chickadee	<i>Poecile hudsonica</i>
Chestnut-backed Chickadee	<i>Poecile rufescens</i>
Red-breasted Nuthatch	<i>Sitta canadensis</i>
White-breasted Nuthatch	<i>Sitta carolinensis</i>

Common Name**Scientific Name****BIRDS (CONT.)**

Pygmy Nuthatch	<i>Sitta pygmaea</i>
Brown Creeper	<i>Certhia americana</i>
Rock Wren	<i>Salpinctes obsoletus</i>
Canyon Wren	<i>Catherpes mexicanus</i>
House Wren	<i>Troglodytes aedon</i>
Winter Wren	<i>Troglodytes troglodytes</i>
Marsh Wren	<i>Cistothorus palustris</i>
American Dipper	<i>Cinclus mexicanus</i>
Golden-crowned Kinglet	<i>Regulus satrapa</i>
Ruby-crowned Kinglet	<i>Regulus calendula</i>
Western Bluebird	<i>Sialia mexicana</i>
Mountain Bluebird	<i>Sialia currucoides</i>
Townsend's Solitaire	<i>Myadestes townsendi</i>
Veery	<i>Catharus fuscescens</i>
Swainson's Thrush	<i>Catharus ustulatus</i>
Hermit Thrush	<i>Catharus guttatus</i>
American Robin	<i>Turdus migratorius</i>
Varied Thrush	<i>Ixoreus naevius</i>
Gray Catbird	<i>Dumetella carolinensis</i>
Brown Thrasher	<i>Toxostoma rufum</i>
American Pipit	<i>Anthus rubescens</i>
Bohemian Waxwing	<i>Bombycilla garrulus</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Northern Shrike	<i>Lanius excubitor</i>
Loggerhead Shrike	<i>Lanius ludovicianus</i>
European Starling	<i>Sturnus vulgaris</i>
Warbling Vireo	<i>Vireo gilvus</i>
Red-eyed Vireo	<i>Vireo olivaceus</i>
Cassin's Vireo	<i>Vireo cassinii</i>
Solitary Vireo	<i>Vireo solitarius</i>
Tennessee Warbler	<i>Vermivora peregrina</i>
Orange-crowned Warbler	<i>Vermivora celata</i>
Nashville Warbler	<i>Vermivora ruficapilla</i>
Yellow Warbler	<i>Dendroica petechia</i>
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>
Yellow-rumped Warbler	<i>Dendroica coronata</i>
Audubon's Warbler	<i>Dendroica coronata auduboni</i>
Black-throated Gray Warbler	<i>Dendroica nigrescens</i>
Townsend's Warbler	<i>Dendroica townsendi</i>
American Redstart	<i>Setophaga ruticilla</i>
Ovenbird	<i>Seiurus aurocapilla</i>
Northern Waterthrush	<i>Seiurus noveboracensis</i>
MacGillivray's Warbler	<i>Oporornis tolmiei</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Wilson's Warbler	<i>Wilsonia pusilla</i>
Western Tanager	<i>Piranga ludoviciana</i>
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>

Common Name**Scientific Name****BIRDS (CONT.)**

Black-headed Grosbeak	<i>Pheucticus melanocephalus</i>
Lazuli Bunting	<i>Passerina amoena</i>
Green-tailed Towhee	<i>Pipilo chlorurus</i>
Spotted Towhee	<i>Pipilo maculatus</i>
American Tree Sparrow	<i>Spizella arborea</i>
Chipping Sparrow	<i>Spizella passerina</i>
Clay-colored Sparrow	<i>Spizella pallida</i>
Brewer's Sparrow	<i>Spizella breweri</i>
Vesper Sparrow	<i>Pooecetes gramineus</i>
Lark Sparrow	<i>Chondestes grammacus</i>
Lark Bunting	<i>Calamospiza melanocorys</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>
Grasshopper Sparrow	<i>Ammodramus savannarum</i>
Fox Sparrow	<i>Passerella iliaca</i>
Song Sparrow	<i>Melospiza melodia</i>
Lincoln's Sparrow	<i>Melospiza lincolni</i>
White-throated Sparrow	<i>Zonotrichia albicollis</i>
Golden-crowned Sparrow	<i>Zonotrichia atricapilla</i>
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>
Harris's Sparrow	<i>Zonotrichia querula</i>
Dark-eyed Junco	<i>Junco hyemalis</i>
Dark-eyed Junco (Gray-headed)	<i>Junco hyemalis caniceps</i>
Dark-eyed Junco (Oregon)	<i>Junco hyemalis oregonus</i>
Dark-eyed Junco (Pink-sided)	<i>Junco hyemalis mearnsi</i>
Snow Bunting	<i>Plectrophenax nivalis</i>
Bobolink	<i>Dolichonyx oryzivorus</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Western Meadowlark	<i>Sturnella neglecta</i>
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>
Common Grackle	<i>Quiscalus quiscula</i>
Brown-headed Cowbird	<i>Molothrus ater</i>
Bullock's Oriole	<i>Icterus bullockii</i>
Gray-crowned Rosy-Finch	<i>Leucosticte tephrocotis</i>
Pine Grosbeak	<i>Pinicola enucleator</i>
Cassin's Finch	<i>Carpodacus cassinii</i>
House Finch	<i>Carpodacus mexicanus</i>
Red Crossbill	<i>Loxia curvirostra</i>
White-winged Crossbill	<i>Loxia leucoptera</i>
Pine Siskin	<i>Carduelis pinus</i>
American Goldfinch	<i>Carduelis tristis</i>
Evening Grosbeak	<i>Coccothraustes vespertinus</i>
House Sparrow	<i>Passer domesticus</i>

FISH

Mottled Sculpin	<i>Cottus bairdi</i>
Slimy Sculpin	<i>Cottus cognatus</i>

Common Name**Scientific Name****FISH (CONT.)**

Westslope Cutthroat Trout	<i>Oncorhynchus clarkii lewisi</i>
Yellowstone Cutthroat Trout*	<i>Oncorhynchus clarki bouvieri</i>
Rainbow Trout*	<i>Oncorhynchus mykiss</i>
Mountain Whitefish	<i>Prosopium williamsoni</i>
pygmy Whitefish	<i>Prosopium coulteri</i>
Brown Trout*	<i>Salmo trutta</i>
Bull Trout	<i>Salvelinus confluentus</i>
Brook Trout*	<i>Salvelinus fontinalis</i>
Northern Pikeminnow	<i>Ptychocheilus oregonensis</i>
Longnose Dace	<i>Rhinichthys cataractae</i>
Redside Shiner	<i>Richardsonius balteatus</i>
Longnose Sucker	<i>Catostomus catostomus</i>
Largescale Sucker	<i>Catostomus macrocheilus</i>
White Sucker*	<i>Catostomus commersoni</i>
Peamouth	<i>Mylocheilus caurinus</i>
Kokanee*	<i>Oncorhynchus nerka</i>
Coho Salmon*	<i>Oncorhynchus kisutch</i>
Arctic Grayling*	<i>Thymallus arcticus</i>
Fathead Minnow*	<i>Pimephales pomelas</i>
Northern Pike*	<i>Esox lucius</i>
Brook Stickleback*	<i>Culaea inconstans</i>
Pumpkinseed*	<i>Lepomis gibbosus</i>
Largemouth Bass*	<i>Micropterus salmoides</i>
Yellow Perch*	<i>Perca flavescens</i>

AMPHIBIANS AND REPTILES

Long-toed Salamander	<i>Ambystoma macrodactylum</i>
Rocky Mountain Tailed Frog	<i>Ascaphus montanus</i>
Western Toad	<i>Bufo boreas</i>
Pacific Treefrog	<i>Pseudacris regilla</i>
Columbia Spotted Frog	<i>Rana luteiventris</i>
Painted Turtle	<i>Chrysemys picta</i>
Rubber Boa	<i>Charina bottae</i>
Terrestrial Gartersnake	<i>Thamnophis elegans</i>
Common Gartersnake	<i>Thamnophis sirtalis</i>
Prairie Rattlesnake	<i>Crotalus viridis</i>
Eastern Racer	<i>Coluber constrictor</i>

INVERTEBRATES

A Leech	<i>Helobdella stagnalis</i>
Virile Crayfish	<i>Orconectes virilis</i>
An Amphipod	<i>Hyaella azteca</i>
Signal Crayfish	<i>Pacifastacus leniusculus</i>
A Riffle Beetle	<i>Zaitzevia parvula</i>
A Riffle Beetle	<i>Heterlimnius corpulentus</i>
A Riffle Beetle	<i>Cleptelmis addenda</i>

Common Name**Scientific Name****INVERTEBRATES (CONT.)**

A Riffle Beetle	<i>Lara avara</i>
A Riffle Beetle	<i>Narpus concolor</i>
A Riffle Beetle	<i>Optioservus quadrimaculatus</i>
A Riffle Beetle	<i>Ordobrevia nubifera</i>
A Eukiefferiellan Chironomid	<i>Eukiefferiella brehmi</i>
A Mayfly	<i>Serratella tibialis</i>
A Mayfly	<i>Ephemerella excrucians</i>
A Mayfly	<i>Baetis bicaudatus</i>
A Mayfly	<i>Epeorus longimanus</i>
A Mayfly	<i>Drunella coloradensis</i>
A Mayfly	<i>Drunella doddsi</i>
A Mayfly	<i>Drunella grandis</i>
A Mayfly	<i>Drunella spinifera</i>
A Mayfly	<i>Acentrella turbida</i>
Hagen's Small Minnow Mayfly	<i>Dipheter hageni</i>
A Mayfly	<i>Timpanoga hecuba</i>
A Mayfly	<i>Plauditus punctiventris</i>
Northern Rocky Mountains Refugium Mayfly	<i>Caudatella edmundsi</i>
A Mayfly	<i>Caudatella hystrix</i>
Large Marble	<i>Euchloe ausonides</i>
Gillette's Checkerspot	<i>Euphydrys gillettii</i>
Hayden's Ringlet	<i>Coenonympha haydenii</i>
Pacific Spiketail	<i>Cordulegaster dorsalis</i>
Blue-eyed Darner	<i>Rhionaeschna multicolor</i>
Mountain Emerald	<i>Somatochlora semicircularis</i>
White-faced Meadowhawk	<i>Sympetrum obtrusum</i>
Last Best Place Damselfly	<i>Enallagma optimolocus</i>
A Stonefly	<i>Despaxia augusta</i>
A Stonefly	<i>Amphinemura banksi</i>
A Stonefly	<i>Zapada cinctipes</i>
A Stonefly	<i>Zapada columbiana</i>
A Stonefly	<i>Zapada oregonensis</i>
A Stonefly	<i>Yoraperla brevis</i>
A Stonefly	<i>Doroneuria theodora</i>
A Stonefly	<i>Hesperoperla pacifica</i>
A Stonefly	<i>Claassenia sabulosa</i>
A Stonefly	<i>Setvena bradleyi</i>
A Caddisfly	<i>Rhyacophila betteni</i>
A Rhyacophilan Caddisfly	<i>Rhyacophila brunnea</i>
An Agapetus Caddisfly	<i>Agapetus montanus</i>
A Caddisfly	<i>Hydropsyche confusa</i>
A Caddisfly	<i>Parapsyche elsis</i>
A Caddisfly	<i>Lepidostoma cascadenense</i>
A Caddisfly	<i>Lepidostoma unicolor</i>
A Caddisfly	<i>Chyrandra centralis</i>
A Caddisfly	<i>Dicosmoecus atripes</i>
A Caddisfly	<i>Dicosmoecus gilvipes</i>

Common Name**Scientific Name****INVERTEBRATES (CONT.)**

A Rhyacophilan Caddisfly	<i>Rhyacophila alberta</i>
A Caddisfly	<i>Anagapetus debilis</i>
A Caddisfly	<i>Arctopsyche grandis</i>
A Rhyacophilan Caddisfly	<i>Rhyacophila narvae</i>
A Rhyacophilan Caddisfly	<i>Rhyacophila verrula</i>
A Caddisfly	<i>Neophylax splendens</i>
A Caddisfly	<i>Neothremma alicia</i>
A Caddisfly	<i>Micrasema bacro</i>
A Limnephilid Caddisfly	<i>Nemotaulius hostilis</i>
A Caddisfly	<i>Hesperophylax designatus</i>
A Caddisfly	<i>Onocosmoecus unicolor</i>
A Caddisfly	<i>Brachycentrus americanus</i>
A Caddisfly	<i>Brachycentrus occidentalis</i>
Western Pearlshell	<i>Margaritifera falcata</i>
Grooved Fingernailclam	<i>Sphaerium simile</i>
Forest Disc	<i>Discus whitneyi</i>
Magnum Mantleslug	<i>Magnipelta mycophaga</i>
Smoky Taildropper	<i>Prophysaon humile</i>
Brown Hive	<i>Euconulus fulvus</i>
Quick Gloss	<i>Zonitoides arboreus</i>
Meadow Slug	<i>Deroceras laeve</i>
Spruce Snail	<i>Microphysula ingersolli</i>
Alpine Mountainsnail	<i>Oreohelix alpina</i>
Carinate Mountainsnail	<i>Oreohelix elrodi</i>
Rocky Mountainsnail	<i>Oreohelix strigosa</i>
Subalpine Mountainsnail	<i>Oreohelix subrudis</i>
Lyre Mantleslug	<i>Udosarx lyrata</i>
Wrinkled Marshsnail	<i>Stagnicola caperata</i>
Two-ridge Rams-horn	<i>Helisoma anceps</i>
A Millipede	<i>Corypus cochlearis</i>
A Millipede	<i>Ergodesmus compactus</i>
A Millipede	<i>Lophomus laxus</i>
A Millipede	<i>Endopus parvipes</i>
A Freshwater Sponge	<i>Ephydatia cooperensis</i>

* non-native species

Appendix C. Explanation of Montana Natural Heritage Program Ranks.

The Montana Natural Heritage Program employs a standardized ranking system to denote global (G) and state (S) status. Species are assigned numeric ranks ranging from 1 (critically imperiled) to 5 (demonstrably secure), reflecting the relative degree to which they are "at-risk." Rank definitions are given below. A number of factors are considered in assigning ranks - the number, size and distribution of known "occurrences" or populations, population trends (if known), habitat sensitivity, life history traits and threats.

G1 S1

At high risk because of extremely limited and potentially declining numbers, extent and/or habitat, making it highly vulnerable to global extinction or extirpation in the state.

G2 S2

At risk because of very limited and potentially declining numbers, extent and/or habitat, making it vulnerable to global extinction or extirpation in the state.

G3 S3

Potentially at risk because of limited and potentially declining numbers, extent and/or habitat, even though it may be abundant in some areas.

G4 S4

Uncommon but not rare (although it may be rare in parts of its range), and usually widespread. Apparently not vulnerable in most of its range, but possibly cause for long-term concern.

G5 S5

Common, widespread and abundant (although it may be rare in parts of its range). Not vulnerable in most of its range.

GX SX

Presumed Extinct or Extirpated - Species is believed to be extinct throughout its range or extirpated in Montana. Not located despite intensive searches of historical sites and other appropriate habitat, and small likelihood that it will ever be rediscovered.

GH SH

Possibly Extinct or Extirpated - Species is known only from historical records, but may nevertheless still be extant; additional surveys are needed.

GNR SNR

Not yet ranked.

GU SU

Unrankable - Species currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

GNA SNA

A conservation status rank is not applicable for one of the following reasons:
The taxa is of Hybrid Origin; is Exotic or Introduced; is Accidental or is Not Confidently Present in the state. (see other codes below)

Other Codes and Modifiers:

HYB

Hybrid-Entity not ranked because it represents an interspecific hybrid and not a species.

T

Intraspecific Taxon (trinomial) - The status of intraspecific taxa (subspecies or varieties) are indicated by a "T-rank" following the species' global rank.

?

Inexact Numeric Rank - Denotes inexact numeric rank.

Q

Questionable taxonomy that may reduce conservation priority-Distinctiveness of this entity as a taxon at the current level is questionable; resolution of this uncertainty may result in change from a species to a subspecies or hybrid, or inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority (numerically higher) conservation status rank.

C

Captive or Cultivated Only - Species at present is extant only in captivity or cultivation, or as a reintroduced population not yet established.

A

Accidental - Species is accidental or casual in Montana, in other words, infrequent and outside usual range. Includes species (usually birds or butterflies) recorded once or only a few times at a location. A few of these species may have bred on the one or two occasions they were recorded.

SYN

Synonym - Species reported as occurring in Montana, but the Montana Natural Heritage Program does not recognize the taxon; therefore the species is not assigned a rank.

B

Breeding - Rank refers to the breeding population of the species in Montana.

N

Nonbreeding - Rank refers to the non-breeding population of the species in Montana.

M

Migratory - Species occurs in Montana only during migration.

Appendix D. Vascular Plant Species Associated with Glacial Wetlands in the Ovando Valley (Lesica 1994).

Alismataceae

Alisma gramineum
Alisma plantago-aquatica
Sagittaria cuneata

Amaranthaceae

Amaranthus californicus

Apiaceae

Cicuta bulbifera
Cicuta douglasii
Sium suave

Asteraceae

Antennaria microphylla
Artemisia biennis
Artemisia ludoviciana
Aster brachyactis
Aster occidentalis
Aster pansus
Bidens cernua
*Cirsium arvense**
*Cirsium vulgare**
Conyza canadensis
Coreopsis atkinsoniana
Crepis runcinata
Erigeron lonchophyllus
Gnaphalium palustre
Grindellia howellii
Grindelia squarrosa
Haplopappus integrifolius
Helenium autumnale
Petasites sagittatus
Senecio debilis
Senecio foetidus
Senecio indecorus
Solidago canadensis
Solidago nana
*Sonchus uliginosus**
*Taraxacum officinale**

Betulaceae

Alnus incana
Betula glandulosa

Boraginaceae

Plagiobothrys scouleri

Brassicaceae

Hutchinsia procumbens
Rorippa curvisiliqua
Rorippa islandica

Rorippa obtusa

Callitrichaceae

Callitriche hermaphroditica
Callitriche heterophylla

Chenopodiaceae

Atriplex truncata
Chenopodium glaucum
Chenopodium rubrum
Salicornia rubra

Cyperaceae

Carex atherodes
Carex athrostachya
Carex aurea
Carex buxbaumii
Carex canescens
Carex chordorhiza
Carex cusickii
Carex diandra
Carex disperma
Carex flava
Carex interior
Carex lasiocarpa
Carex lanuginosa
Carex limosa
Carex microptera
Carex nebrascensis
Carex parryana
Carex praegracilis
Carex sartwellii
Carex scirpoidea
Carex stipata
Carex vesicaria
Eleocharis acicularis
Eleocharis palustris
Eriophorum viridicarinatum
Scirpus acutus
Scirpus americanus
Scirpus maritimus
Scirpus microcarpus

Droseraceae

Drosera anglica

Equisetaceae

Equisetum fluviatile
Equisetum variegatum

Fabaceae

Astragalus tenellus
*Medicago lupulina**

Trifolium longipes

Gentianaceae

Swertia perennis

Haloragaceae

Myriophyllum spicatum

Hippuridaceae

Hippuris vulgaris

Iridaceae

Iris missouriensis
Sisyrinchium angustifolium

Juncaceae

Juncus alpinus
Juncus balticus
Juncus bufonius
Juncus ensifolius
Juncus longistylis
Juncus tenuis

Juncaginaceae

Triglochin maritima

Lamiaceae

Mentha arvensis
Prunella vulgaris
Scutellaria galericulata
Stachys palustris

Lemnaceae

Lemna minor
Lemna trisulca

Lentibulariaceae

Utricularia intermedia
Utricularia minor
Utricularia vulgaris

Liliaceae

Zigadenus elegans

Menyanthaceae

Menyanthes trifoliata

Najadaceae

Najas flexilis

Nymphaeaceae

Nuphar polysepalum

Onagraceae

Epilobium glaberrimum
Epilobium palustre

Orchidaceae

Habenaria dilatata
Habenaria hyperborea
Spiranthes romanzoffiana

Plantaginaceae

Plantago major*

Poaceae

Agrostis alba
Agrostis scabra
Alopecurus aequalis
Alopecurus pratensis*
Beckmannia syzigachne
Calamagrostis canadensis
Calamagrostis inexpansa
Calamagrostis neglecta
Deschampsia cespitosa
Distichlis stricta
Festuca pratensis*
Festuca rubra
Glyceria borealis
Glyceria grandis
Glyceria striata
Hierocloe odorata
Hordeum brachyantherum
Hordeum jubatum
Muhlenbergia asperifolia
Muhlenbergia richardsonis
Panicum capillare
Phalaris arundinacea*

Phleum pratense*
Poa nevadensis
Poa palustris*
Poa pratensis*
Polypogon monspeliensis
Puccinellia distans
Sphenopholis obtusata

Polygonaceae

Polygonum amphibium
Rumex crispus*
Rumex maritimus
Rumex occidentalis
Rumex salicifolius
Potamogetonaceae
Potamogeton crispus*
Potamogeton friesii
Potamogeton foliosus
Potamogeton gramineus
Potamogeton natans
Potamogeton pectinatus
Potamogeton pusillus
Potamogeton richardsonii
Potamogeton zosteriformis

Ranunculaceae

Ranunculus acriformis
Ranunculus aquatilis
Ranunculus cymbalaria
Ranunculus flammula
Ranunculus gmelinii
Ranunculus macounii
Ranunculus sceleratus

Rosaceae

Geum macrophyllum

Potentilla biennis
Potentilla gracilis
Potentilla palustris

Rubiaceae

Galium trifidum

Ruppiaceae

Ruppia maritima

Salicaceae

Salix bebbiana
Salix boothii
Salix candida
Salix drummondiana
Salix exigua
Salix planifolia

Scrophulariaceae

Mimulus guttatus
Mimulus moschatus
Pedicularis groenlandica
Veronica americana
Veronica catenata
Veronica peregrina

Sparganiaceae

Sparganium emersum
Sparganium minimum

Typhaceae

Typha latifolia

(* exotic species)

Appendix E. Native Salmonid Viability: Definitions of Key Attributes.

Notes excerpted from Native Salmonid Work Group Meetings.

Condition

(The following four elements of condition are bull trout population demographic characteristics influencing the risk of local extinction).

Abundance:

Very Good: Spawning adults consistently abundant (average more than 100).

Good: Spawning adults common. (average more than 10 but less than 100)

Fair: Spawning adults low or highly variable (average less than 10 or vary substantially between less than and more than 10; but are consistently present)

Poor: Spawning adults occur only occasionally, or adult numbers are unknown

Note: The number includes the adults in the local population associated with or including this 6th code. The extent of the local population may extend beyond a single 6th code or may be contained entirely within it. Suitable spawning habitats that are discontinuous but within a few kilometers could be expected to exchange adults through dispersal (e.g., Whiteley et al. 2004). The numbers are based on the 50:500 rules of thumb from conservation biology and the approximation of effective population size given demographic characteristics of typical bull trout populations (Rieman and Allendorf 2003). Specifically a consistent average of effective spawners higher than 50 is believed important to minimize the effects of inbreeding depression and 500 is important to maintain long-term genetic diversity. Few populations will exceed 500 adults so this number must be maintained through dispersal, gene flow and the demographic linkage among populations at a broader level. This should be a contextual variable considered later when we roll up the major population groups. The number is an average (strictly the harmonic mean) of the adults spawning over an extended period of time. Because of generation times, reproductive and other demographic characteristics a conservative estimate of the effective population size is approximately twice the average number of adults spawning per year (See Rieman and Allendorf 2001 for details). If the population reaches these numbers but varies a lot and is commonly lower, the effective population size is lower. The number of adults should include both migratory and resident fish, males and females. The number might be approximated through regular or periodic redd counts, but that will require some assumption or observation of the number of adults per redd count (some estimates range from 2 to 3 total adults for observed redd). If there is no information to judge abundance, the estimates should be conservative. If bull trout are known to occur at numbers that exceed a threshold, but no long term perspective is possible, the next lower class should be selected, e.g., Morrell Creek and West Fork Clearwater have supported redd counts or adult population estimates that would represent more than 50 adults and conceivably more than 100, but long term averages are not available and the populations are also known to fluctuate dramatically from year to year. They would be classified as either fair or good depending on the interpretation of existing data. Estimates of abundance in tributaries could be extrapolated to approximate adult numbers based on typical age structure information. For example the number of adults in any population might be assumed to be approximately 10% of the fish \geq age 1. So an extrapolation of at least 1,000 resident fish

could equate to an adult population of approximately 100. Generally populations with average to high abundance and roughly 10 km of available habitat would be close.

Life History Expression

Very Good: All potential migratory life histories are abundant or dominant

Good: Migratory life histories occurs, but access through corridors or to rearing areas occasionally limited

Fair: Migratory life history occurs, but relative abundance is low or adult access is blocked or limited during typical migration periods

Poor: No migratory life histories. Local population is isolated by permanent impassible barrier; OR life history expression unknown

Note: The full expression of life history is believed to represent important biological diversity in bull trout populations. Migratory life histories also contribute to the resilience of populations because they tend to be more fecund, may resist hybridization with brook trout or competition with other species. If migratory adults occur resident life histories probably occur as well, but may be restricted in abundance or distribution by the presence of the migratory form. Thus the occurrence of the migratory life history should really reflect the full expression and diversity of the population. Life history diversity may be an important hedge against habitat loss or degradation, non-native invasion, and climate change (Fausch et al. 2006; Hilborn et al. 2003) and a primary mechanism facilitating gene flow and dispersal among local populations (Rieman and Dunham 2000).

Genetic Integrity

Not Applicable for bull trout

Note: available information indicates hybridization is primarily limited to F1. When post F1 hybridization does occur, it does not appear to progress to full introgression.

Resilience

Very good- Population is stable and moderate to high abundance, or when reduced has the capacity to grow back quickly. Habitat is in excellent condition and expected to stay that way. Nonnative salmonids are not important.

Good- Population is stable at moderate abundance, or growing slowly. When reduced in abundance, population does slowly rebuild. Habitat is in good condition and nonnatives are not present or rare.

Fair- Population is stable at low to moderate abundance and or habitat is degraded, but not destroyed. Non-natives may be relatively abundant, but not dominant.

Poor- Population is declining and or habitat is in poor condition and nonnatives are abundant or dominate the community. OR nothing is known about resilience.

Size

Extent of habitat network within the 6th code

Very Good- the length of the interconnected stream network supporting spawning and rearing is > 20 km.

Good- the length of the interconnected stream network supporting spawning and rearing habitat is between 10 and 20 km in length.

Fair- the length is between 3 and 10 km.
Poor- the length is less than 3 km.

Note: The persistence of bull trout has been strongly associated with the size of the spawning and rearing habitat network or patch (Dunham and Rieman 1999, Dunham et al. 2002). The reasons may include the size of the population and the mitigation of small population effects and the diversity and extent of habitat minimizing the threat of catastrophic disturbances. This metric can be estimated from the extent of fish distribution identified in the existing MFWP inventories. Likely will require a GIS analysis, but might be done with a quick approximation using a mapped hydrography in each 6th code, the fish distribution maps, a map of existing barriers and a scale that can be placed on the mapped stream network.

Landscape Context

Water quality: Temperature, Sediment, and Chemical Contaminants

Very Good- all three elements are considered functioning acceptably
Good- two elements are functioning acceptably, one is functioning at risk
Fair- two or more elements are functioning at risk, none at unacceptable risk
Poor- one or more elements is functioning at unacceptable risk

Note: this would be based on the Forest Service Assessment for the encompassing 6th code (subwatershed). It might be modified with additional information if available, i.e., streams that are 303 d listed would be considered poor.

Habitat Structure: Large wood, width-depth, floodplain connectivity, stream bank condition

Very Good- all four elements are considered functioning acceptably
Good- three elements are functioning acceptably, one is functioning at risk
Fair- two or more elements are functioning at risk, none at unacceptable risk
Poor- one or more elements is functioning at unacceptable risk

Note: this would be based on the Forest Service Assessment for the encompassing 6th code (subwatershed). I've included only some of the elements in habitat and channel condition. Substrate, pools and off channel habitat were dropped because presumably they are correlated or represented by those selected.

Hydrology: Flow and Hydrology

Very Good- both elements are considered functioning acceptably
Good- One is functioning acceptable and one is functioning at risk
Fair- Two or more elements are functioning at risk,
Poor- One or more elements is functioning at unacceptable risk

Note: this would be based on the Forest Service Assessment for change in peak/base flows and drainage network increase for the encompassing 6th code (subwatershed). Additional data on water diversion might be used to consider condition.

Connectivity: Physical barriers

Very good- there are no barriers or impediments to fish migration from the 6th code to the lake or river environment where migratory life histories could be expected to rear or stage.

Good- Temporary or partial impediments or barriers may exist for juvenile movement, but only occasionally. There are no barriers to adult movements, or they exclude less than 25% of the 6th code spawning habitat

Fair- Temporary or partial impediments or barriers may exist for juvenile and adult movements; or permanent barriers may exist that exclude adult migrants from 25% to 75% of the 6th code spawning habitat

Poor-Permanent barriers exclude adult movement to spawning habitat in more than 75% of the 6th code.

Note: presumably this would be based on Forest Service inventory of fish passage barriers.

Appendix F. Invertebrate Species of Concern and Potential Species of Concern Associated with Herbaceous Wetlands West of the Continental Divide.¹

Group	Common Name	Scientific Name	MT Status ²	Global Rank ³	MT Rank	Habitat	Blackfoot	Seeley
Snails	Mountain Marshsnail	<i>Stagnicola montanensis</i>	SOC	G3	S1S3	wetlands/marshes	?	X
Butterflies	Eyed Brown	<i>Satyrodes eurydice</i>	SOC	G4	S2S3	wetlands/marshes	?	?
Butterflies	Frigga Fritillary	<i>Boloria frigga</i>	SOC	G5	S1S3	mountain wetlands	?	?
Butterflies	Gillett's Checkerspot	<i>Euphydryas gillettii</i>	SOC	G2G3	S2S3	wet meadows	X	X
Dragonflies	Boreal Whiteface	<i>Leucorrhinia borealis</i>	SOC	G5	S1	Wetlands	?	?
Dragonflies	Brush-tipped Emerald	<i>Somatochlora walshii</i>	SOC	G5	S1S2	Wetlands	?	?
Dragonflies	Subarctic Darner	<i>Aeshna subarctica</i>	SOC	G5	S1S2	Wetlands	?	?
Dragonflies	Western Pondhawk	<i>Erythemis collocata</i>	SOC	G5	S1S2	Wetlands	?	?
Dragonflies	California Darner	<i>Aeshna californica</i>	PSOC	G5 S3S5		wetland/lake w/ emergent vegetation	?	?
Dragonflies	Chalk-fronted Corporal	<i>Ladona julia</i>	PSOC	G5 S3S4		wetland/lake w/ emergent vegetation	?	?
Dragonflies	Crimson-ringed Whiteface	<i>Leucorrhinia glacialis</i>	PSOC	G5 S3		wetland/lake w/ emergent vegetation	X	X
Dragonflies	Lake Darner	<i>Aeshna eremita</i>	PSOC	G5 S3S4		wetland/lake w/ emergent vegetation	?	?
Dragonflies	Lance-tipped Darner	<i>Aeshna constricta</i>	PSOC	G5 S1S3		wetland/lake w/ emergent vegetation	?	?
Dragonflies	Hudsonian Emerald	<i>Somatochlora hudsonica</i>	PSOC	G5 S2S4		wetland/lake w/ emergent vegetation	X	X
Dragonflies	Mountain Emerald	<i>Somatochlora semicircularis</i>	PSOC	G5 S3S5		Wetlands	X	X
Dragonflies	Ocellated Emerald	<i>Somatochlora minor</i>	PSOC	G5 S2S4		wetland/lake w/ emergent vegetation	?	?
Dragonflies	Red-veined Meadowhawk	<i>Sympetrum madidum</i>	PSOC	G4 S2S3		wetland/lake w/ emergent vegetation	?	?
Dragonflies	Ringed Emerald	<i>Somatochlora albicincta</i>	PSOC	G5 S1S3		wetlands	?	?
Dragonflies	Sedge Darner	<i>Aeshna juncea</i>	PSOC	G5 S3S5		Wetlands	?	?
Dragonflies	Spiny Baskettail	<i>Epitheca spinigera</i>	PSOC	G5 S3S5		wetland/lake w/ emergent vegetation	?	?

¹ Source: Dave Stagliano, Montana Natural Heritage Program

² SOC: Species of Concern/Conservation Need; PSOC: Potential Species of Concern/Conservation Need

³ Global (G) and state (S) ranks are explained in Appendix C.

Appendix G. Montana State Noxious Weed List (3/27/08).

Category 1.

Category 1 noxious weeds are weeds that are currently established and generally widespread in many counties of the state. Management criteria include awareness and education, containment and suppression of existing infestations and prevention of new infestations. These weeds are capable of rapid spread and render land unfit or greatly limit beneficial uses.

- (a) Canada thistle (*Cirsium arvense*)
- (b) Field bindweed (*Convolvulus arvensis*)
- (c) Whitetop or Hoary cress (*Cardaria draba*)
- (d) Leafy spurge (*Euphorbia esula*)
- (e) Russian knapweed (*Centaurea repens*)
- (f) Spotted knapweed (*Centaurea maculosa*)
- (g) Diffuse knapweed (*Centaurea diffusa*)
- (h) Dalmatian toadflax (*Linaria dalmatica*)
- (i) St. Johnswort (*Hypericum perforatum*)
- (j) Sulfur (Erect) cinquefoil (*Potentilla recta*)
- (k) Common tansy (*Tanacetum vulgare*)
- (l) Oxeye-daisy (*Chrysanthemum leucanthemum* L.)
- (m) Houndstongue (*Cynoglossum officinale* L.)
- (n) Yellow toadflax (*Linaria vulgaris*)
- (o) Hoary alyssum (*Berteroa incana*)

Category 2.

Category 2 noxious weeds have recently been introduced into the state or are rapidly spreading from their current infestation sites. These weeds are capable of rapid spread and invasion of lands, rendering lands unfit for beneficial uses. Management criteria include awareness and education, monitoring and containment of known infestations and eradication where possible.

- (a) Purple loosestrife or lythrum (*Lythrum salicaria*, *L. virgatum*, and any hybrid crosses thereof).
- (b) Tansy ragwort (*Senecio jacobea* L.)
- (c) Meadow hawkweed complex (*Hieracium pratense*, *H. floribundum*, *H. piloselloides*)
- (d) Orange hawkweed (*Hieracium aurantiacum* L.)
- (e) Tall buttercup (*Ranunculus acris* L.)
- (f) Tamarisk [Saltcedar] (*Tamarix* spp.)
- (g) Perennial pepperweed (*Lepidium latifolium*)
- (h) Rush skeletonweed (*Chondrilla juncea*)
- (i) Yellowflag iris (*Iris pseudacorus*)
- (j) Blueweed (*Echium vulgare*)

Category 3.

Category 3 noxious weeds have not been detected in the state or may be found only in small, scattered, localized infestations. Management criteria include awareness and education, early detection and immediate action to eradicate infestations. These weeds are known pests in nearby states and are capable of rapid spread and render land unfit for beneficial uses.

- (a) Yellow starthistle (*Centaurea solstitialis*)
- (b) Common crupina (*Crupina vulgaris*)
- (c) Eurasian watermilfoil (*Myriophyllum spicatum*)
- (d) Dyer's woad (*Isatis tinctoria*)
- (e) Flowering rush (*Butomus umbellatus*)
- (f) Japanese knotweed complex (*Polygonum cuspidatum*, *sachalinense* & *polystachyum*)

Category 4.

Category 4 noxious weeds are invasive plants and may cause significant economic or environmental impacts if allowed to become established in Montana. Management criteria include prohibition from sale by the nursery trade. Research and monitoring may result in the plant being listed in a different category.

- (a) Scotch broom (*Cytisus scoparius*)

Appendix H. Blackfoot River Valley Conservation Area Monitoring Plan (DRAFT 2007).

Indicator	Target (s)	Key Attribute	Threats Reference	Methods	Priority	Who monitors
Fish Population Measures						
Connectivity of fluvial trout populations	native salmonids	Connectivity within tributaries and to the Blackfoot River	<ul style="list-style-type: none"> • Construction and operation of drainage or diversion systems, dikes and ditches. • Roads – stream crossings • Milltown Dam 	Refer to FWP methods to obtain fisheries data	High	MT DFWP gathers fish data. Obtain data and summarize from their reports
Distribution of fluvial trout populations	native salmonids	Distribution of pure-strain westslope cutthroat and bull trout populations	<ul style="list-style-type: none"> • Construction and operation of drainage or diversion systems, dikes and ditches. • Grazing Practices • Roads – stream crossings • Invasive/ Alien Species • Milltown dam 	Assess the current distribution of native salmonid species to an historic one. Need to develop measures that place percent of unoccupied habitat into appropriate category. Work with FWP.	High	Data gathered by MT DFWP. Summarized by TNC
Trout redd and juvenile counts	native salmonids	Reproduction Success	<ul style="list-style-type: none"> • (none – viability measure) 	This is a count of reproductive measures (redds/ juveniles) that is related to a baseline condition. Measures need to be developed. Work with FWP to see how we can use their data.	High	MT DFWP gathers data, TNC summarize

Indicator	Target (s)	Key Attribute	Threats Reference	Methods	Priority	Who monitors
Grizzly Bear Habitat Measures						
Grizzly bear use of available habitat	grizzly bear	Secure Available Habitat	<ul style="list-style-type: none"> • Road development/use • Livestock production • Residential development • Second home resort development • Recreational use • Parasites/pathogens 	Use CEM Model to determine	High	USFS, FWP CEM Model will provide data
Grizzly Bear Population Measures						
Grizzly bear linkage zone intactness and/or number of barriers to g bear movement	grizzly bear	Habitat Connectivity	<ul style="list-style-type: none"> • Road development/use • Livestock production • Residential development • Second home resort development • Recreational use 	Need to identify linkage zones and barriers to movement, then determine method to measure. Can use CEM model to help determine these.	High	USFS, FWP CEM Model will provide data
Grizzly bear population demography: Reproductive success/ mortality	grizzly bear	Viable population	<ul style="list-style-type: none"> • Viability measure • Poaching 	Use FWP observation and population trend monitoring data. Consult the annual reports.	High	FWP
Grizzly bear population and population trend	grizzly bear	Population size and trend	<ul style="list-style-type: none"> • Viability measure 	Population Trend monitoring Study and DNA Study	High	NPS, FWP, USFWS

Indicator	Target (s)	Key Attribute	Threats Reference	Methods	Priority	Who monitors
Grizzly bear incidences or conflicts with livestock/ residences	grizzly bear	Bear/ Human Harmony	<ul style="list-style-type: none"> • Livestock production • Residential development • Second home resort development • Recreational use 	Use FWP annual conflict data reports	High	FWP
Bird Nesting Measures						
Nesting and fledgling success of loons and trumpeter swans	herbaceous wetlands	Quality of bird nesting (and rearing) habitat	<ul style="list-style-type: none"> • (none – viability measure) 	Loons are monitored and likely USFWS monitors Trumpeter Swans, refer to USFWS reports for the information on nesting and fledgling success	Medium	FWP? USFWS?
Blackfoot River Measures (Water Quality/Quantity)						
Seasonal surface river flow volumes	native salmonids	Functioning Hydrologic Regime- sufficient instream flows	<ul style="list-style-type: none"> • Construction and operation of drainage or diversion systems, dikes and ditches. 	Obtain USGS water flow data for Blackfoot River Gauge near Bonner MT (available on-line). Obtain an annual low flow (CFS) average for the months of June, July, August for the last 7 years. Average these low flows for the 7 year period. Place in appropriate category.	High	Data collected by USGS, to be summarized by TNC

Indicator	Target (s)	Key Attribute	Threats Reference	Methods	Priority	Who monitors
Water temperature and particulate level (TMDL)	native salmonids	Water quality	<ul style="list-style-type: none"> • Grazing/ livestock production practices • Mining practices • Milltown dam • Roads – stream crossings 	Obtain TMDL plans and data. Still need to develop indicator ratings and methods	High	Data gathered by Blackfoot Challenge Contractors? Summarized by TNC
Vegetation Community Measures – Invasive Species						
Amount of aggressive exotic species	herbaceous wetlands native grasslands/ sagebrush communities aspen and riparian woody vegetation	Native Vegetation Community	<ul style="list-style-type: none"> • Invasive/ alien species • Construction and operation of drainage or diversion systems, dikes and ditches. • Crop production Practices • Recreational Use • Residential development • Grazing Practices 	No methods developed yet. Would need to see if anyone is monitoring weeds at this scale. If not would need to develop sampling protocol to estimate area affected by aggressive exotic species. This probably will involve sampling	High	?
Vegetation Community Measures – Wetlands Condition						
Amount of filled, altered, or drained or otherwise disturbed herbaceous wetlands	herbaceous wetlands	Functional Hydrologic Regime: Intactness of wetland	<ul style="list-style-type: none"> • Construction and operation of drainage or diversion systems, dikes and ditches. • Crop production Practices • Conversion to agriculture • Filling 	Try to obtain information through aerial photo interp. If not possible a field sample may be required. Develop standards for what constitutes a drained, filled or altered wetland. This is simply a count of how many have been impaired.	Medium	?

Indicator	Target (s)	Key Attribute	Threats Reference	Methods	Priority	Who monitors
Number, distribution, and size of wetlands	herbaceous wetlands	Number, distribution and size of wetlands	<ul style="list-style-type: none"> • Construction and operation of drainage or diversion systems, dikes and ditches. • Crop production Practices • Conversion to agriculture • Filling 	Aerial Photo interp or NWI assessment of wetland area	Medium	?
Age class distribution of aspen, and riparian woody vegetation types	aspen and riparian woody vegetation	Functioning disturbance regime (fire, browsing, beaver)	<ul style="list-style-type: none"> • Construction and operation of drainage or diversion systems, dikes and ditches. • Channelization of rivers and streams • Residential development • Conversion to agriculture • Fire suppression • Grazing practices 	None developed yet. Need to field measure condition of woody riparian and aspen stands.	Medium	?
Miles/acres of aspen and riparian woody vegetation	aspen and riparian woody vegetation	Number, Size, or Area of aspen and riparian woody vegetation	<ul style="list-style-type: none"> • Construction and operation of drainage or diversion systems, dikes and ditches. • Channelization of rivers and streams • Residential development • Conversion to agriculture • Grazing practices 	Methods not developed. May be able to complete with aerial photo interpretation.	Medium	?

Indicator	Target (s)	Key Attribute	Threats Reference	Methods	Priority	Who monitors
Vegetation Community Measures – Grasslands/ Sagebrush Condition						
Fire Return Interval of grassland/ sagebrush communities	native grasslands/ sagebrush communities	Functioning fire regime	<ul style="list-style-type: none"> • Fire suppression 	Not developed	Medium	?
Areal extent of grasslands/ sagebrush communities	native grasslands/ sagebrush communities	Area/ Size of grasslands/ sagebrush communities	<ul style="list-style-type: none"> • Fire suppression • Conversion to agriculture • Grazing practices • Invasive/ alien species • Residential development 	Need to calculate HRV and compare current coverage. Need to determine resolution of veg mapping (community level) and method of sampling (remote sensing? aerial photos?). Not sure how HRV is determined in open country (consult with EMRI)	Medium	?
Vegetation Community Measures – Forest Condition						
Amount and distribution of cone producing whitebark pine stands	mid to high elevation coniferous forest	Areal extent of cone producing white bark pine stands	<ul style="list-style-type: none"> • Fire suppression • Parasites/ pathogens 	Use USFS vegetation surveys to determine covertype/ PNV type distribution in conjunction with cone production surveys (they may be on a different monitoring interval)	Medium	USFS inventory for data?

Indicator	Target (s)	Key Attribute	Threats Reference	Methods	Priority	Who monitors
Fire Regime Condition of forest types	mid to high elevation coniferous forest	Functioning disturbance regime - fire	<ul style="list-style-type: none"> • Fire suppression • Forestry practices 	Utilize USFS FRCC models	Medium	USFS has models that can be summarized
Departure from Historic Range of Variability of forest types	mid to high elevation coniferous forest low-elevation ponderosa pine/western larch	Patch size and distribution of forest cover types and age classes	<ul style="list-style-type: none"> • Fire suppression • Forestry practices 	Use patch dynamic analyses, HRV, veg mapping and Fragstats etc. need to explore these methods and if they are available. Emphasize the presence of large diameter trees/stands in the low-elevation forest targets	Medium	? Is USFS doing this?
Percent of ponderosa pine/larch stands that have fire/fire surrogate treatment	low-elevation ponderosa pine/western larch	Functioning disturbance regime - fire	<ul style="list-style-type: none"> • none (viability measure) 	Not sure: Aerial photo interp, USFS Models, FRCC, field sampling?	High	USFS has models that can be summarized

Appendix I. Acronyms and Abbreviations.

BBCTU	Big Blackfoot Chapter, Trout Unlimited
BBS	Breeding Bird Survey
BC	Blackfoot Challenge
BCCA	Blackfoot Community Conservation Area
BFS	Basin Fill Sediment Unit
BLM	U.S. Bureau of Land Management
BLM	U.S. Bureau of Land Management
BMP	Best Management Practice
BPA	Bonneville Power Administration
CBWTP	Columbia Basin Water Transaction Program
COCE	Crown of the Continent Ecosystem
CRC	Clearwater Resource Council
CRP	Conservation Reserve Program
CWA	Clean Water Act
EPA	Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land and Policy Management Act
FRI	Fire-Return Interval
FVLT	Five Valleys Land Trust
GRP	Grasslands Reserve Program
GLCI	Grazing Lands Conservation Initiative
HCP	Habitat Conservation Plan
INFISH	Inland Native Fish Strategy
ITEEM	Integrated Transportation and Ecosystem Enhancements for Montana
LWCF	Land and Water Conservation Fund
MBTRT	Montana Bull Trout Restoration Team
MBTSG	Montana Bull Trout Scientific Group
MCA	Montana Code Annotated
MDEQ	Montana Department of Environmental Quality
MDNRC	Montana Department of Natural Resource Conservation
MDT	Montana Department of Transportation
MEPA	Montana Environmental Policy Act
MFWP	Montana Department of Fish, Wildlife and Parks
MLR	Montana Land Reliance
MTNHP	Montana Natural Heritage Program
NCDE	Northern Continental Divide Ecosystem
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPCC	Northwest Power and Conservation Council

Appendix I (continued)

NPS	National Park Service
NRCS	Natural Resources Conservation Service
PCTC	Plum Creek Timber Company
RLI	Rural Living Institute
RMEF	Rocky Mountain Elk Foundation
RRAFT	River Recreation Advisory for Tomorrow
SSURGO	Soil Survey Geographic Database
STATSGO	State Soil Geographic Database
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TU	Trout Unlimited
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
WHIP	Wildlife Habitat Incentives Program
WMA	Wildlife Management Area
WRP	Wetlands Reserve Program
WUI	Wildland-Urban Interface