Montana's Comprehensive Fish and Wildlife Conservation Strategy

Montana Fish, Wildlife & Parks
2005

The mission of Montana Fish, Wildlife & Parks is to provide for the stewardship of the fish, wildlife, parks, and recreational resources of Montana, while contributing to the quality of life for present and future generations. To carry out its mission, FWP strives to provide and support fiscally responsible programs that conserve, enhance, and protect Montana's 1) aquatic ecotypes, habitats, and species; 2) terrestrial ecotypes, habitats, and species; and 3) important cultural and recreational resources.

This document should be cited as *Montana's Comprehensive Fish and Wildlife Conservation Strategy.* 2005. Montana Fish, Wildlife & Parks, 1420 East Sixth Avenue, Helena, MT 59620.

Table of Contents

List of Figures

List of Tables

Index of Acronyms

AFA	Application for Federal Assistance
BLM	Bureau of Land Management
BOR	Bureau of Outdoor Recreation
CARA	Conservation and Reinvestment Act
CFWCS	Comprehensive Fish and Wildlife Conservation Strategy
CRP	Conservation Reserve Program
CPUE	Catch Per Unit Effort
D-J	Dingell-Johnson (Act)
DEQ	Department of Environmental Quality
DNRC	Department of Natural Resources
ESA	Endangered Species Act of 1973
FWP	(Montana) Fish, Wildlife & Parks
GAP 50	Geospacial Analysis Program (50 scale)
GYE	Greater Yellowstone Ecosystem
HUC	Hydrologic Unit Code
IAFWA	International Association of Fish and Wildlife Agencies
LWCF	Land and Water Conservation Fund
LIP	Land Incentives Program
MDOT	Montana Department of Transportation
MFWP	Montana Fish, Wildlife & Parks
MNHP	Natural Heritage Program
NPS	National Park Service
NRCS	Natural Resource Conservation Service
NWR	National Wildlife Refuge
PIF	Partners in Flight
PILT	Payment in Lieu of Taxes
POD	Point Observation Database
P-R	Pittman-Roberts (Act)
RNA	Research Natural Area
SOC	Species of Concern
SWG	State Wildlife Grants
TNC	The Nature Conservancy
TWS	The Wildlife Society
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WCRP	Wildlife Conservation and Restoration Program

FOREWORD

Montana, like other states, is rich in fish and wildlife but unfortunately not in the funds needed to address all species successfully.

Responding to the need for funding, Congress established the State Wildlife Grants (SWG) program in 2001. The funds support conservation projects for species historically overlooked because money’s been short. To ensure that funds are used efficiently and effectively, Congress charged each state to develop a comprehensive assessment of its fish and wildlife and the places they inhabit.

This is Montana's contribution to the nationwide effort to take a broad look at America's fish and wildlife. It is our hope that this Comprehensive Fish and Wildlife Conservation Strategy (CFWCS) will bring Montana a step closer to securing long-term federal funding needed to conserve and manage hundreds of species that fall in the conservation gap between the state's major game animals and those that are threatened or endangered.

This document not only identifies Montana's critical wildlife habitats and the animals that need special attention, it aims to keep fish and wildlife management decisions in the hands of Montana citizens by keeping species from becoming threatened or endangered.

FWP hopes this comprehensive assessment will enable Montana to build on past successes and broaden the agency's ability to fulfill its mission to conserve all species.

Jeff Hagener
Director
Montana Fish, Wildlife and Parks

Acknowledgements

The Comprehensive Fish and Wildlife Conservation Strategy was developed through the collaboration and hard work of many Fish, Wildlife & Parks (FWP) employees along with numerous agencies, organizations, and the public throughout Montana. A special thanks is extended to Montana's senators, the Honorable Conrad Burns and the Honorable Max Baucus, and Montana's member of the U.S. House of Representatives, the Honorable Denny Rehberg, who continue to support State Wildlife Grant funding. Although individual contributors are too numerous to recognize, we would like especially to acknowledge the critical support provided by the Montana Natural Heritage Program, NatureServe, The Nature Conservancy, the National Wildlife Federation, the Montana Wildlife Federation, Montana Audubon, the Defenders of Wildlife, the Rocky Mountain Elk Foundation, the Blackfoot Challenge, the Tribes of Montana, the University of Montana, Montana State University, U.S. Forest Service–Northern Region, and the Bureau of Land Management.

Introduction

History

By Mike Aderhold

For centuries Native Americans observed and hunted Montana's wildlife. Their stories, sketched on rocks and passed on by oral tradition, constitute Montana's earliest wildlife record.

Montana's scientific wildlife record started just 200 years ago with the observations of six members of the Lewis and Clark Expedition (Lewis, Clark, Ordway, Floyd, Gass, and Whitehouse). They followed a western tradition of writing notes on paper. These pioneering naturalists documented the rich variety of wild animals that existed in Montana at the dawn of European settlement.

Heading home in 1806, the Lewis and Clark Expedition passed trappers traveling west. These mountain men were soon followed by traders. They were followed by explorers, surveyors, wealthy tourists, pioneering women, prospectors, cowboys, miners, ranchers, missionaries, merchants, railroaders, tradesmen, speculators, entrepreneurs, wolfers, tuskers, and homesteaders. Their tradition was to live off the land as much as possible. The impacts on fish and wildlife were devastating.

In 1912 William Hornaday, then director of the New York Zoological Park, wrote to several Montanans asking about wildlife that had become extinct or was threatened with extinction. In his 1913 book, *Our Vanishing Wildlife,* it was noted in the Montana section that many birds were on the verge of extinction. But the only animals that had vanished from the wild were free-roaming bison, passenger

pigeons, and whooping cranes. Threatened animals included blue grouse, trumpeter swans, most waterfowl species, long-billed curlews, white-tailed ptarmigans, plovers, grizzly bears, and moose. Montana had fewer than 3,000 elk, less than 3,000 antelope, and very few deer east of the Rockies.

REACTION

The initial reaction of residents of the Montana Territory to their disappearing wildlife heritage included passage of protective legislation, creation of a wildlife agency, introduction of revenue-generating licenses, organization of an enforcement effort, and the start of a wildlife restoration program.

EARLY LEGISLATION (1864–1893)

The first Montana Territorial Legislature (1864–65) passed a bill requiring "…a rod or pole line and hook…to catch trout in the Territory." In 1876 a law was passed prohibiting fishing with explosives, and in 1881 a law was passed prohibiting the dumping of sawdust and mill waste into a stream. Starting in 1883 the popular pastime of collecting bird eggs was prohibited. In 1893 moose and elk hunting seasons were closed statewide.

CREATION OF A MONTANA WILDLIFE AGENCY (1901)

When Montana became the 41st state of the Union on November 8, 1889, county commissioners were empowered to hire one game warden for each county. There was either no money or little concern because no wardens were immediately appointed. By 1900 only 4 of the then 24 counties had hired game wardens. The first board of Fish and Game commissioners was appointed by Governor Robert A. Smith on March 4, 1895. A state game warden, R. A. Wagner, was appointed in July 1898.

The 1901 legislature, acting on a recommendation of the Fish and Game commissioners, organized the Montana Fish and Game Department (April 1, 1901). The charter created fish and game districts and authorized the appointment of up to eight "deputies"—one for each district. The new department received more than 1,000 applications for positions that paid $100 per month including travel expenses.

ENFORCEMENT (1886–1916)

It is impossible to regulate effectively without some degree of enforcement. This was discovered in Yellowstone National Park where, despite federal and state laws, market hunting, souvenir collecting, and livestock trespass were rampant. Early park superintendents and visiting naturalists documented the problem and finally appealed to War Department Secretary W. W. Belknap.

On August 20, 1886, Captain Moses Harris led M Troop, First United States Cavalry, into Mammoth Hot Springs, Wyoming. He took over the duties of the civilian superintendent, and his soldiers assumed the role of park police. Captain Harris was under orders from General Phil Sheridan to control the poachers, stop the vandalism, and protect the buffalo and elk.

Eight years later Congress would pass the Yellowstone Park Protection Act of 1894, giving the army some authority to arrest violators and confiscate their equipment. The army would stay in Yellowstone Park for 32 years and become the model for National Park Service rangers and western state game wardens.

Initially all of Montana's Fish and Game employees were commissioned law enforcement officers. The director was initially called the "State Game Warden," and the district employees were called "Deputy Game Wardens." One of the first assignments of new deputies was to travel throughout their districts posting the game laws.

FIRST LICENSES (1901–1905)

The 1901 legislature required nonresidents to purchase a $25 big game license, and a $15 license was required to hunt game birds. The first resident hunting and fishing license was created in 1905. The cost of the license was $1, at a time when a laborer's wage was $2 a day. Only one license was required per family. There were 30,220 licenses sold in 1905. Receipts for the year were $30,593.50, and expenses incurred by the Fish and Game were $16,788.40. In 1906 receipts totaled $24,491.13, and expenses were $17,410.95.

The new system required a support staff. The first year 300 justices of the peace were supported to some degree by license sales and fines for wildlife violations.

LAND PROTECTION AND RESTORATION (1872–1936)

In 1872 Congress set aside 3,300 square miles of land around the headwaters of the Yellowstone River "…to provide against the wanton destruction of fish and game… and against their capture or the destruction for the purpose of merchandise…" Yellowstone National Park and the enactment of its Protection Act in 1894 were the first field efforts to conserve wildlife habitat in the West.

President Benjamin Harrison started the first government "preserve" in 1892 when he set aside Afognak Island off the coast of Alaska for the protection of terrestrial wildlife, salmon, and sea mammals. President Theodore Roosevelt started the national "refuge" movement in 1903 with Pelican Island National Wildlife Refuge (NWR) off the east coast of Florida. Before leaving office in 1909, Roosevelt created 52 more wildlife refuges on federal land—all by "executive order." In 1908 Congress followed by authorizing federal funds to purchase

12,800 acres from the Flathead Indians for the first part of the National Bison Range.

Between 1911 and 1936 the state of Montana established 46 “preserves,” starting with the Snow Creek, Pryor Mountain, and Gallatin preserves in 1911 and the Sun River Preserve in 1913. Between 1913 and 1925 state refuges and preserves were established in 24 states.

The original “preserve” concept was to protect relic wildlife populations from hunting and human harassment. As these protected populations increased, they naturally spread to adjacent areas, and some resident animals were trapped and relocated to suitable habitat. In 1910, 25 elk from the northern Yellowstone Park winter range were relocated to Fleecer Mountain. This was the first Fish and Game relocation of a big game species. Butte and Anaconda hunters and anglers paid $5 per elk to cover the transportation cost.

In 1907 the Montana Legislature created a $1 resident fishing license. Some of this money was used the next year to open the first state fish hatchery in Anaconda. This hatchery was initially used to raise cutthroat trout to enhance populations throughout their Montana range.

Wardens and Forest Service personnel started surveying elk along the Rocky Mountain Front in 1903.

PITTMAN-ROBERTSON ACT (1937)

In 1936 the first North American Wildlife Conference brought together leaders of the most prominent conservation organizations and representatives from more than 20 agencies concerned about the nation’s wildlife resources. The “proceedings” of this meeting, compiled in one volume and now a collector’s item, brought together more information on the status of North American wildlife and the problems facing wildlife conservation than had ever been published. Out of this meeting came a commitment to develop a “national wildlife program.”

In 1937 the Senate Special Committee on the Conservation of Wildlife Resources and a similar committee in the House introduced a bill earmarking Depression Era excise taxes on sporting arms and ammunition to state wildlife agencies for conservation easements, development, and research. The Federal Aid in Wildlife Restoration Act, or Pittman-Robertson Act (named for the two committee chairmen, Rep. A. Willis Robertson, Virginia, and Sen. Key Pittman, Nevada), became law on September 2, 1937.

This law created a special fund that today continues to earn revenue from an 11 percent federal excise tax on firearms, ammunition, and archery equipment and a 10 percent tax on handguns. This fund is administered by the U.S. Fish and Wildlife Service. Most of the revenue is apportioned among the states by a

formula based on 50 percent on each state's geographic area and 50 percent on the number of hunting-license holders. No state receives less than one-half of 1 percent or more than 5 percent of the amount annually available. These federal allocations must be matched by state funds. States usually provide at least one license dollar for every three federal excise dollars (for every dollar of federal money, the states must match with 33.33 cents). One of the most farsighted features of the act was a 29-word requirement that each state prohibit diversion of hunting-license revenue to other uses. All 50 states have enacted such laws. The goal was to ensure that every state could sustain a long-term wildlife restoration and management program.

This foundation allowed Montana to buy land for wildlife (1938) and to employ its first wildlife biologists (1940). Since its passage, Montana has received $125,230,898 in apportionments (through FY 2004). Most of Montana's 84 Wildlife Management Areas were purchased with these matching funds.

In 1970 amendments to the P-R Act gave Montana an option. Instead of submitting individual projects, the state could submit a "comprehensive fish and wildlife resource management plan" covering a minimum of five years. Once approved, projects encompassed by this plan would be routinely funded.

DINGELL-JOHNSON ACT (1950)

During World War II, Congress enacted excise taxes on fishing equipment. After the war, Rep. John Dingell, Michigan, and Sen. Edwin Johnson, Colorado, put together a bill modeled closely after the P-R program, using revenues originally derived from the 10 percent federal excise tax on fishing rods, creels, reels, artificial lures, baits, and flies. Forty percent of this allocation is based on the state's geographic area and 60 percent on the number of fishing-license holders. This law also had a requirement that each state prohibit the diversion of fishing-license revenues, and there also was a requirement for a 1:3 state:federal match. The statute was officially called the Federal Aid in Sport Fish Restoration Act. Through FY 2004 Montana has received $103,378,741.

With this new funding the Montana Fish and Game Department (later Montana Fish, Wildlife & Parks) hired regional fisheries biologists and started a number of management projects including native fish management in rivers, the impact of logging on streams, fish problems at irrigation diversions, a study of the habits and habitat of native grayling, and, in 1955, the long-remembered exotic fish removal above the site of Tiber Dam.

It was also during the 1950s that the department's seven administrative regions were established, with regional offices set up in Kalispell, Missoula, Bozeman, Great Falls, Billings, Glasgow, and Miles City.

LAND AND WATER CONSERVATION FUND (1965)

In 1963, in response to increasing demands for outdoor recreation, Congress created the Bureau of Outdoor Recreation (BOR) in the Department of the Interior. Two years later, in 1965, Congress established the Land and Water Conservation Fund (LWCF), which uses monies from the disposal of federal surplus property, certain user fees, and a portion of the federal royalties from offshore (outer continental shelf) oil and gas production. Money from this fund is appropriated by Congress, and the amount varies. It has been as much as $900 million a year nationwide.

The broad purpose of LWCF is to "…provide a diversity of outdoor recreation resources which would allow individual active participation in a variety of outdoor pastimes…"

Up to 60 percent of the appropriation may be used to cost-share, on a 50:50 matching basis, certain activities carried out by the states, including "…planning, acquisition and development of needed land and water areas…" Responsibility for the program was transferred to the National Park Service in 1981.

Over the years this funding has been erratic. In 1965 the funding was $300 million; $600 million in 1978; and $900 million from 1980 through 1989. During the 1980s dozens of Montana communities funded swimming pools and tennis courts, and FWP's Parks Division purchased Wildhorse Island on Flathead Lake and parts of Giant Springs Heritage State Park in Great Falls.

During the 1990s the appropriations were greatly reduced, and the state/local component of the LWCF dropped to zero between 1995 and 1999. The Bureau of Land Management (BLM), U.S. Forest Service (USFS), and U.S. Fish and Wildlife Service (USFWS) all receive LWCF money, which has been used to purchase inholdings, wetlands, and some easements.

ENDANGERED SPECIES ACTS (1966, 1969, 1973)

During the 1960s concern grew about the status and conservation of our rarest plants and animals. There was prolonged debate about the role of government in protecting species threatened by human activities. The first result was the Endangered Species Preservation Act of 1966. That law directed the heads of all federal agencies within the Departments of Interior, Agriculture, and Defense to protect native wildlife declared "endangered." It also provided funds to acquire habitat for these animals, and it required the Secretary of the Interior to identify species in jeopardy.

In 1969 Congress passed the Endangered Species Conservation Act. It expanded the definition of "fish and wildlife" to include reptiles, amphibians, mollusks, and crustaceans. It expanded the listing to include animals classified

as “threatened with extinction,” and it made commercial traffic of “endangered” and “threatened” species illegal.

A few years later Congress enhanced the 1969 act to create the Endangered Species Act of 1973 (ESA). With a few changes this is the statute in use today. This law formalized the listing procedure and required the development of “recovery plans.” It increased criminal penalties, added funds for habitat acquisition, and put state “threatened” and “endangered” species under the clear authority and legal jurisdiction of the federal government.

There was also movement at the state level. In 1972 the International Association of Fish and Wildlife Agencies (IAFWA) and The Wildlife Society (TWS) developed a model state nongame and endangered species law. The 1973 Montana Legislature adopted this law on July 1, 1973. It granted Fish, Wildlife & Parks the authority to conserve resident “endangered” and “threatened” wildlife and to conduct nongame and endangered species research, acquire habitat for their use, and develop management programs for these species.

Presently, Montana has 14 species listed as either federally “threatened” or “endangered”—four birds, four mammals, three fish, and three plants. The nine threatened species include the bald eagle, piping plover, grizzly bear, gray wolf, Canada lynx, bull trout, water howellia, Spalding’s catchfly, and Ute ladies’-tresses. The five endangered species include the whooping crane, interior least tern, black-footed ferret, pallid sturgeon, and white sturgeon. Nationally there are now 276 threatened species, of which 147 are plants, and 987 endangered species, of which 599 are plants.

FORSYTHE-CHAFEE ACT (1980)

In 1980 Congress passed the Fish and Wildlife Conservation Act, which is also referred to as the Nongame Act or Forsythe-Chafee Act (John Chafee, Rhode Island, and Edwin Forsythe, New Jersey). This act was meant to promote the conservation of nongame fish and wildlife that receive relatively little (12 to13 percent, 1985, FWS estimate) assistance under the Pittman-Robertson and Dingell-Johnson statutes. The Forsythe-Chafee Act authorizes federal technical and financial assistance to the states, generally on a 75:25 federal to state matching basis, for the development of plans, programs, and projects benefiting nongame animals. “Nongame” is defined as those species “not ordinarily taken for sport” and which are not listed as “endangered” or “threatened” under the Endangered Species Act.

The Forsythe-Chafee Act was to be financed by general revenue appropriated annually by Congress. The statute authorized appropriations up to $5 million for fiscal years 1982–1985, but neither the Reagan Administration nor Congress ever appropriated any money.

The U.S. Fish and Wildlife Service studied 25 potential funding methods including general appropriations, various fees, and different excise taxes. In 1986 Congress held a hearing on nongame legislation and the financing study, but because of the deficits during the Reagan and the first Bush administrations, this nongame proposal stalled.

MITCHELL ADMENDMENT (1988)

During the 1980s some dramatic declines in shore birds and neotropical migrants were documented. Several bird conservation organizations made this concern a cause, and Congress responded by adjusting the U.S. Fish and Wildlife Service's budget expressly for bird monitoring. New Senate Majority Leader George Mitchell pointed out that the USFWS, under the Migratory Bird Treaty Act of 1918 and the Fish and Wildlife Conservation Act of 1980, had the responsibility to monitor all migrating birds, not just waterfowl and raptors. The USFWS needed to identify management actions before any particular species became listed as federally threatened or endangered.

This was a strong message from Congress that it was time for the USFWS and other wildlife agencies to reexamine their programs and establish new priorities for all wildlife species. The National Audubon Society dedicated 31 pages to this specific issue in its 1989/1990 Wildlife Report.

PARTNERS IN FLIGHT (1990)

Partners In Flight (PIF) is a cooperative effort involving federal, state, and local government agencies, philanthropic foundations, professional organizations, conservation groups, and the academic community. It was launched in 1990 to promote the conservation of birds not covered by existing conservation activities. Its initial focus was on neotropical migrants—species breeding in North America and wintering in Central and South America.

The goal of Partners In Flight is to focus resources to improve monitoring, inventory, research, management, and education programs involving birds and their habitats. This group and the North American Bird Conservation Initiative, Bird Conservation International, the National Audubon Society, and others have kept the pressure on for nongame funding.

TEAMING WITH WILDLIFE INITIATIVE (1995)

The Internation Association of Fish and Wildlife Agencies (IAFWA) was founded in 1902, and today it includes leaders of wildlife agencies throughout the United States, Canada, and several Central American countries. In 1995 this group took on the challenge of finding money for a comprehensive wildlife management program. Traditionally, wildlife programs in western states have been almost exclusively supported by hunters and anglers.

IAFWA recruited a “team” that included the American Fisheries Society, the Izaak Walton League, the National Wildlife Federation, the National Audubon Society, The Nature Conservancy, The Wildlife Society, the Wildlife Management Institute, and others. They developed a proposal to establish a federal tax on a variety of outdoor supplies including backpacks, sleeping bags, tents, canoes, binoculars, spotting scopes, photographic equipment, bird seed, feeders, etc. The money would be allocated to states to fund programs benefiting nongame wildlife.

This movement eventually attracted more than 3,000 supporting groups, and in 1998 the team introduced the initial version of the Conservation and Reinvestment Act (CARA).

MAGNUSON-STEVENS (1996)

During the 1980s and early 1990s, some coastal fish stocks diminished to the point where their survival was questioned. Senators Warren Magnuson, Washington, and Ted Stevens, Alaska, led the discussion about coastal species and their impact on the economy of coastal cities and towns. In the hearing for the Fishery Conservation and Management Act, much was said about the continuing loss of marine, estuarine, and other aquatic habitats. The law highlighted the need for a national program to address conservation and management of the fishery resources throughout the United States. This, along with mounting concern about bird species, added more impetus to the push for a broad-based fish and wildlife conservation program.

CONSERVATION AND REINVESTMENT ACT (CARA) (1997) FIRST ITERATION

The CARA concept came from two places. The first was the Teaming with Wildlife coalition, which initially settled on the “tried and successful” excise tax idea by which hunters and anglers supported the P-R and D-J programs. The challenge was how to get the millions of recreationists who do not hunt or fish to pony up a share of the money needed to research, monitor, and manage the majority of wildlife species not classified as “game.”

The “teaming” concept was a creative partnership of recreation groups, equipment manufacturers, retailers, state and local politicians, land management agencies, wildlife agencies, and others. The number of team members eventually surpassed 3,500. Each group wanted consideration for their special interest. The bill grew weekly and eventually had eight titles, or sections, dealing with a) coastal conservation, b) land and water funding—city parks and recreation areas, c) nongame funding, d) state parks programs, e) historic preservation initiatives, f) federal lands and Indian lands, g) conservation easement and species recovery programs, and h) federal payments in lieu of taxes (PILT payments).

This huge bill got a trial run in 1997. No one was prepared to embrace the whole thing. Unlike the gun manufacturers in 1937, many recreation equipment manufacturers and dealers were reluctant to advocate higher taxes for their customers and higher costs for their products. Some consumers broke ranks with their interest groups and expressed opposition. No senator or representative was willing to sponsor a bill with so many new taxes and so much new spending.

CONSERVATION AND REINVESTMENT ACT (CARA) (1998) SECOND ITERATION

Rather than collect money from people who buy outdoor products, some suggested using the federal royalties and taxes from offshore oil and gas leasing and production. That idea had been around since the Land and Water Conservation Fund (LWCF) was created in 1965.The revenue, which is more than $4 billion a year, generally goes directly to the Treasury. A slice of it had been pared out for the LWCF, but the bulk of this money had been used to balance the budget since the Carter Administration (1977–1981). The Clinton Administration was enjoying prosperity and a budget surplus, so in a bipartisan move, the proposed funding source for CARA was switched to offshore oil and gas royalties. CARA would guarantee $3 billion annually from the offshore drilling account for a 15-year period for all the programs in the original bill.

This idea started, not with the Teaming with Wildlife crew, but with a comparatively limited four-year-old proposal to use royalties from offshore oil and gas drilling to mitigate the damages caused by those activities. The initial draft plan would have created a revenue-sharing and coastal conservation fund for coastal states and the conservation of coastal areas.

Scores of lawmakers came on board at the prospect of guaranteed funding for their states. Hundreds of grassroots and national conservation groups continued to push the CARA idea in hope of winning earmarked money for their pet projects. President Clinton swore to make passage of CARA a priority in his final 2000 budget negotiations. All 50 governors supported CARA.

The Conservation and Reinvestment Act flew high the summer of 2000. It passed the House with a 315 to 102 vote and had 66 sponsors in the Senate. The Senate Energy and Natural Resources Subcommittee voted 13 to 7 to report the historic legislation to the full Senate.

As the Clinton Administration moved to a close, CARA encountered resistance. Some viewed the guaranteed, mandatory $45 billion, 15-year stream of funding as an “entitlement” that circumvented the appropriations process. Western legislators did not like the LWCF title and its potential to shift more land from the private to the public sector. Some senators balked at the magnitude of the spending and brought up concerns about Social Security and Medicare. Still others voiced concerns about the primary maintenance backlog in national parks

and national wildlife refuges, and suggested dealing with those problems before acquiring new land. Finally, some were angry at the administration's move to create a number of new national monuments.

In the fall, just before the November 2000 presidential election, the White House backed off the CARA proposal and worked out a compromise with the House Interior Appropriations Committee. The $3 billion a year, 15-year, guaranteed $45 billion package was reduced to a 6-year, $12 billion total discretionary fund called CARA Lite. President Clinton signed this bill (HR 4578) on October 11, 2000.

STATE WILDLIFE GRANTS (2001)

In 2001, during the first year of George W. Bush's administration, Congress created the State Wildlife Grant program (SWG). The purpose of State Wildlife Grant funding is to provide help to states to develop broad-based, comprehensive wildlife programs that address all vertebrate wildlife species. The hope is that implementation of such programs will avoid the expense and problems that come with recovering threatened and endangered species.

State Wildlife Grant monies are appropriated annually. So far Montana has received almost $4.5 million: $1.3 million in 2002, $1 million in 2003, $1.08 million in 2004, and $1.09 million in 2005; plus $852,710 from a one-time 2001 transition program called the Wildlife Conservation and Restoration Program (WCRP).

In Montana, some State Wildlife Grant funds have been used to survey prairie fish, restore native arctic grayling and westslope cutthroat trout, study sauger genetics and sauger movements in the Yellowstone River, investigate the status of native burbot, support management of the grizzly bear and the gray wolf, conserve black-tailed prairie dogs, and conduct a statewide inventory of small mammals.

To receive future funding, every state must develop a Comprehensive Fish and Wildlife Conservation Strategy by October 1, 2005. These strategies will help define a more integrated approach to the stewardship of all wildlife species with additional emphasis on species of concern and habitats at risk. The goal is to shift the focus from single species management and highly specialized individual efforts to a more geographically based, landscape-oriented fish and wildlife conservation effort.

Comprehensive Strategy Goals

Montana's Comprehensive Fish and Wildlife Conservation Strategy (CFWCS) embraces all vertebrate species known to exist in Montana, including both game and nongame species, as well as some invertebrate species (freshwater mussels and crayfish). In the early years of fish and wildlife management, the focus was clearly placed on game animals and their related habitats. This focus was, and continues to be, a result of almost all of the agency's funding being provided by hunters and anglers. Although FWP has no intention of reducing the attention focused on important game species, it is apparent that effective conservation actions directed to particular community types will benefit a variety of game and nongame species. As a result, FWP believes that with this new funding mechanism and conservation strategy in place, managing fish and wildlife more comprehensively is a natural progression in the effective conservation of the remarkable fish and wildlife resources of Montana.

Although game species are included in the Strategy, its priority is to describe those species and their related habitats that are in greatest conservation need. "In greatest conservation need" is interpreted to mean focus areas, community types, and species that are significantly degraded or declining, federally listed, or where important distribution and occurrence information to assess the status of individuals and/or groups of species is lacking. Because management of game species has been largely successful over the last 100 years, most have populations that are stable or increasing, and fewer were identified as in greatest conservation need (49 nongame, 11 game).

The methods and databases developed as part of this planning process are powerful tools that could be used in the future to help integrate other fish and wildlife management priorities as they are established. For this particular iteration of the Strategy, the following goals were developed:

- Identify all of Montana's fish and wildlife and related habitats in greatest need of conservation, and meet all eight requirements of WCRP and SWG

- Identify management strategies to conserve fish and wildlife and related habitats in greatest need

- Work independently and in partnership to conserve, enhance, and protect Montana's diverse fish and wildlife resources, and address each species equitably regardless of classification as game or nongame, rare or "at risk"

- Improve FWP's ability to address present and future funding challenges and opportunities

- Integrate monitoring and management of game and nongame fish and wildlife species

Eight Required Elements

Congress identified the required elements of this Strategy in the WCRP legislation, and the USFWS adopted those same elements as a condition of receiving WCRP and SWG funds.

1. Information on the distribution and abundance of species of wildlife, including low and declining populations, as the state management agency deems appropriate, that are indicative of the diversity and health of the state's wildlife.

2. Descriptions of locations and the relative condition of key habitats and community types essential to the conservation of species identified in (1).

3. Descriptions of problems that may adversely affect species or their habitats identified in (1) and priority research and survey efforts needed to identify factors that may assist in restoration and improved conservation of these species and habitats.

4. Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions.

5. Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions.

6. Descriptions of procedures to review the Comprehensive Strategy at intervals not to exceed ten years.

7. Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Strategy with federal, state, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats.

8. Congress has affirmed through WCRP and SWG and other guidance to FWP and our partners that broad public participation is an essential element of developing and implementing this Strategy, the projects that are carried out while this Strategy is being developed, and the species in greatest need of conservation that Congress has indicated such programs and projects are intended to address.

International Association of Fish and Wildlife Agencies Guidelines

In addition to the eight Congressional requirements, the International Association of Fish and Wildlife Agencies (IAFWA) and the U.S. Fish and Wildlife Service (USFWS) established supplemental guidelines to assist with Strategy development (Appendix A). These guidelines provided recommendations within four areas: 1) planning process and partnerships, 2) focus and scope, 3) format and content, and 4) completion, outcomes, and availability. FWP's CFWCS planning team used all of these guidelines in the creation of this document.

Planning Approach

Technical and Steering Committees

Development of the Strategy was guided by a steering committee and a technical committee. The technical committee served in an advisory capacity to the steering committee. Steering committee members guided the planning process including approach to the public and outside agency involvement; allocation of funds (Appendices B, C, and D) approval of methods and results for identifying habitats, species, and survey and inventory priorities; and internal preparation for implementation of the Strategy.

Steering Committee

Chris Smith	Chief of Staff
Larry Peterman	Chief of Field Operations
Ron Aashiem	Administrator of Conservation and Education
Mike Aderhold	Regional Supervisor
Don Childress	Administrator of Wildlife Division
Chris Hunter	Administrator of Fisheries Division

- Roles and Responsibilities: Provide policy-level direction and oversight to development of FWP's Comprehensive Fish and Wildlife Conservation Strategy and use of SWG funds; approve projects to be funded with SWG; and allocate SWG funds and FWP matching funds to support projects.

Technical Committee

Janet Hess-Herbert	Information Management Unit Leader
T.O. Smith	Fish and Wildlife Conservation Planning Coordinator
Adam Brooks	Federal Assistance Coordinator
Rebecca Cooper	Federal Assistance Specialist
Ken McDonald	Fisheries Management Bureau Chief
Tom Palmer	Information Bureau Chief
Jen Pelej	Information Specialist

Brad Schmitz	Regional Fisheries Manager
Jim Williams	Regional Wildlife Manager
Heidi Youmans	Nongame Bureau Chief
Graham Taylor	Regional Wildlife Manager

- Roles and Responsibilities: Assist in the development of FWP's Comprehensive Fish and Wildlife Conservation Strategy; identify, evaluate, and prioritize potential SWG projects; recommend allocation of SWG funds to the steering committee; develop Applications for Federal Assistance (AFA, a document required to receive SWG funds) and other required project documentation, including interim and final reports; and monitor implementation of projects, including tracking budgets and expenditures.

Exploratory Groups

FWP Staff Exploratory Group

A group of FWP staff was assembled early in the planning process at the request of the technical and steering committees to develop ideas about the most effective way to develop Montana's Strategy that would meet all eight Congressional requirements (Appendix E).

FWP Law Enforcement Exploratory Group

Enforcement officers were brought together as an exploratory group, and they identified the ways that law enforcement could help implement the priorities identified by Montana's Strategy if Congress would allow some of future allocated SWG funding to be used for enforcement activities (Appendix F).

Agency and Non-Governmental Organization Exploratory Group

Before planning began, agencies and organizations that manage significant land and water areas or have significant control over these areas were invited to participate in an advisory group meeting led by Jeff Hagener, FWP director. The goal of this meeting was to identify what level of involvement each of these groups wanted to have during the development of the Strategy. All of the participants indicated that their respective agencies and organizations were interested in the Strategy, would like to be informed of progress on the Strategy, and would be willing to provide support as needed. Most participants indicated that they wanted to have the opportunity to review the Strategy prior to its submission to the USFWS (Appendix G).

Public Involvement

Public involvement is critical to development of the Strategy for Montana and will become even more important as FWP moves toward implementation. The first steps toward gaining public involvement in development of the Strategy were to hold an advisory group meeting and conduct a mail-back survey. The purpose of the advisory group meeting, held in October 2003, was to identify what level of involvement stakeholder organizations wanted to have during the Strategy development process. The survey, on the other hand, was administered by mail to randomly selected Montana residents. The goal was to learn their opinions on the types of comprehensive management that SWG funds promote (see Survey Discussion below). The information obtained was used to aid development of the Comprehensive Strategy and will help direct its implementation.

In addition to the advisory group and survey, other public involvement tools were used to involve partner groups, fish and wildlife enthusiasts, landowners, and more. As part of the Strategy review process, FWP held seven public meetings, one per region, where 49 attendees learned more about the Strategy and provided comments. Printed drafts and visual aids were available at the public meetings. In addition, online news pages were developed on the FWP website at www.fwp.mt.gov, under “Wild Things.” Background information and the draft strategy were posted in a user-friendly format to facilitate review and comment. Press releases were issued regarding developments in SWG funding, the release of the draft Strategy for review, and its submittal for publication. All press releases were posted online as well. During the draft review, 59 FWP employees and 18 people either from the general public or representing organizations and other agencies submitted comments concerning the draft Strategy. Names and details of those commenting or attending meetings is available upon request.

After publication of the Strategy, extensive statewide outreach will occur. Outreach plans include print publications, educational materials and programs, press releases, online announcements, posters, magazine and television features, video, face-to-face communications, and more. Audiences will include elected officials (including county commissioners and board members), landowners, conservation groups, agricultural and industry interests, other government agencies, community leaders, tribes, educational institutions, fish and wildlife enthusiasts, hunters and anglers, media, etc. Montana’s public involvement efforts also will be linked to a national information campaign, led by the International Association of Fish and Wildlife Agencies.

The Comprehensive Strategy is designed to be collaborative with local communities and partner groups. Efforts will be made to distribute as much information as possible, solicit and incorporate feedback, and develop support and involvement in the implementation of recommended actions.

SWG Survey

FWP conducted a mail survey of Montana residents during late summer of 2004 to learn their opinions about the types of comprehensive management that SWG promotes. The goals of the survey were to:

- Better understand what Montanans think about FWP conserving *all* fish and wildlife species in Montana

- Provide information that will aid development and future implementation of Montana's Comprehensive Fish and Wildlife Conservation Strategy

Mail-back surveys were administered to 10,500 randomly selected households across Montana, and a nearly 30 percent response rate to the survey was achieved.

Survey Discussion

Overall, the survey results suggest that most Montanans are supportive of FWP taking a broader role when it comes to managing the state's diverse fish and wildlife. A majority of the survey respondents (62 percent) reported that it is important or very important to them that FWP ensure there are healthy populations of nongame animals.

Implementing the Strategy will be the biggest challenge, and at this point in time, providing the appropriate level of nonfederal match is the biggest concern. This survey asked two key questions related to funding: 1) Are Montanans supportive of FWP using some monies obtained from hunters and anglers to help match federal SWG funding, and 2) Are Montanans willing to help pay for the conservation of nongame animals in ways other than by purchasing hunting and/or fishing licenses and equipment?

Results from the survey revealed that most Montanans are supportive (56 percent) of FWP using some monies obtained from hunters and anglers to help match federal SWG funding. However, there were a significant number (32 percent) of respondents who reported this to be unacceptable to them. Furthermore, only about half of the hunter and anglers identified in the survey found this to be acceptable to them. These findings suggest that while it is acceptable for FWP to use some hunter and angler license dollars for this purpose, the agency needs to act prudently in doing so and should keep hunters and anglers informed of how their license dollars are being used.

Regarding other potential sources of funding to help match federal SWG funding, a majority of the survey respondents (61 percent) said they would not be willing to help pay for the conservation of nongame animals in ways other than by purchasing hunting and/or fishing licenses and equipment. From the survey it

appears that most Montanans are supportive of FWP taking a broader role when it comes to managing the state's fish and wildlife. Yet, most are unwilling to help directly pay for this in ways other than by purchasing hunting and fishing licenses.The results of the survey confirmed that securing alternative funding will be a major challenge for implementation of Montana's Comprehensive Fish and Wildlife Conservation Strategy in the future. Additional research on this topic is recommended if FWP is to successfully take the steps necessary to fully meet the needs of a broader constituency.

The Four Components of Montana's Strategy

Montana's Comprehensive Fish and Wildlife Conservation Strategy is organized into four components. Component I, focus areas, guides attention to specific geographical areas of Montana that are in greatest need of conservation. Component II, community types, identifies habitats along with their related fish and wildlife that are in greatest need of conservation throughout Montana regardless of location. Often, fish and wildlife within a community type face similar conservation concerns. Addressing these concerns using community level conservation allows many species to comprehensively benefit from conservation strategies. However, some species' populations have declined so far, or are so specialized, that conservation strategies aimed at focus areas or community types might not be effective. Therefore, Component III identifies the 60 fish and wildlife species in greatest need of conservation. The conservation concerns for these species should be addressed specifically whether through broad- or fine-scale actions. Finally, there are many species and groups of species for which we do not have available adequate occurrence data in order to determine their status. Component IV provides a list of the species and groups of species that are in greatest need of inventory.

Component I: Geographic focus areas in the landscape that contain significant fish and wildlife communities (species and their associated habitats) that are identified as being in greatest need of conservation.

> *This is a strategy to focus resources and efforts toward geographical areas where they can benefit the largest number of species and communities in need of conservation.*

Component II: Fish and wildlife community types that are in greatest need of conservation (seven identified).

> *This is a high-leverage strategy to address the conservation concerns of whole ecological communities or species groupings. Implementing conservation strategies at this level will comprehensively benefit many fish and wildlife species.*

Component III: Fish and wildlife species that are in greatest need of conservation (60 identified).

> *These are species whose needs must be specifically addressed, whether through focus areas, community types, or individually..*

Component IV: Species and groups of species to be targeted for inventory.

> *Over time, this Strategy will allow FWP to collect data 1) for species or species groups for which we do not have sufficient information to determine their level of conservation need, 2) for species that are important or are indicator species for the health of certain communities, or 3) for species used as measures of success in a comprehensive approach to fish and wildlife management.*

Categorizing the Levels of Conservation Need

Within each component, focus areas, community types, and species were prioritized into three tiers, based on their level of conservation need. Likewise, all species were prioritized for inventory needs using similar definitions. Please review the Methods section of the Strategy to understand how tiers were calculated for focus areas, communities, species, and inventory needs.

Tier I: Greatest conservation need. Montana Fish, Wildlife & Parks has a clear obligation to use its resources to implement conservation actions that provide direct benefit to these species, communities, and focus areas.

Tier II: Moderate conservation need. Montana Fish, Wildlife & Parks could use its resources to implement conservation actions that provide direct benefit to these species, communities, and focus areas.

Tier III: Lower conservation need. Although important to Montana's wildlife diversity, these species, communities, and focus areas are either abundant and widespread or are believed to have adequate conservation already in place.

Tier IV: Species that are non-native, incidental, or on the periphery of their range and are either expanding or very common in adjacent states.

How To Navigate This Strategy

Most users will be interested in particular components of the Strategy. Readers should decide if they are interested in landscape level conservation, a particular community type, or a specific species.

If You Are Interested in Landscape or Community Scale Conservation

Refer to the Table of Contents and directly reference the ecotype (Component I) or the community type (Component II) that you are interested in. For example, if you are interested in montane forests of western Montana, use the Table of Contents to locate Montane Forest Ecotype, and there you will find listed all individual focus areas under that ecotype. On the other hand, if you are interested in the riparian and wetland community type, refer to the Table of Contents under Component II and proceed to the appropriate page. Within the focus areas and community types, you will find descriptions and a map of the area or type, the fish and wildlife and habitats associated with each, and conservation concerns and strategies, as well as references to selected management plans.

If You Are Interested in Species Scale Conservation

If you are interested in a particular fish or wildlife species, you can use the Table of Contents and look under Component III to locate the page number for any Tier I species you are interested in. You can also use the Species Index (Page 640) and locate the page numbers for any species in the Strategy, regardless of tier. Tables for the focus areas, community types, and inventory needs associated with a species can also provide additional information such as lists of other species that are associated comprehensively with similar areas or community types.

If You Are Interested in Inventory

Proceed directly to the fourth component of the Strategy. Species groups and individual species that are in greatest need of inventory are listed taxonomically. Once you have found the species or group of interest, coded symbols are provided to the right of that species or group that indicate some of the reasons why they are in greatest need. A legend for these codes is provided at the beginning of the Component IV listings.

How This Strategy Works

When fully implemented, this Strategy is intended to be dynamic and is based on the concept that fine-scale information for any of Montana's species will be used to continually refine and adjust the classification for that species when appropriate. This will be accomplished using the inventory component of the Strategy. In turn, modifications to the list of species in greatest need of conservation should help redirect priorities in terms of the most at-risk community types. This information will then be used to direct attention to new geographical areas of Montana and help focus the delivery of the appropriate conservation efforts that help address the most critical areas, where possible. FWP has made every effort to use existing management plans to describe the conservation

concerns and strategies for focus areas, community types, and species. In this way the Strategy attempts to tie together many different plans at different levels in order to facilitate collaboration. A full list of conservation and management plans can be found in Table 1.

Implementing Montana's Comprehensive Strategy

Each of the focus areas, community types, species, and inventory needs along with their conservation concerns and strategies are the conservation priorities for Montana. If a focus area, community type, or species is identified as Tier I in this startegy it can be assumed that their current status is low, declining or imperiled. No conservation strategy identified in this document was singled out as more or less important than any other, because successful conservation of the species and habitats in greatest need will require addressing all of these concerns over time. In addition, singling out certain objectives at the strategic level reduces the flexibility of FWP and its partners to take advantage of conservation opportunities as they occur.

Several challenges must be met in order to successfully implement Montana's Conservation Strategy. First, because the document was developed at the strategic level following Congressional guidance, the conservation concerns and strategies that have been identified are intentionally broad in scope and will need to be further developed at the operational level as the Strategy is implemented. Second, SWG funding is allocated annually, and the amounts have so far been insufficient to fully implement the scope of this Strategy. In addition, the unstable nature of funding serves as a roadblock that could prevent FWP and its partners from committing to long-term projects. We anticipate that this funding status will remain the same in the near future.

These challenges will be met in several ways. Following the submission of Montana's Strategy to the USFWS, FWP and its partners will develop an Action Plan within the year that is operational in nature and that targets the Tier I focus areas, community types, species, and inventory needs that offer the greatest opportunity for leveraging our collective resources. These targets will be selected while considering the immediacy of conservation needs and the limited and varying nature of SWG funding. The conservation targets that are selected will have an operational plan developed that details specific priorities, objectives, actions, and responsibilities of FWP and its partners that will be accomplished prior to the next scheduled revision of the Strategy. In this way, FWP and its partners can more realistically narrow the vast conservation needs of Montana's species and habitats to more accurtately reflect the available levels of SWG funding and ongoing conservation efforts that can be leveraged.

Component I: Ecotype Focus Areas of Greatest Conservation Need

"This is a strategy to focus resources and efforts toward geographical areas where they can benefit the largest number of species and communities in need of conservation."

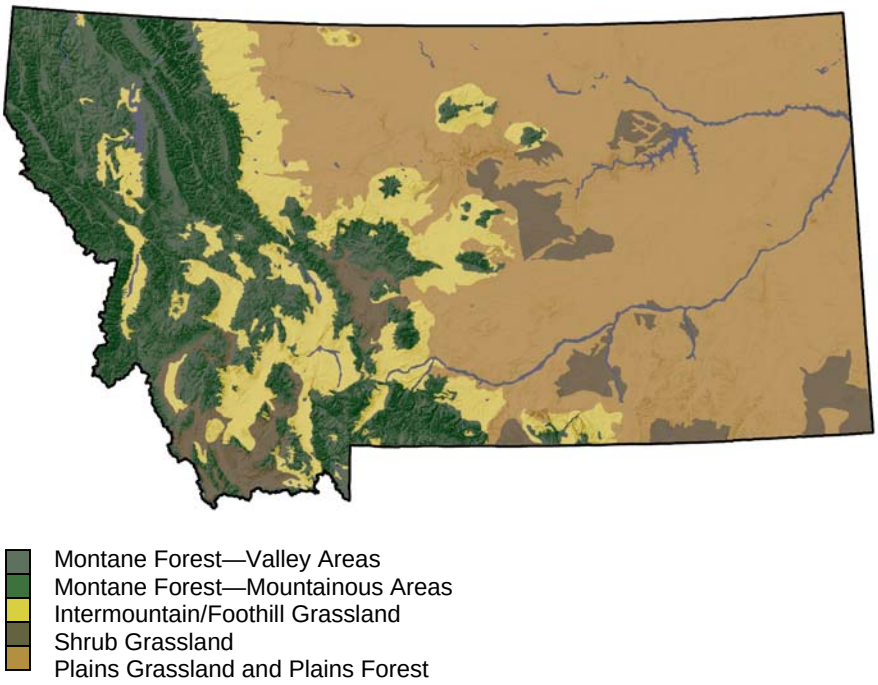


Figure 1. Ecotypes of Montana

Montana Fish, Wildlife & Parks (FWP) habitat programs currently use five ecotypes to describe the broad areas of Montana's landscape that have similar characteristics: intermountain/foothill grassland, montane forest, plains grassland, plains forest, shrub grassland, and riparian (Montana Fish, Wildlife & Parks 1991). For the Strategy, we combined the plains grassland and plains forest into one ecotype. We also defined riparian as a community type instead of an ecotype since it occurs throughout all of the other ecotypes.

Within each of the ecotypes, Tier I (greatest need of conservation) geographic focus areas were identified for all terrestrial and aquatic areas of the state (Apendices H and I). Due to their biological characteristics, aquatic and terrestrial focus areas were identified separately to facilitate implementation of conservation strategies, with the understanding that overlap does exist. For example, there is a Tier I focus area for the terrestrial Bitterroot Valley and also a Tier I focus area for the Bitteroot River. Although these systems occur in the same geographic area, management and conservation efforts often occur separately.

Only the areas in greatest need of conservation are described in the body of the Strategy. These areas guide our attention to locations that offer some of the best opportunity to conserve Montana's community types and fish and wildlife species in greatest need of conservation. Because stewardship (federal, tribal, state, and private ownership) was considered when assessing areas in greatest conservation need, many of the areas identified as Tier I are located on private land. Much of this private land occurs in the eastern portion of Montana. Within each focus area description, the habitats and species of greatest conservation need are listed for each area along with conservation concerns and strategies. Montana Fish, Wildlife & Parks, along with other state and federal agencies, private organizations, and the public, should leverage existing programs to conserve these areas. Specific agencies, organizations, or individuals will be effective at implementing many of the conservation strategies. However, due to the large amount of private land, landowner based and collaborative projects also should be encouraged. Conservation efforts that are under way by various groups that address the conservation strategies should be supported. In some cases working groups might need to be initiated to begin addressing conservation concerns. A good model for how working groups could operate is the Blackfoot Challenge. The Blackfoot Challenge is a Montana group that coordinates management of the Blackfoot River, its tributaries, and adjacent lands. It is organized locally and known nationally as a model for preserving the rural character and natural beauty of a watershed and surrounding areas. Although its charter dates to 1993, Blackfoot landowners have played an instrumental stewardship role since the late 1970s—bringing conservation easement legislation, walk-in hunting areas, and recreation corridor management to Montana. The Blackfoot Challenge can be contacted at Blackfoot Challenge, PO Box 103, Ovando, MT 59854, 406-793-3900.

Many wide-ranging species depend upon habitat connectivity for the long-term health of their populations. Although some information about fish and wildlife corridors can be found, it is typically focused on a single species or a limited area such as the Greater Yellowstone Ecosystem (GYE). A statewide, mapable assessment of important linkage areas does exist (American Wildlands Cooridors Map, 2003); however, conservation concerns such as habitat fragmentation and loss of connectivity occur at a wide variety of scales. Therefore, we did not address broad connectivity concerns in the initial assessment, but did so within each individual focus area and community type and for specific species. In the future, FWP and its partners should work to address concerns about the loss of important areas of fish and wildlife habitat connectivity.

Intermountain/Foothill Grassland Ecotype

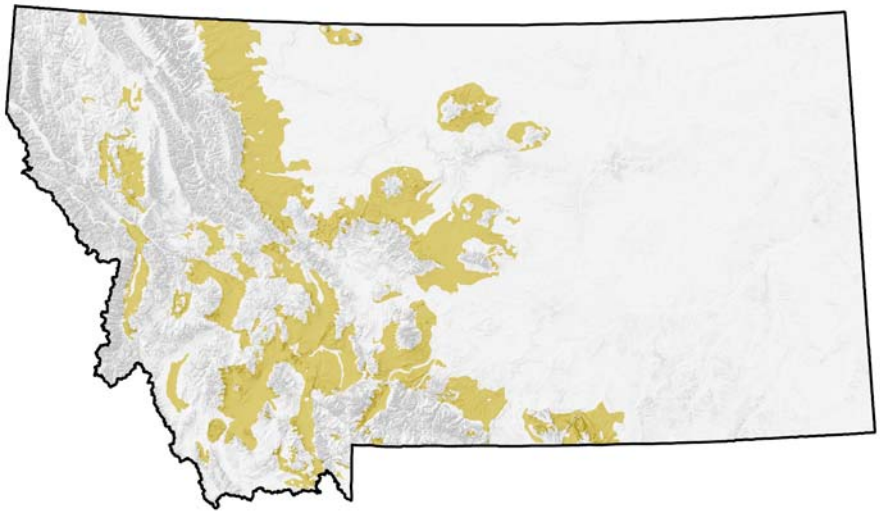


Figure 2. Intermountain/Foothill Grassland Ecotype

The intermountain/foothill grassland ecotype is a mosaic of private and public land that extends from the glaciated Flathead River Valley to the north, south to the Centennial Valley, and east to the Little Belt Foothils, where there remains some of Montana's most diverse fish and wildlife habitats. This western Montana ecotype harbors more wildlife communities than any other in Montana. It also harbors Montana's greatest concentration of human population in and near the towns of Kalispell, Missoula, Helena, and Bozeman. The attraction for wildlife and people is western Montana's broad, lush, and sweeping valleys cradled by the peaks of the Rocky Mountains. The intermountain/foothill grasslands are cut and formed by meandering rivers that create core riparian zones and wetland areas that often include glacial lakes and potholes that attract nesting waterbirds. Addressing the challenges that accompany the interface between human settlement and fish and wildlife and their habitats will be critical to the conservation of these areas.

Landscape Characteristics

The intermountain/foothill grassland ecotype includes 13,414,271 acres and represents 14.3 percent of Montana's land area. The intermountain/foothill grassland ecotype generally lies on level to moderate topography at valley bottoms or lower slopes of mountains, with the Flathead, Clark Fork, Bitterroot, Missouri, Big Hole, Beaverhead, Jefferson, Gallatin, Madison, Yellowstone, and Blackfoot rivers cutting through the ecotype. Elevations are lowest in some of the northwestern valley locations, in some cases below 3,000 feet. Elevations between 3,000 and 4,000 feet occur broadly in the Flathead/Mission and Tobacco valleys. The upper Townsend, Gallatin, and Blackfoot valleys, as well as much of the foothill region to the east of the mountains, are mostly between

4,000 and 5,000 feet. The Jefferson, Madison, Shields/Smith, Paradise, and Deerlodge valleys range from 4,500 to 5,500 feet. Due to glaciation, the northern part of the Flathead Basin contains hundreds of potholes, many of which retain water throughout the average summer.

Soils

Floors of the intermountain valleys of southwestern Montana are mostly composed of thousands of feet of tertiary valley fill deposited at the end of the first stage of mountain building. During the ice ages, the cordilleran ice sheet covered the northern part of the Flathead Basin at various times. Glacial Lake Missoula, formed from meltwater from this ice sheet, reached south into the Bitterroot Valley and west into what is now Washington. Sediments from this lake, plus outwash materials from the ice sheet, cover most of the valley bottoms of the southern part of the Flathead Basin (i.e., south Mission Valley and Hot Springs Valley). Lake sediments farther south (Missoula and Bitterroot valleys) apparently have been eroded away, exposing tertiary fill. The northern parts of the Flathead Basin as well as the Tobacco Valley are underlain by glacial till.

In some places the foothill areas are underlain by outwash from the adjacent mountains; however, more commonly the substrate is some form of sedimentary bedrock. The foothills along the eastern front (Bowman's Corner to the Canadian border), the area north and east of Livingston, and some of the area surrounding the Bears Paw and Little Rocky mountains is underlain by moderately hard sandstones and soft shales of the Cretaceous (beginning about 100 million years ago) Eagle to Willow Creek formations. Part of the foothill areas of these mountains also is composed of Cretaceous soft black marine shales (Colorado Group, Montana Group, Pierre Shale), Cretaceous soft sandstones, siltstones, and claystones (Fox Hills Sandstone, Kootenai Formation). Some of these sedimentary strata may be gently to steeply uplifted as a result of nearby mountain building.

Most of the soils in this ecotype (82 percent, 20,500 mi^2) are described as well developed with dark topsoil horizons, clay "B" horizons, having a cool temperature regime, and occurring under semiarid to subhumid moisture conditions.

Climate

The climate of the intermountain/foothills grassland ecotype varies considerably from one end to the other; generally there is more resemblance to the climate of the plains grassland than to the adjacent mountains. The northwestern valleys are influenced more by Pacific storms in winter and have a more maritime climate than the more southerly valleys. Temperatures there tend to be milder during the winter, and there is a greater proportion of precipitation received

during the winter. Arctic climate outbreaks affect the entire ecotype, although to a lesser extent in the northern foothills.

Annual temperatures average 44 degrees F throughout much of the Gallatin, Townsend, Helena, northern Jefferson, Bitterroot, and Flathead/Mission valleys. In these valleys some areas may have average annual temperatures of 45 degrees F. The Blackfoot, Madison, Paradise, and Jefferson/Beaverhead valleys are about a degree colder because of elevation and/or topography that favor the formation of extreme temperature inversions even in summer. Foothill areas in central and southern Montana experience about the same average annual temperatures as the colder intermountain valleys. The coldest portion of the ecotype is the northern foothills along the eastern front. Some parts of this area sustain average temperatures of 39 to 40 degrees F.

Although maximum daily temperatures in the northwest valleys are similar to those in the Gallatin, Townsend, and Helena valleys, nighttime temperatures average about 5 degrees warmer in the former areas. This generates mean January daily temperatures ranging from 22 to 25 degrees F in the northwest and 20 to 23 degrees in the lower southwest valleys. Temperatures in the colder valleys of the southwest and west central areas range from 19 to 21 degrees F in January. In the foothill locations, January temperatures range from 15 to 22 degrees F.

Mean daily temperatures in July are highest in the Gallatin, Townsend, Helena, northern Jefferson, Bitterroot, and Mission valleys. In the warmest parts of these valleys, daily maximums range from 85 to 86 degrees F. In the Madison, Jefferson/Beaverhead, Paradise, and Flathead valleys and most of the foothill areas, maximum daily temperatures are about a degree lower. The coldest valleys in the extreme southwest and west central areas attain maximums from 80 to 82 degrees F. Highest July nighttime temperatures in the ecotype occur in the Helena and Townsend valleys where they range from 49 to 50 degrees F. The Gallatin Valley is about a degree cooler. A degree cooler than that are the nighttime temperatures in the lower Jefferson, Bitterroot, and Flathead/Mission valleys and most of the foothill region. Nighttime temperatures of 43 to 46 degrees F are experienced in the west-central and extreme southwestern valleys.

The protection afforded the intermountain valleys by the mountains is reflected by the generally much higher annual extreme minimum temperatures contrasted with most of the area to the east. The Mission and Bitterroot valleys are the only parts of Montana with significant areas in plant hardiness zone 5 (mean annual minimums in the minus teens). The remaining area of these valleys, along with the Jefferson/Beaverhead, Gallatin, Madison, Townsend, Helena, Deerlodge, Blackfoot, Missoula, and Tobacco valleys, are in hardiness zone 4B (mean annual minimums in the minus 21 to 25 degrees F range). The central and southern foothill area is mostly in zone 4A (mean annual minimums in the minus

26 to 30 degrees F range). The northern foothill region is partially in zone 3 (mean annual minimums from minus 31 to 40 degrees F range).

The highest annual extreme maximum temperatures occur in the Mission Valley, where much of the area reaches 98 to 99 degrees F on average each year. The Flathead, Missoula, part of the Deerlodge, the lower Jefferson, Gallatin, Townsend, and Helena valleys normally reach 95 to 97 degrees F. This is also the case for the southern and central foothill region.

The longest frost-free season exists in the lower Helena Valley, and acrosshe central and southern foothill sections. Here the season ranges from 120 to 130 days. Lower portions of the Gallatin Valley, the Townsend Valley, and the Flathead/Mission Valley have frost-free seasons ranging from 100 to 125 days. Seasons in the Jefferson, Madison, Paradise, Bitterroot, and Missoula valleys last from 90 to 110 days. Other valleys and the northern foothill areas have seasons ranging from 70 to 100 days.

The intermountain valleys and foothills are basically semiarid, but considerably wetter than the plains grasslands. Mean annual precipitation overall is 15.4 inches. The foothill portion of the ecotype generally is wetter than the intermountain valley portion. Much larger expanses of area receiving more than 16 inches annually occur in the former than the latter area. Broad areas receiving between 10 and 12 inches are found in the Jefferson/Beaverhead Valley, while parts of the Jefferson/Beaverhead/Centennial and Helena valleys get less than 10 inches annually. The Blackfoot Valley and eastern portions of the Flathead/Mission Valley receive between 12 and 16 inches, while western parts of the Flathead/Mission Valley tend to be drier.

Reflecting the stronger maritime influence in the northwest, those valleys tend to receive a smaller proportion of their precipitation in the growing season than do the southwestern valleys and most of the foothill regions. The percentage of moisture falling in the growing season for the Flathead/Mission, Missoula, and Bitterroot valleys ranges from 37 to 45 percent, with a portion of the Mission Valley slightly higher than that. The extreme southwestern valleys (Jefferson/Beaverhead, Madison) and the northern and central foothill region collect 52 to 60 percent of the water during the growing season. Most other areas are in the range of 45 to 55 percent.

Anthropogenic Uses

The intermountain/foothill grassland ecotype is diverse both in land management and its uses by humans. Primary recreational activities include hiking, mountaineering, hunting, biking, snowmobiling, wildlife watching, and skiing. The primary industries in this ecotype are building/construction, farming, ranching, mining, and tourism. The breakdown of landowner stewardship for the intermountain/foothill grassland ecotype is as follows:

U.S. Federal Agencies: 1,007,758 acres, or 7.5% of total area, which include:
BLM: 494,520 acres, or 3.8% of total area
USFS: 408,403 acres, or 3.1% of total area
USFWS: 64,556 acres, 0.5% of total area
NPS: 18,286 acres, or 0.1% of total area
State Agencies: 892,545 acres, or 6.8% of total area
Tribal Lands: 1,091,650 acres, or 8.3% of total area
Private: 10,187,909 acres, or 77.2% of total area
City and County: 6,487 acres, or less than 0.1% of total area

Vegetation

Plant community composition is influenced primarily by the total annual precipitation, which ranges from 8 to more than 20 inches, yearly precipitation distribution, and soil characteristics. The yearly precipitation distribution and, to a certain extent, the total precipitation are related to general geographic location. Northern valleys and foothills tend to receive more total precipitation than more southern areas, while northwestern valleys have a more maritime (winter/spring wet) precipitation. This has an impact on the distribution of major grass species. Most of the potential natural grassland communities within this ecotype can be perceived as different combinations of six or seven major grass species accompanied by a number of subordinate grass and forb species.

Rough fescue (*Festuca scabrella*) extends southward into Montana from Canada, its center of distribution (Moss and Campbell 1947, Coupland and Brayshaw 1953, Tisdale 1947, Stickney 1960). Rough fescue is most abundant and widespread in northwestern Montana on both sides of the Continental Divide, declining southward and penetrating below the 46th parallel only in the Gravelly and Madison ranges. The easternmost occurrences are near Lewistown at the foot of the Judith Mountains.

Idaho fescue (*Festuca idahoensis*) occurs throughout the intermountain/foothill ecotype wherever moisture conditions are favorable, becoming at least a subordinate species at 15 inches of annual precipitation (Ross and Hunter 1976). As well as being a component of most rough fescue communities, Idaho fescue forms habitat types with bluebunch wheatgrass (*Agropyron spicatum*) in most of the medium elevations of southwestern Montana and with western thickspike wheatgrass (*Agropyron dasystachyum*) in foothill areas just east of the mountains where there is enough moisture (Mueggler et al 1980). Idaho fescue rarely occurs as the sole dominant grass. The two Idaho fescue habitat types usually contain prairie junegrass (*Koeleria cristata*) as a subordinate grass. Forbs commonly associated with Idaho fescue include silky lupine (*Lupinus sericeus*), arrowleaf balsamroot (*Balsamorhiza sagitatta*), sticky geranium (*Geranium viscosissimum*), phlox (*Phlox kelseyi*), blanketflower (*Gaillardia aristata*), and pussytoes (*Antennaria microphylla*).

Bluebunch wheatgrass is the most widely spread major forage grass in Montana, occurring at least as a codominant on some sites statewide. In the intermountain/foothill grassland ecotype it is a dominant grass on all upland sites within the 10- to 14-inch precipitation zone (Ross et al 1976). On finely textured soils bluebunch grass forms plant communities where western wheatgrass and thickspike wheatgrass are codominants. Prairie junegrass is usually present and fairly abundant. Other common species include big sagebrush (*Artemisia tridentata* spp. *wyomingensis*), milkvetches (*Astragalus* spp.), biscuitroot (*Lomatium* spp.), sandberg bluegrass (*Poa sandbergii*), hairy goldenaster (*Chrysopsis villosa*), and green needlegrass (*Stipa viridula*). Sites with medium textured, well-drained, shallow soils support little western wheatgrass compared to the finer textured soils but more species like needle-and-thread (*Stipa comata*), sandberg bluegrass, and sometimes blue grama (*Bouteloua gracilis*) as codominants. Such sites occupy about 9 percent (2,325 miles^2) of the ecotype. These communities may contain a variety of shrub species, but those in which shrubs are dominants are included in the shrub grassland ecotype. On sandy sites, bluebunch wheatgrass is a major vegetation constituent along with needle-and-thread, Indian ricegrass (*Oryzopsis hymenoides*), and sometimes prairie sandreed (*Calamovilfa longifolia*). Other species that may be found are aromatic sumac (*Rhus aromatica*), threadleaf sedge (*Carex filifolia*), and yucca (*Yucca glauca*). Within the 15- to 19-inch precipitation zone, bluebunch wheatgrass shares dominance with rough fescue in the northwestern and Idaho fescue in the southwestern and south-central areas of Montana.

Needle-and-thread grass occurs as a community type in some valleys in Montana's extreme southwest (Mueggler et al 1980). This type is found on well-drained, shallow soils that might be limy. Other species include western and thickspike wheatgrass, prairie junegrass, threadleaf sedge, and fringed sedge (*Carex crinita*).

Other sites within the intermountain/foothill grassland ecotype include saline lowlands that support major grasses such as basin wildrye (*Elymus cinereus*), Nuttall alkaligrass (*Puccinellia nuttalliana*), alkali cordgrass (*Spartina gracilis*), saltgrass (*Distichlis stricata*), alkali bluegrass (*Poa juncifolia*), kelsey phlox (*Phlox kelseyi*), and occasionally greasewood (*Sarcobatus vermiculatus*). Also found are subirrigated areas and wetlands that are often dominated by various species of willow (*Salix* spp.) and a variety of hydromorphic grasses, sedges, and rushes. These might include Canada reedgrass (*Calamagrostis Canadensis*), cattails (*Typha latifolia*), Baltic rush (*Juncus balticus*), and basin wildrye (*Leymus cinereus*).

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Bitterroot/Frenchtown Valleys (406,859 acres)

Figure 3. Bitterroot/Frenchtown Valleys Focus Area

The Bitterroot/Frenchtown Valleys area is dominated by views of the jagged peaks of the Bitterroot Range to the west and the lower Sapphire Mountains to the east. The Bitterroot River bisects the valley floor from Idaho north to Missoula. The valleys are arid, flat, or gently rolling landscapes 2 to 15 miles wide. While the valleys support many habitats—from grassland and riparian to forest and sagebrush—most of the area is now in agricultural production. The rolling mountain foothills at the valley edges are important elk, white-tailed deer, and mule deer winter range. In the valley bottoms, the cottonwood riparian habitats are some of the most productive wildlife habitats in the state and are home to a wide variety of birds, mammals, reptiles, and amphibians.

Landscape Characteristics

This subsection contains intermountain valleys that formed in alluvium, outwash, and lacustrine sediments. Elevations range from 3,000 to 4,400 feet. Drainage density is slight. Wetlands occur along both the Clark Fork and Bitterroot rivers. Mean annual precipitation ranges from 11 to 25 inches, with about 40 to 60 percent falling as snow. The soil temperature and moisture regimes are frigid and typically ustic. Primary natural disturbances are flooding and fire, as seen by the dramatic effects of the forest fires in the area in 2000. Another important natural biotic disturbance is beaver activity in riparian and wetland areas. Land use is predominantly extensive urban/suburban development and agricultural activities.

The breakdown for land stewardship in the Bitterroot/Frenchtown Valleys area is as follows:

U.S. Federal Agencies:	42,935 acres, or 10.6% of total area, which include:
USFS:	40,155 acres, or 9.9% of total area
USFWS:	2,780 acres, or 0.7% of total area
State Agencies:	14,147 acres, or 3.5% of total area
Private:	348,727 acres, or 85.7% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Xeric Forest	III	3.57
Wetland and Riparian	I	3.72
Urban	III	3.73
Douglas Fir	II	4.48
Sagebrush	I	4.57
Agricultural Lands - Dry	III	5.73
Mixed Mesic Forest	II	6.05
Ponderosa Pine	II	6.65
Mixed Mesic Shrubs	II	8.52
Altered Herbaceous	II	10.17
Agricultural Lands - Irrigated	III	11.19
Low/Moderate Cover Grasslands	I	25.11

Note: A total of 93.5% of the Bitterroot/Frenchtown Valleys area is represented; 6.5% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 340 terrestrial vertebrate species that are found within the Bitterroot/Frenchtown Valleys Focus Area. Tier I species are listed below. All associations can be found in Table 9.

Amphibians: Coeur d' Alene Salamander, Western Toad, and Northern Leopard Frog

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Long-billed Curlew, Black Tern, Flammulated Owl, Black-backed Woodpecker, and Olive-sided Flycatcher

Mammals: Townsend's Big-eared Bat, Northern Bog Lemming, Gray Wolf, and Grizzly Bear

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth and development of transportation infrastructure	Support strategic conservation easements by conservation organizations and public agencies
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help guide future residential and commercial development
Invasive and exotic plant and animal species	Participate in partnerships to develop and implement weed control strategies as well as invasive species management
Range and forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

Central Montana Broad Valleys (2,604,058 acres)

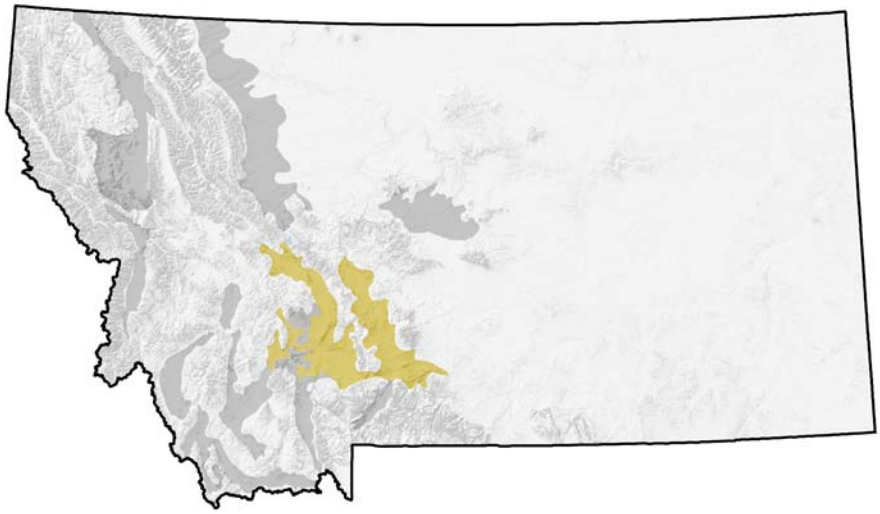


Figure 4. Central Montana Broad Valleys Focus Area

These central valleys include the areas from Three Forks, where the Missouri River begins, north through the Helena Valley, as well as White Sulphur Springs, and south, on the east side of the Belt and Bridger mountains. The valleys are situated among the foothills of the Rocky Mountains where precipitation is reduced by the rain shadow effect. Low and moderate cover grasslands dominate the valley floors, and the dry environment highlights the importance of the riparian areas along the Missouri, Smith, and other rivers and streams. Higher elevations capture enough precipitation to support fir, spruce, and pine forests.

Landscape Characteristics

This subsection has broad intermontane valleys that formed in Tertiary sediments and Quaternary alluvial deposits derived from volcanic rocks, shale, and sandstone. Elevations range from 3,750 to 6,800 feet. Drainage density is low. Mean annual precipitation ranges from 10 to 25 inches, with about 30 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. The primary natural disturbances are fire and flooding. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing, crop production, and urban/suburban development. The breakdown for land stewardship in the Central Montana Broad Valleys area is as follows:

U.S. Federal Agencies:	101,375 acres, or 3.8% of total area, which include:
BLM:	67,460 acres, or 2.6% of total area
USFS:	21,313 acres, or 0.8% of total area
USFWS:	556 acres, or less than 0.1% of total area

State Agencies: 162,163 acres, or 6.2% of total area
Private: 2,331,192 acres, or 89.5% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Moderate/High Cover Grasslands	I	2.19
Rock	III	3.83
Wetland and Riparian	I	5.24
Sagebrush	I	8.16
Very Low Cover Grasslands	I	8.45
Agricultural Lands - Irrigated	III	9.45
Agricultural Lands - Dry	III	11.08
Low/Moderate Cover Grasslands	I	38.26

Note: A total of 86.65% of the Central Montana Broad Valleys area is represented; 13.35% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 318 terrestrial vertebrate species that are found within the Central Montana Broad Valleys Focus Area. Tier I species are listed below. All associations can be found in Table 10.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl

Mammals: Townsend's Big-eared Bat, Pallid Bat, Black-tailed Prairie Dog, Grizzly Bear, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth	Support strategic conservation easements by conservation organizations and public agencies
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help guide future residential and commercial development

	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Invasive and exotic plant species	Participate in partnerships to develop and implement weed control strategies
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

Deerlodge Valley (175,260 acres)

Figure 5. Deerlodge Valley Focus Area

One of several broad, intermountain valleys located in southwestern Montana, the north-flowing Clark Fork River bisects the Deerlodge Valley along an east-west axis. Cattle ranching and hay production are the chief agricultural activities. Native bunchgrasses occur on the valley foothills, which provide important elk and deer winter range and support other diverse nongame wildlife.

Landscape Characteristics

This subsection consists of an intermontane valley that formed in Tertiary sedimentary rocks and more recent stream deposits. Elevations range from 4,400 to 6,000 feet. Drainage density is moderate. Mean annual precipitation ranges from 11 to 16 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. The primary natural disturbances are flooding and mass wasting. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly agriculture, livestock grazing, and urban/suburban development. The breakdown for land stewardship in the Deerlodge Valley area is as follows:

U.S. Federal Agencies:	1,792 acres, or 1% of total area, which include:
BLM:	62 acres, or less than 0.1% of total area
NPS:	1,730 acres, or 0.9% of total area
State Agencies:	14,023 acres, or 8% of total area
Private:	159,445 acres, or 91% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Very Low Cover Grasslands	I	2.00
Mixed Barren Sites	III	2.14
Altered Herbaceous	II	3.22
Mixed Xeric Shrubs	I	4.70
Sagebrush	I	4.96
Moderate/High Cover Grasslands	I	5.37
Wetland and Riparian	I	6.14
Agricultural Lands - Irrigated	III	6.99
Mixed Mesic Shrubs	II	7.18
Low/Moderate Cover Grasslands	I	51.73

Note: A total of 94.42% of the Deerlodge Valley area is represented; 5.58% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 259 terrestrial vertebrate species that are found within the Deerlodge Valley Focus Area. Tier I species are listed below. All associations can be found in Table 11.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Long-billed Curlew, and Black Tern

Mammals: Townsend's Big-eared Bat and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth	Support conservation easements by conservation organizations or public agencies
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help plan for and manage development
Invasive and exotic plant species	Participate in partnerships to develop and implement weed control strategies

Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp. + appendices.

Flathead River Valley (1,586,787 acres)

Figure 6. Flathead River Valley Focus Area

The glaciated Flathead Valley of northwestern Montana lies among majestic mountain ranges and cradles the Flathead River. The primary stem of the Flathead River and the Stillwater and Tobacco rivers are among the major headwater rivers of the Columbia basin. The valley supports diverse wetland and aquatic communities including glacial lakes, ponds, spring creeks, riparian swamps, cottonwood forests, oxbow lakes, and Flathead Lake, the nation's largest natural freshwater lake west of the Mississippi. The northern and southern reaches of the valley still support intact palouse prairie habitats interspersed with wetlands and forest.This region historically has provided habitat for nesting, migrating, and wintering waterfowl and a range of habitats for upland game birds, raptors, shorebirds, colonial waterbirds, and other resident and migratory species. In particular, the region was an important historic northern leopard frog habitat and is the focus of northern leopard frog reintroduction efforts. It also contains important seasonal habitat for black bears, grizzly bears, mountain lions, elk, mule deer, and white-tailed deer. The rich resources of the valley floor—riparian/wetlands, grasslands, and foothills—are primarily in private ownership and are under extreme development pressure.

Landscape Characteristics

This subsection consists of an intermontane basin that formed in alluvium, glacial outwash, and lacustrine sediments underlain by argillite, siltite, and dolomite. Elevations range from 2,300 to 6,200 feet. Drainage density is low to moderate. Mean annual precipitation ranges from 14 to 25 inches, with about 50 percent falling as snow. The soil temperature and moisture regimes are frigid and typically xeric. The primary natural disturbances are fire and flooding. Another

important natural biotic disturbance is beaver activity in riparian and wetland areas. Land use is predominantly agriculture and timber harvest on public and to a greater degree private lands, as well as rural/suburban development. The breakdown for land stewardship in the Flathead River Valley area is as follows:

U.S. Federal Agencies:	132,943 acres, or 8.4% of total area, which include:
USFS:	108,047 acres, or 6.8% of total area
USFWS:	24,711 acres, or 1.6% of total area
State Agencies:	98,904 acres, or 6.2% of total area
Tribal Lands:	456,713 acres, or 28.8% of total area
Private:	898,121 acres, or 56.6% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Lodgepole Pine	III	2.54
Wetland and Riparian	I	2.85
Mixed Mesic Shrubs	II	2.85
Ponderosa Pine	II	2.92
Mixed Xeric Forest	III	3.06
Agricultural Lands - Dry	III	3.40
Altered Herbaceous	II	4.22
Sagebrush	I	6.63
Douglas Fir	II	7.26
Water	III	9.29
Agricultural Lands - Irrigated	III	9.88
Low/Moderate Cover Grasslands	I	15.56
Mixed Mesic Forest	II	17.71

Note: A total of 88.16% of the Flathead River Valley area is represented; 11.84% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 344 terrestrial vertebrate species that are found within the Flathead River Valley Focus Area. Tier I species are listed below. All associations can be found in Table 12.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Columbia Sharp-tailed Grouse, Long-billed Curlew, Black Tern, Flammulated Owl, Black-backed Woodpecker, and Olive-sided Flycatcher

Mammals: Townsend's Big-eared Bat, Northern Bog Lemming, Grizzly Bear, Gray Wolf, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation, especially as a result of human population growth/development and expansion of the transportation network	Support conservation easements and other methods that help protect critical habitat on private lands, including corporate forested lands
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help guide future residential and commercial development
Human/wildlife conflicts and related wildlife mortality	Public education regarding human/wildlife conflicts
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Water quality degradation	Support watershed, riparian, and grassland restoration opportunities with Confederated Salish and Kootenai Tribes, Montana Department of Environmental Quality, U.S. Natural Resource Conservation, and Partners for Wildlife Program
Invasive or exotic plant species	Support efforts to eradicate exotic or invasive plant species when appropriate

Altered fire regimes	Work with coordinating agencies to mimic natural fire regimes

References

Confederated Salish and Kootenai Tribes and Montana Fish, Wildlife & Parks. 2003. Flathead Subbasin Plan Assessment: Executive Summary. Northwest Power and Conservation Council. Portland, OR.

Kootenai Tribe of Idaho and Montana Fish, Wildlife & Parks. 2004. Public Review Draft Kootenai Subbasin Plan. Executive Summary. Report prepared for the Northwest Power and Conservation Council. Portland, OR.

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes, including Report, Appendices, Conservation Area Descriptions and Maps.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Little Belt Foothills (839,541 acres)

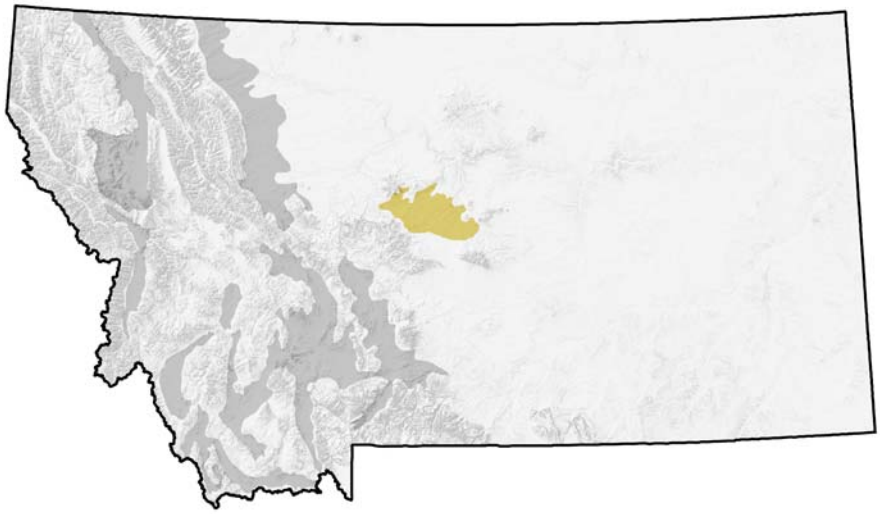


Figure 7. Little Belt Foothills Focus Area

The Little Belt Foothills area covers the Judith Basin, a large mountain foothill grassland community rimmed by the Little Belt, Highwood, Moccasin, and Big Snowy mountains. The Judith River, a tributary to the Missouri River, is the basin's primary drainage. Large, flat grassland benches define the high foothills. The lower elevations consist of rangeland interspersed with cropland, and sprawling terraces dominate the lower elevations. While about 30 percent of the landscape in the Judith Basin is farmed, the remaining areas support bunchgrass and sagebrush grasslands.

Landscape Characteristics

This subsection consists of foothills, terraces, and fans that formed in shale, siltstone, and terrace deposits. Elevations range from 3,500 to 5,000 feet. Drainage density is moderate. Mean annual precipitation ranges from 15 to 19 inches, with about 40 to 50 percent falling as snow. The soil temperature and moisture regimes are frigid and ustic. The primary natural disturbance is drought and fire. Other important natural biotic disturbances include beaver activity in riparian areas and prairie dog complexes in grassland areas. Land use is predominantly livestock grazing at higher elevations, with a combination of cropping and livestock grazing at lower elevations. The breakdown for land stewardship in the Little Belt Foothills area is as follows:

U.S. Federal Agencies:	16,309 acres, or 1.9% of total area, which include:
BLM:	15,197 acres, or 1.8% of total area
USFS:	1,112 acres, or 0.1% of total area
State Agencies:	77,159 acres, or 9.2% of total area
Private:	746,073 acres, or 88.9% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Mesic Shrubs	II	2.04
Very Low Cover Grasslands	I	2.36
Wetland and Riparian	I	7.34
Moderate/High Cover Grasslands	I	11.69
Agricultural Lands - Irrigated	III	18.99
Agricultural Lands - Dry	III	22.88
Low/Moderate Cover Grasslands	I	29.12

Note: A total of 94.42% of the Little Belt Foothills area is represented; 5.58% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 288 terrestrial vertebrate species that are found within the Little Belt Foothills Focus Area. Tier I species are listed below. All associations can be found in Table 13.

Amphibians: Northern Leopard Frog

Reptiles: Western Hog-nosed Snake and Milksnake

Birds: Bald Eagle, Greater Sage-Grouse, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl

Mammals: Townsend's Big-eared Bat, Black-tailed Prairie Dog, and Black-footed Ferret

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Fragmentation and loss of native habitat as a result of conversion to cropland and human population growth/development	Government and private conservation programs/activities that encourage and support private land stewardship

	Encourage the conservation of natural rangeland communities through increased efforts to maintain ecological features (e.g., black-tailed prairie dog colonies) or processes (e.g., fire) on public lands
	Support state/federal tax incentives that discourage habitat fragmentation
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Altered natural fire regime	Work with public and private efforts to restore natural fire regime to area
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of invasive or exotic species

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

North Tobacco Root Mountains and Foothills (224,989 acres)

Figure 8. North Tobacco Root Mountains and Foothills Focus Area

The rugged peaks of the Tobacco Root Mountains, with their abundant high mountain lakes and small running stream systems, overlook this area. These mountains have seen extensive historical mining activity that has resulted in numerous roads. The foothills provide important elk and mule deer winter range and are dominated by sagebrush/grassland that has seen conversion from the spraying and burning of sagebrush. Along the Jefferson River there are productive cottonwood riparian habitats that support an abundance of wildlife species including whitetailed deer and recently introduced Merriam's turkeys. The valley bottom is home to extensive agricultural production of cattle and alfalfa and little or no grain production.

Landscape Characteristics

This subsection consists of complex faulted mountains and foothills that formed in gneiss, volcanic, and a variety of sedimentary bedrock. Elevations range from 4,200 to 8,000 feet. Drainage density is high. Mean annual precipitation ranges from 10 to 25 inches, with about 35 percent falling as snow. The soil temperature and moisture regimes are frigid (cryic at higher elevations) and aridic ustic. The primary natural disturbance is fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing and timber harvest. The breakdown for land stewardship in the North Tobacco Root Mountains and Foothills area is as follows:

U.S. Federal Agencies:	32,309 acres, or 14.4% of total area, which include:
BLM:	17,544 acres, or 7.8% of total area
USFS:	14,765 acres, or 6.6% of total area
State Agencies:	20,695 acres, or 9.2% of total area

Private: 171,985 acres, or 76.4% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Wetland and Riparian	I	2.11
Agricultural Lands - Dry	III	3.29
Limber Pine	III	3.36
Agricultural Lands - Irrigated	III	3.83
Douglas Fir	II	5.01
Mixed Xeric Forest	III	7.42
Very Low Cover Grasslands	I	8.24
Sagebrush	I	11.88
Low/Moderate Cover Grasslands	I	50.44

Note: A total of 95.59% of the North Tobacco Root Mountains and Foothills area is represented; 4.41% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 244 terrestrial vertebrate species that are found within the North Tobacco Root Mountains and Foothills Focus Area. Tier I species are listed below. All associations can be found in Table 14.

Amphibians: Western Toad

Birds: Flammulated Owl and Bald Eagle

Mammals: Townsend's Big-eared Bat, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of population growth/development	Support strategic conservation easements/protection by conservation organizations or public agencies by providing advice and technical assistance
	Promote and further develop county ordinances that help manage and plan for development
	Support state/federal tax incentives that discourage habitat fragmentation

	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

Rocky Mountain Front Foothills (2,018,789 acres)

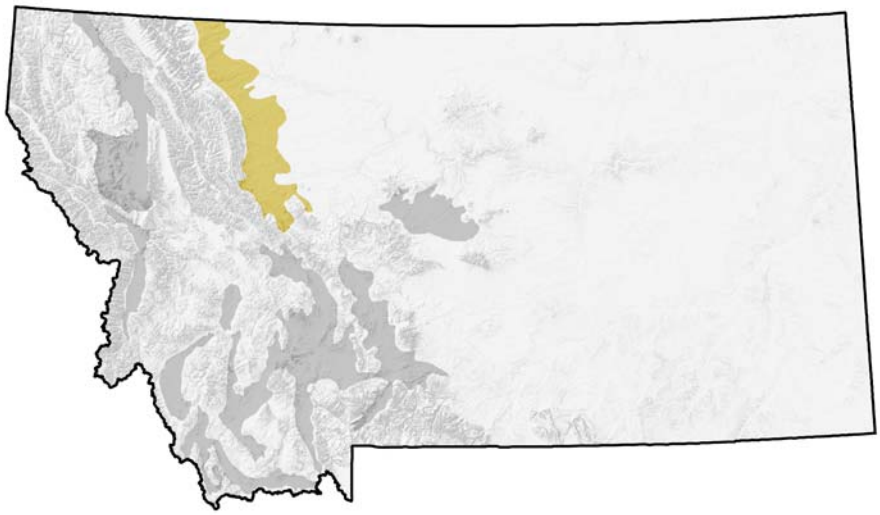


Figure 9. Rocky Mountain Front Foothills Focus Area

The Rocky Mountain Front, extending from Alberta, Canada, south through Montana, marks the easternmost edge of the Bob Marshall Wilderness, where thrust-faulted mountains give way to rolling foothills and Great Plains grasslands. This variable landscape still offers glimpses of grizzly bears moving from high mountain fir and spruce forests to native prairie grasslands dotted with pothole marshes where migrating birds stage season after season. With the exception of bison, all of the native mammals that inhabited this land when Lewis and Clark passed through survive here.

Landscape Characteristics

This subsection consists of mountain front foothills, moraines, fans, and terraces that formed in calcareous shales overlain by till, outwash, alluvium, and terrace deposits. The landscape has been modified by glaciation. Elevations range from 3,400 to 8,500 feet. Drainage density is low to moderate. Mean annual precipitation ranges from 12 to 20 inches, with about half falling as snow. The soil temperature and moisture regimes are frigid and typic ustic. Chinook winds are frequent. The primary natural disturbance is fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing. The breakdown for land stewardship in the Rocky Mountain Front Foothills area is as follows:

U.S. Federal Agencies:	33,421 acres, or 1.7% of total area, which include:
BLM:	9,019 acres, or 0.5% of total area
USFS:	4,819 acres, or 0.2% of total area
USFWS:	1,421 acres, or less than 0.1% of total area
State Agencies:	172,603 acres, or 8.5% of total area
Tribal Lands:	482,906 acres, or 23.9% of total area

Private: 1,329,427 acres, or 65.9% of total area

Associated Habitats

Habitat	Habitat Tier	Percent of Area
Limber Pine	III	2.02
Mixed Broadleaf Forest	I	2.13
Altered Herbaceous	II	3.77
Agricultural Lands - Dry	III	4.41
Agricultural Lands - Irrigated	III	5.96
Mixed Mesic Shrubs	II	6.13
Wetland and Riparian	I	6.47
Moderate/High Cover Grasslands	I	10.46
Low/Moderate Cover Grasslands	I	49.69

Note: A total of 91.03% of the Rocky Mountain Front Foothills area is represented; 8.97% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 362 terrestrial vertebrate species that are found within the Rocky Mountain Front Foothills Focus Area.Tier I species are listed below. All associations can be found in Table 15.

Amphibians: Western Toad and Northern Leopard Frog

Reptiles: Western Hog-nosed Snake

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Piping Plover, Mountain Plover, Long-billed Curlew, Black Tern, Flammulated Owl, and Burrowing Owl

Mammals: Townsend's Big-eared Bat, Black-tailed Prairie Dog, Northern Bog Lemming, Grizzly Bear, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation as a result of conversion of natural lands to agriculture and human population growth/development and energy exploration and development activities	Policy-based approaches that encourage the conservation of natural communities rather than support their conversion

	Increased efforts to maintain ecological features (e.g., black-tailed prairie dog colonies) or processes (e.g., fire) on public lands as they disappear from private lands
	Promote further development of county ordinances that help guide future residential and commercial development
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Invasive or exotic plant species	Support cooperative efforts to eradicate or reduce the abundance of exotic or invasive plant species

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

South Elkhorn Mountains (171,059 acres)

Figure 10. South Elkhorn Mountains Focus Area

The South Elkhorn Mountains area is a diverse landscape with vegetation and topography more typical of central Montana than the intermountain western portion of Montana. Sagebrush grasslands and broken and rough terrain are found throughout much of this area, although much of the southern portion has been converted to dryland grain and CRP grasslands. Mule deer and antelope are common throughout much of the South Elkhorn Mountains area, and greater sage-grouse were rumored to have been common prior to the loss of much of their primary sagebrush habitat. In the northern portion of this area, as the mountainous portion of the Elkhorn Mountains is approached, the common geologic formations are limestone ridges and outcrops. These ridges provide the environment for abundant stands of mountain mahogany, which among other things makes this area very attractive as mule deer winter range.

Landscape Characteristics

This subsection consists of mountains and foothills that formed in limestone, dolomite, argillite, andesite, sandstone, and quartzite. Elevations range from 4,500 to 7,500 feet. Drainage density is low. Mean annual precipitation ranges from 12 to 22 inches, with about 30 percent falling as snow. The soil temperature and moisture regimes are frigid (cryic at higher elevations) and aridic ustic. The primary natural disturbance is fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing and timber harvest. The breakdown for land stewardship in the South Elkhorn Mountains area is as follows:

U.S. Federal Agencies:	71,105 acres, or 41.6% of total area, which include:
BLM:	8,494 acres, or 5% of total area

USFS:	22,610 acres, or 13.2% of total area
State Agencies:	6,425 acres, or 3.7% of total area
Private:	93,529 acres, or 54.7% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Lodgepole Pine	III	2.12
Montane Parkland and Subalpine Meadows	III	3.42
Rocky Mountain Juniper	III	7.41
Mixed Xeric Forest	III	7.54
Douglas Fir	II	8.17
Very Low Cover Grasslands	I	13.66
Sagebrush	I	22.13
Low/Moderate Cover Grasslands	I	28.70

Note: A total of 93.14% of the South Elkhorn Mountains area is represented; 6.86% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 243 terrestrial vertebrate species that are found within the South Elkhorn Mountains Focus Area. Tier I species are listed below. All associations can be found in Table 16.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Bald Eagle and Black-backed Woodpecker

Mammals: Townsend's Big-eared Bat, Pallid Bat, Gray Wolf, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, degradation, and fragmentation, especially as a result of human population growth	Support strategic conservation easements/protection by conservation organizations or public agencies by providing advice and technical assistance
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote and further develop county ordinances that help plan for and manage development
	Support state/federal tax incentives that discourage habitat fragmentation

Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies

References

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

Southwest Montana Intermontane Basins and Valleys (2,077,477 acres)

Figure 11. Southwest Montana Intermontane Basins and Valleys Focus Area

The area consists of valleys that are located between mountain ranges and typically follow major stream courses. Many small tributary mountain streams flow down the hillsides of these valleys and support wetlands, rivers such as the Red Rock, Madison, Jefferson, and Big Hole, and Red Rock Lakes. The vegetation is a mix of sagebrush grassland on the valley floor, and in the wet valley bottoms, riparian species like sedges and willows are common. Coniferous forest and aspen stands in the wetter microsites dominate the higher elevations. The coniferous forest and adjacent sagebrush communities provide winter habitats for mule deer and elk, while the riparian bottoms provide yearlong habitat for white-tailed deer. These intermountain basins and valleys are highly valued for residential development and are under the imminent threat of habitat fragmentation.

Landscape Characteristics

This subsection consists of intermontane basins and broad valleys that formed in alluvium, glacial deposits, and Tertiary volcanic materials. Elevations range from 4,700 to 7,600 feet. Drainage density is low. Mean annual precipitation ranges from 9 to 20 inches, with about 10 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Parts of the Red Rock Basin and Big Hole Valley have cryic temperature regimes. The primary natural disturbances are flooding and fire. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly livestock grazing, agriculture, and urban/suburban development. The breakdown for land stewardship in the Southwest Montana Intermontane Basins and Valleys area is as follows:

U.S. Federal Agencies:	479,632 acres, or 23.1% of total area, which include:
BLM:	344,156 acres, or 16.6% of total area
USFS:	96,180 acres, or 4.6% of total area
USFWS:	38,610 acres, or 1.9% of total area
NPS:	680 acres, or less than 0.1% of total area
State Agencies:	275,028 acres, or 13.2% of total area
Private:	1,318,307 acres, or 63.5% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Very Low Cover Grasslands	I	5.19
Wetland and Riparian	I	6.94
Agricultural Lands - Irrigated	III	9.04
Sagebrush	I	30.19
Low/Moderate Cover Grasslands	I	31.81

Note: A total of 83.17% of the Southwest Montana Intermontane Basins and Valleys area is represented; 16.83% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 296 terrestrial vertebrate species that are found within the Southwest Montana Intermontane Basins and Valleys Focus Area. Tier I species are listed below. All associations can be found in Table 17.

Amphibians: Western Toad

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Greater Sage-Grouse, Long-billed Curlew, and Flammulated Owl

Mammals: Townsend's Big-eared Bat, Pygmy Rabbit, Great Basin Pocket Mouse, Gray Wolf, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation and loss of connectivity as a result of human population growth/development	Identify and prioritize key wildlife linkage areas and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity

	Support strategic conservation easements/protection by conservation organizations or public agencies by providing advice and technical assistance
	Support state/federal tax incentives that discourage habitat fragmentation
	Participate in government and private conservation programs/activities that encourage and support private land stewardship
	Promote and further develop county ordinances that help plan for and manage development
	Support habitat-protecting conservation incentives directed at private landowners
	Manage for the sustainable use of recreational vehicles on public lands
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies, especially strategies that promote plant diversity
Altered fire regime	Work with public and private efforts to restore natural fire regimes to area
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

Fargione, Joseph, Cynthia S. Brown, and David Tilman. 2003. Community assembly and invasion: an experimental test of neutral versus niche processes. PNAS. Vol. 100 (15):8916–8920.

Montana Partners for Fish & Wildlife. 2000. Centennial Valley. 4 pp. More information at http://www.r6.fws/gpv/pfw/montana/mt3c.htm.

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Upper Yellowstone Valley (178,039 acres)

Figure 12. Upper Yellowstone Valley Focus Area

The Upper Yellowstone Valley area, south of Livingston, is better known to many as Paradise Valley. Bracketed by the Absaroka-Beartooth Wilderness on the east and the Gallatin Range on the west, the valley's grassland habitats are bisected by the Yellowstone River and its riparian areas and cottonwood stands. Several streams in the area harbor genetically pure populations of Yellowstone cutthroat trout. Much of the valley lies in the rain shadow of the mountains and is a wintering area for elk, bighorn sheep, and mule deer. The area supports grizzly bears, and there is an increasing wolf presence. Cradled within the Gallatin and Absaroka ranges are low-elevation meadows and limited juniper stands mixed with grasslands and sagebrush. Higher up are forests of aspen, pine, spruce, subalpine fir, and whitebark pine.

Landscape Characteristics

This valley consists of valley floor, terraces, toeslopes, and foothills that formed in alluvium and Tertiary sedimentary and volcanic rocks. Elevations range from 4,500 to 7,500 feet. Drainage density is moderate and wetlands are fairly common. Mean annual precipitation ranges from 15 to 40 inches, with about 55 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. The primary natural disturbance is flooding. Another important natural biotic disturbance is beaver activity in riparian areas. Land use is predominantly recreational development, with some agriculture and livestock grazing. The breakdown for land stewardship in the Upper Yellowstone Valley area is as follows:

U.S. Federal Agencies:	18,656 acres, or 10.5% of total area, which include:
BLM:	1,668 acres, or 0.9% of total area

USFS:	16,988 acres, or 9.6% of total area
State Agencies:	12,293 acres, or 7% of total area
Private:	146,101 acres, or 82.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Broadleaf Forest	I	2.14
Mixed Xeric Forest	II	2.28
Moderate/High Cover Grasslands	I	2.28
Mixed Subalpine Forest	III	3.95
Agricultural Lands - Dry	III	3.98
Wetland and Riparian	I	4.57
Montane Parkland and Subalpine Meadows	III	5.00
Douglas Fir	II	5.17
Sagebrush	I	5.49
Agricultural Lands - Irrigated	III	7.15
Rock	III	7.87
Very Low Cover Grasslands	I	11.16
Low/Moderate Cover Grasslands	I	28.56

Note: A total of 89.61% of the Upper Yellowstone Valley area is represented; 10.39% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 264 terrestrial vertebrate species that are found within the Upper Yellowstone Valley Focus Area. Tier I species are listed below. All associations can be found in Table 18.

Amphibians: Western Toad and Northern Leopard Frog

Birds: Trumpeter Swan, Bald Eagle, Long-billed Curlew, and Black-backed Woodpecker

Mammals: Gray Wolf, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Recreational infrastructure development, especially road network development	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction

Habitat loss and fragmentation, especially as a result of human population growth/development	Support strategic conservation easements/protection by conservation organizations or public agencies
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote and further develop county ordinances that help plan for and manage development
	Support state/federal tax incentives that discourage habitat fragmentation
Invasive or exotic plant species	Support efforts to eradicate exotic or invasive plant species
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles

References

A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountain Ecoregion: Report to The Nature Conservancy. 2001. R. Noss, G. Wuerthner, K. Vance-Borland, and C. Carroll. Conservation Science, Inc. 125 pp + Executive Summary and Appendix D.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Big Hole River (153 River Miles)

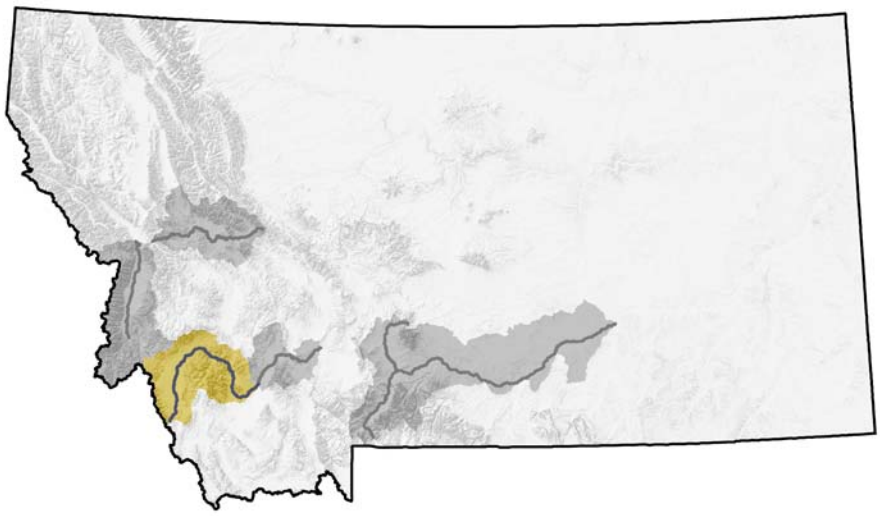


Figure 13. Big Hole River Focus Area

Originally named the Wisdom River by Meriwether Lewis, the Big Hole River and its tributaries start along the border of Montana and Idaho. Surrounded by hay meadows, the upper Big Hole separates the Bitterroot Range on the west from the Pioneer Mountains to the east. The middle section of the river runs through a length of gorge and then glides out through hay meadows once again, where it teams up with the Beaverhead River to create the Jefferson River.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		153
Intermountain Valley Streams	II		967
Lowland Lakes	III	297	
Lowland Reservoirs	III	64	
Mountain Lakes	III	2,886	
Mountain Reservoirs	III	12	
Mountain Streams	I		2,929

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 19 aquatic species that are found within the Big Hole River Focus Area. Tier I species are listed below. All associations can be found in Table 19.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout, Lake Trout (native lakes), Arctic Grayling, and Burbot

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Diversion of water for irrigation ditches and livestock watering	Increased installation of stockwater wells in place of irrigation ditches
Entrainment of juvenile and adult fishes by irrigation diversion or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Develop statewide riparian best management principles
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels, streambanks and riparian areas to a condition that simulates their natural form and function
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flow
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies as well as invasive species management

References

Montana Partners for Fish & Wildlife. 2000. Big Hole River Watershed. 4 pp. More information at http://www.r6.fws/gpv/pfw/montana/mt3c.htm.

Bitterroot River (84 River Miles)

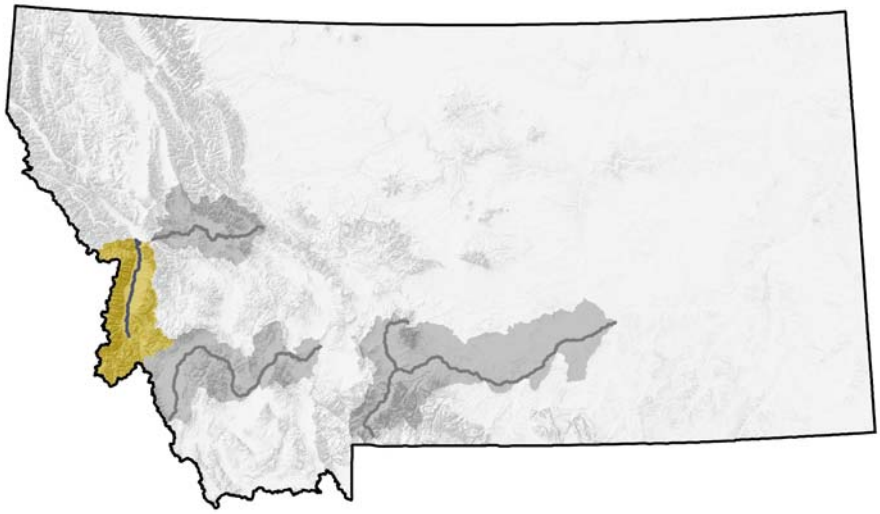


Figure 14. Bitterroot River Focus Area

The Bitterroot River originates in the Anaconda-Pintler Wilderness and the Bitterroot Mountains in Montana. As the primary tributaries flow together near Conner, Montana, it continues north along U.S. Highway 93 for 85 miles to where it empties into the Clark Fork River near Missoula. To the west is the glacial Bitterroot Range, and to the east rises the smoother and drier Sapphire Mountains. Just west of the Bitterroot Range lies the Selway-Bitterroot Wilderness, which encompasses more than 2.15 million acres. The river is characterized by constantly shifting stream channels among extensive cottonwood and ponderosa pine bottomland.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		84
Intermountain Valley Streams	II		325
Lowland Lakes	III	1,260	
Mountain Lakes	III	2,946	
Mountain Reservoirs	III	27	
Mountain Streams	I		3,304

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 21 aquatic species that are found within the Bitterroot River Focus Area. Tier I species are listed below. All associations can be found in Table 20.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Valley fragmentation as a result of human population growth	Pursue conservation easements within the valley
Presence of non-native aquatic species including warmwater fishes, bullfrogs, crayfish, and milfoil	Programs to control exotic species and promote natural habitats that support native species but not exotic species
Water quality problems due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores beneficial fish passage
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles

Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows

Blackfoot River (127 River Miles)

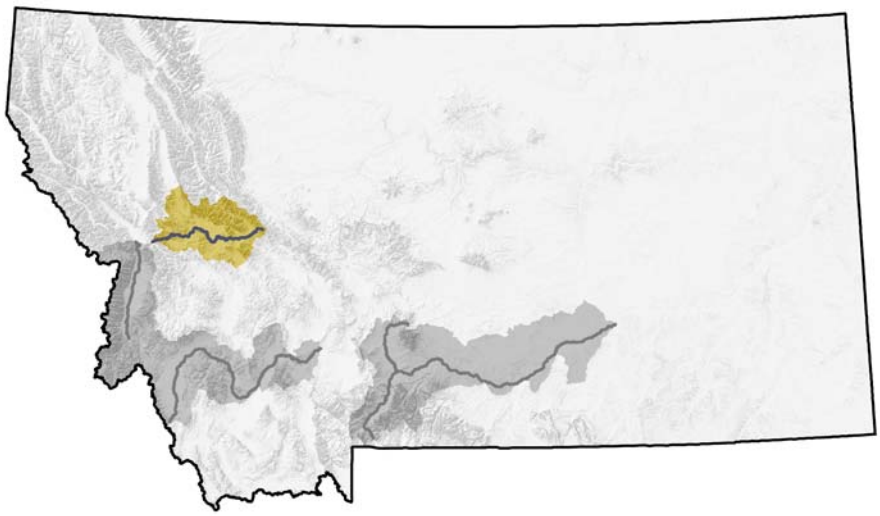


Figure 15. Blackfoot River Focus Area

The Blackfoot River begins at the junction of Beartrap and Anaconda creeks near the Continental Divide and flows west 132 miles to its mouth at Bonner, Montana. Near its headwaters, the Blackfoot River drops through glaciated high-alpine meadows and runs between steep, forested slopes. Above Lincoln, the river almost annually goes underground, then reappears below Lincoln and meanders through conifer forests and wetlands until it intersects with the North Fork of the Blackfoot River. For its remaining 52 miles, the Blackfoot levels out and moves through open ranch and timbered areas until it meets the Clark Fork River near Bonner. A free-flowing river, the Blackfoot is affected by the soon-to-be-removed Milltown Dam, which has blocked fish passage on the Clark Fork River since 1907.

Associated Habitats

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

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 23 aquatic species that are found within the Blackfoot River Focus Area. Tier I species are listed below. All associations can be found in Table 21.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage for fluvial native fish, including the Milltown Dam
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes

Unnatural hydrograph and water temperatures associated with the presence and operations of large dams, as well as blockage of migratory corridors (These alterations of the quantity or timing of stream flows cause unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Water chemistry problems that arise due to hard rock mines in headwaters	Implementation of a comprehensive mine cleanup in the headwaters of the Blackfoot River upstream of Lincoln, Montana

Jefferson River (77 River Miles)

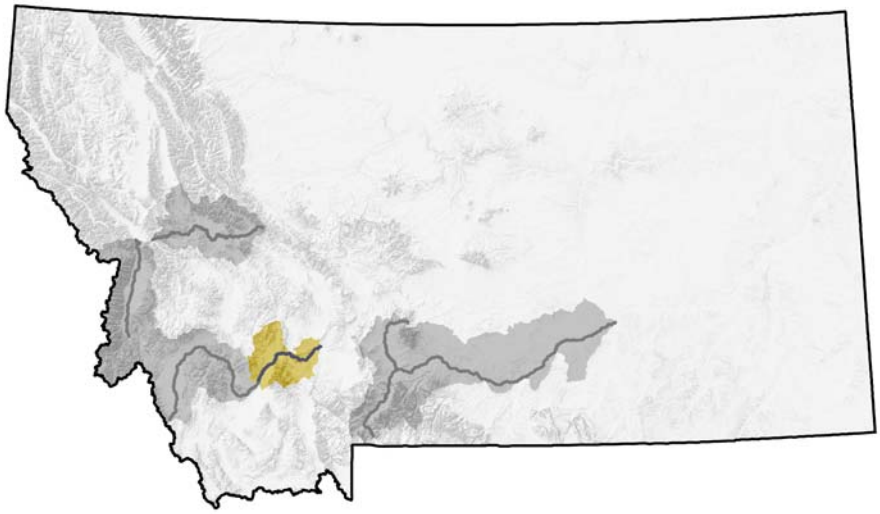


Figure 16. Jefferson River Focus Area

Lewis and Clark named this river after President Thomas Jefferson because it carried the greatest volume of water at that time compared to the nearby Madison and Gallatin rivers. The Jefferson River begins where the Big Hole and Beaverhead rivers intersect and flows north through agricultural areas and limestone cliffs, and into the cottonwood bottoms near Three Forks, where it meets the Madison and Gallatin rivers to form the Missouri River.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		77
Intermountain Valley Streams	II		1,377
Lowland Lakes	III	214	
Lowland Reservoirs	III	715	
Mountain Lakes	III	627	
Mountain Reservoirs	III	609	
Mountain Streams	I		1,091

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 20 aquatic species that are found within the Jefferson River Focus Area. Tier I species are listed below. All associations can be found in Table 22.

Invertebrates: Western Pearshell

Fish: Westslope Cutthroat Trout and Burbot

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce habitat connectivity	Removal or modification of barriers in a manner that restores fish passage
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows causing dewatering, temperature change or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, help sustain lower temperatures, and simulate the natural hydrograph as well as protect instream flows

References

DNRC 2005. Canal Seepage Monitoring in the Upper Jefferson River Basin.

Land and Water Consulting, Inc. 2004. Aerial Photo Review and Field Source Assessment, 2004.

Land and Water Consulting, Inc. 2003. Jefferson River Water Quality Restoration Planning Areas. Watershed Characterization Report.

Land and Water Consulting, Inc. 2003. Jefferson River Water Quality Restoration Planning Areas. Water Quality Status Report.

McGuire, Daniel. 2004. Jefferson River Aquatic Macroinvertebrate Survey.

Montana Fish, Wildlife & Parks. 2004. Jefferson River fisheries information (1979–2004).

USDA. 1975. Hydrology of the Jefferson River drainage.

Upper Yellowstone River (272 River Miles)

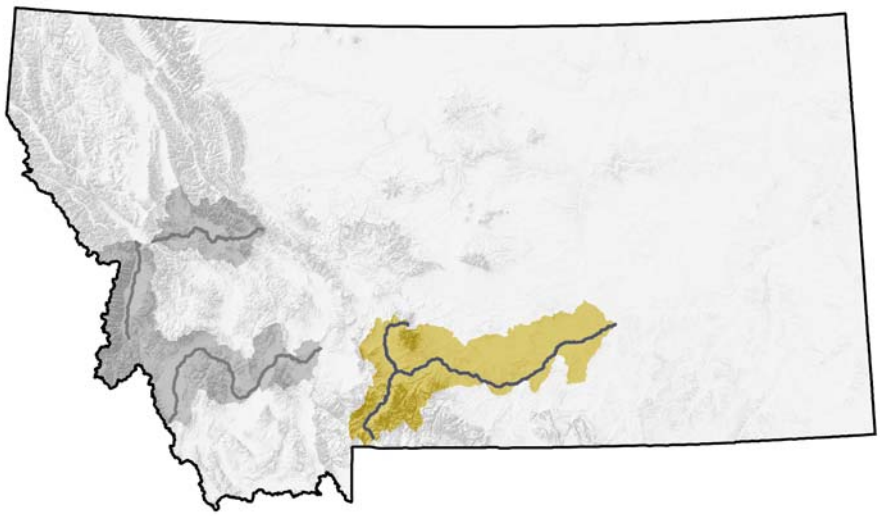


Figure 17. Upper Yellowstone River Focus Area

The Yellowstone River originates in Wyoming and flows through Yellowstone National Park before entering Montana near Gardiner. From the park boundary to Livingston, the river flows north through the Gardiner Basin and eventually enters the Paradise Valley, flanked by the Absarokee Mountains on the east and the Gallatin Range on the west. The river continues in a northeasterly direction from Livingston and meets up with the Missouri River just across the North Dakota border. The Yellowstone has survived as one of the last, large, free-flowing rivers in the continental United States. Lack of impoundments allows spring peak flows and fall and winter low flows that support a naturally unique and dynamic community. The Upper Yellowstone River supports clear, coldwater cutthroat trout fisheries in Yellowstone National Park to the warmwater habitats on the plains. The adjacent environments include cottonwood-willow bottomlands and broad low cover grasslands.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	10,838	
Lowland Reservoirs	III	580	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		259
Prairie Streams	I		5,378
Intermountain Valley Rivers	II		131
Intermountain Valley Streams	II		1,068
Mountain Lakes	III	1,893	

Mountain Streams	I	2,834

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 46 aquatic species that are found within the Upper Yellowstone River Focus Area. Tier I species are listed below. All associations can be found in Table 23.

Fish: Yellowstone Cutthroat Trout, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control exotic species and promote natural habitats that support native species but not exotic species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function

	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage

References

Hansen, A., J. Rotella, L. Klass, and D. Gyskiewicz. 2003. Riparian Habitat Dynamics and Wildlife Along the Upper Yellowstone River. Technical Report #1. Landscape Biodiversity Lab, Montana State University, Bozeman, MT. In cooperation with the Governor's Upper Yellowstone River Task Force.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Montane Forest Ecotype

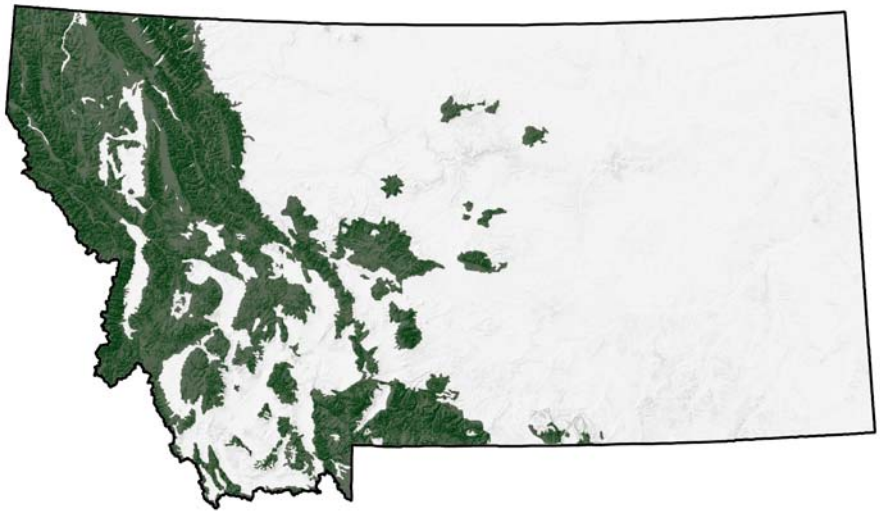


Figure 18. Montane Forest Ecotype

Montana's montane forests occur along the western third of the state, from the rugged peaks of the Purcell Mountains in northwestern Montana to the Beartooth Range near Yellowstone National Park. From the foothills to the summits, vast coniferous forests of larch, fir, hemlock, pine, and spruce trees characterize these areas. Such mountain forests also serve to protect the headwaters of Montana's rivers. Most of this ecotype is in public ownership through the U.S. Forest Service (USFS). Collaboration with the USFS will be critical to the conservation of these areas.

Landscape Characteristics

The montane forest ecotype includes 24,498,117 acres and represents 26 percent of Montana. This ecotype is mostly situated on mountain slopes, although a small portion is located in the valleys of extreme northwest Montana. Slopes are generally moderate to steep, often exceeding 45 degrees. All mountain ranges in Montana have at least some montane forest, as do the following major valley locations: lower Clark Fork, upper Flathead, Seeley/Swan, Kootenai, Bull River/Lake Creek, and Stillwater north of Whitefish. All are included in this ecotype.

The elevation range is the same as for the entire state (the highest and lowest elevation points in Montana are in this ecotype). The lowest elevation, 1,800 feet, occurs where the Kootenai River flows into Idaho. The highest elevation is 12,799 feet atop Granite Peak in the Beartooth Mountains. Both base elevations and mountaintop elevations are lowest in the northwest section of the ecotype and increase toward the south. Base elevations of almost 2,000 feet in the Libby, Troy, and Thompson Falls area increase to about 3,000 feet in the

Flathead/Mission Valleys and to more than 3,000 feet in the Missoula/Bitterroot Valleys. The highest base elevations west of the divide are generally about 4,500 feet along the east front and south as far as the upper Jefferson Valley. As the divide is approached from here, base elevations exceed 6,000 feet in the Big Hole and Centennial valleys. Generally, base elevations inside and outside of the mountain front as well as around the Little Belt, Big Snowy, Judith, and Crazy mountains are around 4,000 to 4,500 feet. Base elevations around the Highwood, Bears Paw, and Little Rocky mountains are about 3,000 to 3,500 feet.

Although summit elevations of mountains in the north are lower than those in the south (i.e., major mountain ranges in the north top out at 9,000 to 10,000 feet versus 10,500 to 12,800 feet in the south), base to summit relief is similar. High mountain ranges in all areas are 6,000 to 7,000 feet from base to summit and moderate mountain ranges 4,000 to 5,000 feet. Distances between mountain ranges are shorter in the north particularly, and west of the divide generally, than those in the southwest.

Since the end of the Precambrian time period (570 million years ago), there have been two major mountain building episodes in the region now occupied by the Northern Rockies. The first was a compression stage, resulting in folding and overthrusting of rock strata. Following this was a tension stage, where the region was pulled apart, causing rock segments to separate and tip at various angles. This stage is currently active.

During the Precambrian time period, sediments were deposited over a wide area in a sea extending from the Three Forks area north into Canada. These sediments form the belt series rocks found in the mountains of most of northwestern Montana. Most of the mountains in the southwest are composed of combinations of metamorphic, igneous, and Paleozoic/Mesozoic (deposited after 570 million years ago) rocks. Individual mountain ranges often have a core or central area of metamorphic or intrusive igneous rock partially surrounded by uplifted layers of sedimentary rock. Some mountain areas such as the Gallatin Range, the mountains around Wolf Creek, and the Bears Paw Mountains consist of extrusive igneous (lava flows) rock. Two very large areas of intrusive igneous rock (granite) occur between Helena and Twin Bridges and south from Hamilton toward Anaconda.

The topography of most of the higher mountain ranges was influenced by glaciation. Mountain glaciers created features including glacial troughs (U-shaped valleys), cirques, tarns (lakes in cirques), and sharp horns and walls. The mountains in the northwest corner were overridden by the cordilleran ice sheet, which tended to smooth off their tops. The northern end of the Mission Range is an example of this, whereas the southern end of this range is a prime example of mountain glaciation. Except for the Crazies and the Little Belts, the isolated mountain groups of central Montana did not experience mountain glaciation but may have been partially overridden by the Laurentide ice sheet.

Most of the mountain region has had anywhere from 10 to 45 centimeters of volcanic ash deposited on it. The heaviest deposits were in the extreme northwest. These deposits occurred during the time of the formation of the Cascade Mountains.

Soils

Most of the montane forest ecotype is overlain by soils that are classified as cool or cold (32 to 47 degrees F)—cool in the summer, cold in the winter, and moist most of the time. Such soils generally form under forest cover and have an organic duff layer (partially decomposed leaves, etc.) underlain by either a white leached layer or a brown clay layer. If the parent material is limestone, a calcareous layer may be present. Except for the limestone-derived soils, soils in this region are usually acidic.

Climate

Most of the climate discussion is based on information in Caprio and Nielsen (1992). The climate of the montane forest ecotype is ruled first by macroclimatic influences and then by elevation influences. The general climate of northwest mountain areas is maritime, whereas that of the mountains farther east and south is more continental, although mountain areas in general tend to be more maritime than their adjacent lowlands. Elevation affects both temperature and precipitation. A general rule of thumb is that temperature decreases about 6 degrees F for every 1,000-foot rise in elevation. This is a general rule and might not hold true in specific areas. Because of orographic effects, precipitation increases with increased elevation, so that in any specific area the higher elevations are wetter. However, due to macroclimatic differences, a given elevation in one part of the state will not receive the same amount of precipitation as another. The pattern of yearly distribution will also be different.

Mean yearly temperatures range from 39 to 40 degrees F at lower elevations in most of the mountains to about 30 degrees F at the highest elevations. The Beartooth Mountains and Plateau constitute a large and very high landmass with average annual temperatures as low as 20 degrees F. Throughout most of the mountain mass, January maximum daily temperatures are in the 22- to 25-degree F range. However, at the high elevations of mountains in southwestern and central Montana and Glacier National Park, these temperatures range from 8 to 19 degrees F. Some of the areas of northwestern Montana are warmer, with January maximum daily temperatures ranging from 28 to 30 degrees F. A similar pattern holds true for mean January nighttime minimums, except that the relative greater warmth of the northwestern mountains is more extreme. The mountains of almost the entire northwest corner exhibit January minimum temperatures in the 10- to 11-degree F range no matter what elevation. The mountains of the rest of Montana have January mean minimum temperatures ranging from 4 to 6 degrees F at lower elevations and 0 to minus 11 degrees F at the highest

elevations. The mean July daily temperatures at low elevations generally range from 58 to 60 degrees F, whereas at high elevations they range from 51 to 54 degrees F. The coldest places are the Beartooth Plateau and the mountains of Glacier National Park. Those mountains bordering or surrounded by the plains have the lowest mean annual extreme minimum temperatures. The two coldest mountain ranges in this regard, the Beartooths and Crazys, experience annual minimum temperatures in the minus 41- to minus 45-degree F range. At the other extreme, the mountains of the northwest corner do not generally get colder than minus 27 degrees F at any elevation. Annual maximums range from 85 to 92 degrees F throughout most of the mountains. The frost-free season at most of the higher elevations ranges from 10 to 50 days annually. Lower elevations have frost-free seasons ranging from 50 to 90 days annually.

The montane forest ecotype is the wettest in the state. Closed canopy forests generally do not occur at less than 20 inches annual precipitation in western Montana. Within the ecotype the northwest is the wettest. A given precipitation level is reached at a much lower elevation in the northwest than in the south and east; in other words, it takes a lot more elevation to produce the same amount of precipitation in the southwest, south-central, and central mountains than it does in the northwest. In the southwest, only a few very small and scattered areas receive more than 60 inches of precipitation annually. These occur at elevations greater than 11,000 feet in the Beartooth, Crazy, and Madison mountains. In the northwest, such areas are relatively large and occur in most mountain areas higher than 7,000 feet. Higher parts of Glacier National Park, the Cabinet Mountains, the Mission Range, and the Swan Range are estimated to receive more than 120 inches annually.

Average annual precipitation for the ecotype as a whole is estimated to be around 37 inches. Some relatively small areas of the ecotype are in the 12- to 16-inch zone. While 52 percent of the area in the ecotype receives 20 to 40 inches, the remainder receives 40 to 60 inches (20 percent), 16 to 20 inches (15 percent), 60 to 100 inches (9 percent), 12 to 16 inches (3 percent), and 100 or more inches (1 percent). Yearly precipitation in the mountain areas has more precipitation in winter than summer, as opposed to adjacent lowlands. This effect is most extreme in the northwest corner, where the relatively higher winter precipitation extends even into low elevations. The lowest percentage of growing season precipitation in the state, 22 to 27 percent, occurs in a wide area around the Cabinet Mountains and in small areas in Glacier National Park and the Mission Range. Summer precipitation in the high southwestern mountains generally ranges from 32 to 35 percent of the total annual precipitation.

Snowfall ranges from 81 to 300 inches annually in most mountain areas depending on elevation, although parts of the Mission Range, the Swan Range, and Glacier National Park may get 1,000 inches in an average year. In most mountain areas, the ground will be covered with at least 1 inch of snow from 120

to 260 days in an average year. A large part of the Glacier National Park may have snow on the ground for more than 300 days.

Anthropogenic Uses

The montane forest ecotype is diverse both in land management and its uses by humans. Whether it is for natural resources or recreational activities, these areas have multiple opportunities for explorers and entrepreneurs. Primary activities include hiking, mountaineering, hunting, biking, snowmobiling, animal watching, and skiing. The primary industries in this ecotype are construction and the timber industry. The breakdown of landowner stewardship for the montane forest ecotype is as follows:

U.S. Federal Agencies: 17,405,054 acres, or 71.8% of total area, which include:

BLM:	648,466 acres, or 2.7% of total area
USFS:	15,586,235 acres, or 64.3% of total area
USFWS:	19,707 acres, or less than 0.1% of total area
NPS:	1,125,565 acres, or 4.6% of total area
State Agencies:	765,594 acres, or 3.2% of total area
Tribal Lands:	825,579 acres, or 3.4% of total area
Private:	5,231,777 acres, or 21.6% of total area
City and County:	6,795 acres, or less than 0.1 of total area

Vegetation

Vegetation community composition in the forested mountain areas of Montana is not affected by soil conditions except under a few conditions (Pfister et al. 1977). Forest vegetation patterns are influenced primarily by climate, topography, and species migration patterns. The factors mentioned above result in a great variation in forest species composition across the ecotype. Because of this, the vegetation of this ecotype will be described in general areas based on climate characteristics.

The area north of Missoula and west of the Continental Divide has the greatest variety of tree species. The macroclimate of the northwest forest is more maritime, generally resulting in an area less subject to cold arctic outbreaks in the winter, which receives more total precipitation and a higher proportion of precipitation in the winter. The climatic conditions create an area where potentially 100 percent of the land could be forested. Most valleys are forested, and except for the nonforested Flathead Basin, these are included in the montane forest ecotype. Climate, plus a greater proximity to the Pacific, results in a greater abundance of Pacific and intermountain flora and a greater variety of plant species than the remainder of Montana. Grand fir (*Abies grandis*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), mountain hemlock (*Tsuga mertensiana*), and western white pine (*Pinus monticola*) are trees essentially confined to the northwest forested area. Western hemlock and

white pine are limited primarily to the extreme northwest corner. Alpine larch (*Larix lyallii*) extends a very short distance into the northernmost part of the east-of-divide area, and western larch penetrates much of the west-central region (Arno 1979). As in other parts of Montana, individual tree species are adapted to certain elevation zones. The order of adaptation from lowest to highest elevation for trees in the northwest area has been determined by (Pfister et al. 1977). In those areas warm and dry enough that there is a lower timberline adjacent to grassland, ponderosa pine (*Pinus ponderosa*) dominates at the lowest forest elevations. The upper timberline at about 8,000 feet is formed by alpine larch, whitebark pine, and subalpine fir. Grand fir, western red cedar, both hemlocks, and alpine larch have very narrow zones of distribution. The other conifer species may occupy elevation zones thousands of feet wide and therefore occur together with numerous other species. Generally the tree species are considered climax dominants only in the lower part of their range and are seral in the upper parts; however, in the northwest area, western larch, lodgepole pine, and spruce are considered seral wherever they occur (Pfister et al. 1977).

Some of the understory species common in the northwest area of the montane forest ecotype are either absent or rare in other parts of the ecotype. These include devil's club (*Oplopanax horridum*), queencup beadlily (*Disporum hookeri*), trefoil foamflower (*Tiarella trifoliate*), and wild sarsaparilla (*Aralia nudicaulis*). Heartleaf arnica (*Arnica cordifolia*), common juniper (*Juniperus communis*), and elk sedge (*Carex geyeri*) are rare in the northwest area but are widespread in other areas of the ecotype (Arno 1979). Understory species ubiquitous and relatively common in the northwest and throughout the montane forest ecotype include bluebunch wheatgrass, Idaho fescue, rough fescue, snowberry (*Symphoricarpus albus*), spirea (*Spirea betulifolia*), pinegrass (*Calamagrostis rubescens*), ninebark (*Physocarpus malvaceus*), twinflower (*Linnaea borealis*), huckleberry (*Vaccinium* spp.), and kinnikinnick (*Arctostaphylos uva-ursi*).

In the west-central area of the montane forest ecotype, the climate is drier, colder, and less maritime than the northwest, but is less continental than parts of the ecotype to the east and south. Western larch is common (although not necessarily widespread) in west-central and northwest areas but not throughout the ecotype. Western red cedar, grand fir, and alpine larch penetrate slightly into this area. The elevation ordering of tree species is similar to the northwest area except that grand fir, western red cedar, white pine, and hemlock are missing in most areas. Understory species shared with the northwest area but uncommon or missing to the east and south include smooth woodrush (*Luzula hitchcockii*), menziesia (*Menziesia ferruginia*), and beargrass (*Xerophyllum tenax*). In areas east of the Continental Divide, the ecotype is reduced to relatively isolated mountain islands surrounded by grassland or shrub grassland. Compared to the northwest and west-central areas, the overall climate in the east is colder, drier, and windier. This results in conditions unsuitable for several of the tree species found to the north and west. Although ponderosa pine is present in the plains

forests to the east (plains forest ecotype), it is generally absent throughout all but a small portion of this area of the montane forest ecotype. Apparently, the growing seasons coupled with high elevations limit the distribution of ponderosa pine. The most extensive areas of ponderosa pine just east of the divide are around Helena (Arno 1979). Douglas fir, lodgepole pine, and subalpine fir dominate forests throughout this area. Lodgepole pine is an extremely common seral species dominating much of the upper Douglas fir zone and the spruce fir zone. Only a very restricted area close to Yellowstone National Park is apparently climax lodgepole pine. Areas near the timberline commonly support subalpine fir and whitebark pine except on limestone substrates where whitebark pine is generally missing and often replaced by limber pine (*Pinus flexilis*). Alpine larch penetrates a small proportion of this area as well. Extensive amounts of the south-central area of the ecotype support spruce-dominated forests.

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Mission/Swan Valley and Mountains (679,663 acres)

Figure 19. Mission/Swan Valley and Mountains Focus Area

This area is geologically similar to Glacier National Park, with the Swan Valley sandwiched in between the heavily glaciated ranges of the Mission and Swan mountains. The mountain ranges and a strong Pacific storm track produce an inland maritime climate over a topography ranging from alpine ridges, cirque headwalls, and cirque basins down to moraines, terraces, and creek and river bottoms. The area is heavily forested and has relatively fertile soils, most of which have a 6- to 12-inch-thick layer of volcanic ash immediately below the organic matter, a result of eruptions in the Cascade Range. The valley bottom, in addition to the riparian areas along streams and rivers, is composed of a wide array of wetlands such as fens/peatlands, marshes, vernal pools, ponds, and lakes, with the valley bottom area consisting of more than 15 percent wetlands (compared to the Montana average of less than 2 percent wetlands). The area currently provides critical habitat for wildlife such as the grizzly bear, lynx, bull trout, bald and golden eagle, peregrine falcon, common loon, northern goshawk, and wolverine. More common wildlife species include whitetail and mule deer, elk, mountain goat, moose, black bear, mountain lion, bobcat, and beaver, along with a host of other mammals, fish, waterfowl, raptors, and songbirds. The valley contains one of the highest concentrations of rare plant populations in the region, with most of them being associated with wetland habitats, such as the water howellia.

Landscape Characteristics

This area is a large intermontane valley with adjacent block-faulted mountains that formed in valley fill, till, and metasedimentary rock. Volcanic ash influences

most soils. Alpine glaciation has strongly shaped the landscape. Elevations range from 2,900 to 9,300 feet. Drainage density is moderate, and wetlands and lakes occur frequently in this subsection. Mean annual precipitation ranges from 20 to 110 inches, with about 80 percent falling as snow in the mountains. The soil temperature and moisture regimes are cryic and udic. The primary natural disturbances are fire, insects, and windthrow. Land use is predominantly resource management and outdoor recreation with rural and suburban development in the valleys. The breakdown for land stewardship in the Mission/Swan Valley and Mountains area is as follows:

U.S. Federal Agencies:	375,477 acres, or 55.2% of total area, which include:
USFS:	373,870 acres, or 55% of total area
USFWS:	1,606 acres, or 0.2% of total area
State Agencies:	45,344 acres, or 6.7% of total area
Tribal Lands:	99,089 acres, or 14.6% of total area
Private:	159,136 acres, or 23.4% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Snowfields or Ice	II	2.09
Douglas Fir/Lodgepole Pine	III	2.36
Western Larch	III	2.55
Montane Parkland and Subalpine Meadow	III	4.16
Rock	III	4.38
Mixed Mesic Shrubs	II	5.21
Douglas Fir	II	10.12
Lodgepole Pine	III	10.61
Mixed Subalpine Forest	III	14.57
Mixed Mesic Forest	II	31.64

Note: A total of 87.68% of the Mission/Swan Valley and Mountains area is represented; 12.32% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 246 terrestrial vertebrate species that are found within the Mission/Swan Valley and Mountains Focus Area. Tier I species are listed below. All associations can be found in Table 24.

Amphibians: Western Toad

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Flammulated Owl, Black-backed Woodpecker, and Olive-sided Flycatcher

Mammals: Townsend's Big-eared Bat, Hoary Marmot, Northern Bog Lemming, Gray Wolf, Grizzly Bear, and Canada Lynx

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat fragmentation and loss of connectivity, especially as a result of human population growth/development and related transportation network	Support strategic conservation easements by conservation organizations and public agencies
	Promote further development of county ordinances that help guide future residential and commercial development
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Invasive or exotic plant species	Participate in partnerships to develop and implement weed control strategies
Human/wildlife conflicts and related wildlife mortality	Public education regarding human/wildlife conflicts
	Work with Montana Department of Transportation and Federal Highway Commission to effectively mitigate impacts of highway construction
Altered fire regimes	Work with coordinating agencies to mimic natural fire regimes

References

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes, including Report, Appendices, Conservation Area Descriptions, and Maps.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Lower Clark Fork (149 River Miles)

Figure 20. Lower Clark Fork River Focus Area

The Lower Clark Fork River originates at the confluence of the Clark Fork River and the Flathead River near the town of Paradise and continues to the Idaho border. The Lower Clark Fork River is bordered on the south by the Bitterroot Mountains and on the north by the Cabinet Mountains. At the point where the Lower Clark Fork leaves Montana, it is the largest river in Montana based on mean annual discharge. Average annual precipitation in the Lower Clark Fork drainage is quite high in comparison to other portions of Montana due to a significant maritime influence. Relatively wet and warm winter conditions commonly lead to rain-on-snow events that significantly affect the hydrology of tributaries to the Lower Clark Fork River by increasing the frequency of high flow. The Clark Fork River has been substantially altered by the construction of the Thompson Falls, Noxon Rapids, and Cabinet Gorge hydroelectric dams. These dams currently impound approximately 63 miles of the river within Montana.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		149
Lowland Lakes	III	812	
Lowland Reservoirs	III	11,637	
Mountain Lakes	III	3,607	
Mountain Streams	I		2,053

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 27 aquatic species that are found within the Lower Clark Fork River Focus Area. Tier I species are listed below. All associations can be found in Table 25.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants

Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species
Misidentification of fish species by anglers	Increase efforts to educate anglers on the identification of fish species

References

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes including Report, Appendices, Conservation Area Descriptions, and Maps.

Middle Clark Fork (119 River Miles)

Figure 21. Middle Clark Fork River Focus Area

The Middle Clark Fork River extends about 115 river miles from Milltown Dam in Bonner, Montana, to its confluence with the Flathead River, and is entirely free flowing. The Milltown Dam is scheduled to be removed in the near future. The river's drainage is mountainous and covered with the large forested tracts of the Lolo National Forest and private timberlands, broken by grazing and cropland areas in the lower valleys down to the Thompson Falls Dam. Through the broad Missoula Valley, the Middle Clark Fork is a sinuous river with frequent side channels, wide floodplains, and cottonwood-willow bottoms. The river then transitions into the Alberton Gorge whitewater area and becomes an entrenched single channel as it proceeds toward Thompson Falls. Major tributary systems such as Rattlesnake Creek and Fish Creek drain premier roadless wildlands including the Rattlesnake Wilderness and proposed Great Burn Wilderness along the Montana-Idaho divide. This river supports an excellent coldwater trout fishery including fluvial populations of native westslope cutthroat trout and bull trout. Because the Middle Clark Fork receives the waters of the Blackfoot, Bitterroot, and upper Clark Fork basins, it is known as a steady and productive system that supports a consistent fishery.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Rivers	II		119
Intermountain Valley Streams	II		113
Lowland Lakes	III	546	
Lowland Reservoirs	III	9	

Mountain Lakes	III	1,168	
Mountain Streams	I		2,080

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 20 aquatic species that are found within the Middle Clark Fork Focus Area. Tier I species are listed below. All associations can be found in Table 26.

Invertebrates: Western Pearlshell

Fish: Westslope Cutthroat Trout and Bull Trout

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
	Conservation easements and cooperative efforts to address human population growth and related impacts
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes

Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
	To the extent feasible, operate dams to mimic a more natural hydrograph on the main channel of rivers and ensure a more natural thermal regime
Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants
Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species
Misidentification of fish species by anglers	Increase efforts to educate anglers on the identification of fish species
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Whirling disease	Continue efforts to minimize impact of whirling disease on native fish populations
Degradation of habitat by unmanaged recreation use	Increase current efforts to improve river recreation management practices

References

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes including Report, Appendices, Conservation Area Descriptions, and Maps.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Plains Grassland and Plains Forest Ecotype

Figure 22. Plains Grassland and Plains Forest Ecotype

Montana's high eastern plains, part of America's Great Plains, are generally found on high, rolling land and on some scattered hills and in wide river valleys. Some of the rivers in this region, particularly the warmwater sections of the Yellowstone and Missouri in eastern Montana, harbor the most diverse communities of fish in the state. It's a rather harsh environment, with short, hot summers and long, cold winters that bring fewer than 15 inches of precipitation a year. In this environment, the protection offered by woody draws and the unique badlands or "breaks" provide important pockets of habitat and protection for wildlife.

In addition, Montana's unique prairie forests, found in the blistered "island" mountain ranges east of the Rocky Mountains, provide a higher elevation relief where precipitation is sufficient to create closed-canopy forests of Great Plains ponderosa pine and various hardwoods. Although these forests are not islands in the true sense, they are a unique part of the plains landscape.

Grassland

Landscape Characteristics

The plains grassland and plains forest ecotype includes 43,918,691 acres and represents 46.7 percent of Montana. Elevations at the western and southern edges of the plains grassland and plains forest ecotype range between 3,500 and 4,000 feet. Elevations decrease gradually toward the northeast, where the lowest point, 1,900 feet, as the Missouri River exits Montana, is reached. Broad areas less than 2,500 feet lie near the lower Missouri and Yellowstone rivers. For the most part the land is flat or rolling. Steeper dissected topography is found in

various badland areas of the east and southeast and in river breaks areas near the Missouri and Yellowstone and some major tributaries. Two major rivers, the Missouri and the Yellowstone, cross the entire ecotype. Flowing into these rivers are various large tributaries including the Milk, Marias, Powder, Tongue, Bighorn, and Musselshell rivers, all crossing many miles of the plains grassland.

Most of the area north of the Missouri and a little of it to the south, was overridden by the continental glaciers, creating topography that is somewhat smoother and flatter than the plains to the south. Exceptions to this are areas near some of the major rivers where erosion following glaciation dissected the land. Glaciated plains tend to have a relatively large number of small, poorly drained depressions, some of which form potholes or small lakes.

Soils

All soils in the plains grassland ecotype are classified as cool (average annual temperature ranging between 32 and 47 degrees F). Much of the soil in the glaciated plains (approximately north of the Missouri River) part of the ecotype contains large amounts of salt and may also be alkaline. Such soils may be medium textured with distinct topsoil horizons, or they may be heavy clay soils without horizons. The second-largest category of soils in the ecotype includes those that have light-colored topsoil layers and are not particularly saline or alkaline. These soils may or may not have lime layers. Places with somewhat higher effective precipitation (due to greater precipitation and or/ lower evaporation) have dark, well-developed topsoil horizons with a distinct clay layer just beneath that. These tend to be the most fertile and most easily tilled soils in the ecotype.

Climate

The climate of the plains grassland ecotype can be generally characterized as semiarid—cold in winter, warm in summer, and highly variable compared to the remainder of Montana. During much of the winter, Canadian high pressure pushes cold air south over the region. This type of weather pattern produces extremely low temperatures that may persist for days or weeks at a time, as well as low precipitation since moisture-producing weather systems are subsequently routed south. During the summer, low pressure caused by high temperatures may draw moisture in from the Gulf of Mexico. The area is mostly outside of the primary track of Pacific moisture-producing storms except for a period during late spring to early summer.

Mean annual temperatures range from 38 degrees F in some areas in the extreme northeast to 48 degrees F at some places south of the Yellowstone River. The mean for the ecotype is somewhere around 43 to 44 degrees F. Mean January temperatures vary from 2 degrees F in the northeast to 21 degrees F in the south. Mean July temperatures range from 63 to 72 degrees F. The highest

temperatures are along the Yellowstone River, whereas the lowest are in the northwest where the ecotype abuts the intermountain /foothill grassland ecotype. Minimum yearly temperatures upon which plant hardiness zones are based range from minus 38 degrees F in the northeast to minus 24 degrees F in the south. The boundary between hardiness zones 3 and 4 (mean minimum yearly temperatures in the minus 30s and minus 20s respectively) follows a line going approximately from the southeastern corner of Montana to the Sweetgrass Hills. There is no zone 5 in this ecotype. Mean annual maximum temperatures range from 104 degrees F along the lower Yellowstone River to 95 degrees F at the highest elevations of the ecotype in the northwest.

Average annual precipitation in the ecotype ranges from 10 inches in a wide band along most of the highline and a south-central area to 16 inches in some scattered eastern and southern areas. The average for the ecotype is from 12 to 14 inches. Except for some widely scattered isolated areas, the eastern portion of the ecotype tends to receive a greater proportion of its precipitation in the April 1 to July 31 (growing season) period than the west. Except for an area in the northwest, western areas near the mountains receive less than 55 percent of the precipitation in the April to August period, while most areas in the east receive more than 60 percent.

Snowfall ranges from 21 to 40 inches throughout most of the area. The higher snowfalls occur in the portions of the ecotype closest to the mountains. A few isolated areas in the extreme east get less than 20 inches of snow per year. The mean number of days per year when there is at least 1 inch of snow on the ground increases from the western and southern edges of the ecotype to the northeast. The areas with the least number of days of snow cover are in the Chinook zone, where extremely strong and persistent winds during the winter either sublimate or melt the snow. Mean wind speeds vary from 11 to 13 miles per hour over most of the ecotype. Days with snow cover range from less than 60 to more than 120 across the ecotype.

Anthropogenic Uses

The plains grassland ecotype encompasses the largest area in Montana. Recreational activities include hunting, fishing, and snowmobiling. Major industries includes ranching and farming, which produce some of the largest wheat and cattle yields in the country. The breakdown of landowner stewardship for the plains grassland ecotype is as follows:

U.S. Federal Agencies:	6,081,573 acres, or 13.8% of total area, which include:
BLM:	5,083,576 acres, or 11.6% of total area
USFS:	142,889 acres, or 0.3% of total area
USFWS:	716,050 acres, or 1.6% of total area
NPS:	556 acres, or less than 0.1% of total area
State Agencies:	2,886,994 acres, or 6.6% of total area

Tribal Lands:	2,532,892 acres, or 5.8% of total area
Private:	32,190,791 acres, or 73.7% of total area
City and County:	3,027 acres, or less than 0.1% of total area

Vegetation

On the semiarid plains grasslands, vegetation communities and soil characteristics are strongly associated. The rather uniform climatic conditions across the area dictate that differences in plant community composition are primarily due to the variations in available water-holding capacity of the soils. Soils are organized into categories that reflect annual precipitation as well as water-holding capacity. These categories, called ecological sites, are grouped on the basis of parameters such as texture, slope topographic position, and chemical characteristics. Most of the ecotype is within the 10- to 14-inch precipitation zone, and therefore, textural/topographic/chemical characteristics are the primary regulators of plant community composition.

Within the ecotype there is a relatively small number of grass species that occur as dominants throughout the area. Some of these are found in various amounts in nearly all the communities, whereas others are more specialized and occur only under certain conditions. Other major changes in the grassland communities occur with human management because of differing responses of species to management treatments. In addition to dry land farming, which totally removes native vegetation, range management practices impact native species.

Vegetation found throughout the ecotype includes western wheatgrass (*Agropyron smithii*), needle-and-thread (*Stipa comata*), bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), prairie junegrass (*Koeleria macrantha*), green needlegrass (*Stipa viridula*), thickspike wheatgrass (*Agropyron dasystachyum*), fringed sage (*Artemisia frigida*), and dense clubmoss (*Selaginella densa*). Other widespread species common in certain conditions include little bluestem (*Andropogon scoparius*), prairie sandreed (*Calamovilfa longifolia*), silver sage (*Artemisia cana*), sun-sedge (*Carex stenophylla*), and threadleaf sedge (*Carex filifolia*). Most other grasses and grasslike plants are only minor community components or are dominants in very restricted areas (Ross and Hunter 1976).

In terms of biomass, forbs in plains grassland communities tend to be highly subordinate in most conditions. Certain subshrubs, including fringed sage, broom snakeweed (*Gutierrezia sarothrae*), and prickly pear (*Opuntia polyacantha*) may become dominant members of some communities following overgrazing. Varying amounts of shrubs occur throughout the plains grasslands. However, the areas where shrubs contribute a large and consistent proportion of the biomass have been included in the shrub grassland ecotype.

Patterns of species dispersal and precipitation distribution influence the distribution of some species throughout the ecotype. The bluestems (warm-season grasses) originated farther east in the plains region of the United States and generally do not penetrate much beyond the eastern third of Montana with its more continental pattern of precipitation distribution. Bluebunch wheatgrass originated in the intermountain region of the United States (Barker and Whitman 1988), where spring and winter are wet and summers are dry. Although it is abundant on most sites in the western part of the ecotype, it becomes progressively less abundant and more restricted toward the east. Western wheatgrass, another important plains species, decreases toward the west. The plains grassland ecotype is a zone where mixed prairie species meet some of the Pacific/intermountain bunchgrasses, although the area is primarily dominated by the former (Wright and Wright 1948).

Coarse-textured sandy soils (2 percent of the ecotype) have not had time to form soil cover. Widespread species favored by coarse-textured soils include needle-and-thread, little bluestem, silver sage, and threadleaf sedge (Ross and Hunter 1976) (Hansen et al. 1988). Some other species whose distribution in Montana is mostly restricted to, rather than just favored by, sandy soils, include sand and big bluestems (*Andropogon hallii*, *A. gerardi*), prairie sandreed, Indian ricegrass (*Oryzopsis hymenoides*), sideoats grama (*Bouteloua curtipendula*), and yucca glauca.

Medium-textured soils, described as silty, occupy the greatest (more than 70 percent) range within the ecotype. Silty soils have a good combination of relatively high water-holding capacity as well as high permeability and infiltration rates. Potential natural communities in medium-textured soils in the 10- to 14-inch precipitation zone are dominated by western wheatgrass and needle-and-thread. However, blue grama can become abundant enough during drought periods to become dominant on many sites. This suggests that plant communities in the northern Great Plains with its extreme and variable climate are not static but vary greatly over time. Culwell et al. (1986) sampled grasslands in extreme eastern Montana dominated by western wheatgrass, blue grama, and threadleaf sedge. Western wheatgrass and green needlegrass constitute most coverage with run-in moisture such as swales and footslopes. Bluebunch wheatgrass is a dominant in western areas with western wheatgrass and needle-and-thread becoming much less abundant. Subdominant grasses include prairie junegrass, blue grama, sun sedge, and sometimes thickspike wheatgrass. Plains reedgrass (*Calamagrostis montanensis*) and plains muhly (*Muhlenbergia cuspidate*) may be locally dominant in some western areas. Little bluestem is locally dominant in some areas mostly in the east. The most important forb genera include *Lomatium and Astragalus*. In addition to the common species of the rest of the plains grassland, the areas receiving between 15 and 19 inches of annual precipitation allows the establishment of some species for which the surrounding areas are too dry. These include big bluestem (*Andropogon gerardii*) and Idaho fescue (*Festuca idahoensis*). Some plant communities on medium-

textured soils have been altered by cultivation or long periods of heavy grazing. Heavy grazing increases blue grama, fringed sage, clubmoss, prairie junegrass, and cheatgrass (*Bromus tectorum*) at the expense of wheatgrass and sometimes needle-and-thread.

Fine-textured soil constitutes a little more than 18 percent of the ecotype and is less favorable to species like needle-and-thread, prairie junegrass, and blue grama, although they will likely persist if adequate topsoil exists and is maintained. The finest textured soils with little or no topsoil support mostly western wheatgrass, green needlegrass, thickspike wheatgrass, and bluebunch wheatgrass in central and western parts of the ecotype (Ross and Hunter 1976). The heaviest clay soils are also usually saline and possible alkaline. Species not adapted to such conditions are prevented from establishing and are replaced by facultative or obligate halophytes such as western wheatgrass, saltgrass (*Distichlis stricta*), green needlegrass, Nuttall saltbush (*Atriplex nuttallii*), and greasewood (*Sacrobatus vermiculatus*). In low-lying areas, species favored by periodic flooding occur. These include Nuttall alkaligrass (*Puccinnellia nuttalliana*) and alkali cordgrass (*Spartina gracilis*). Areas of fine-textured soils in the plains that receive greater (15 to 19 inches) precipitation than the rest of the area share many of the dominant species as the adjacent foothill regions as well as those of the rest of the plains ecotype. These foothill species include bluebunch wheatgrass and Idaho fescue. Big bluestem occurs in the easternmost areas.

Topographically complex areas in the plains grassland ecotype include the river breaks and badlands areas, which are difficult to categorize vegetationally. Bluebunch wheatgrass and western wheatgrass tend to be dominant grasses in most areas. Little bluestem, prairie sandreed, needle-and-thread, and green needlegrass may be locally abundant. Shrubs and conifers may be locally important, especially in the breaks. Common shrubs include big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), rubber rabbitbrush (*Chrysothamnus nauseosus*), aromatic (skunkbush) sumac (*Rhus aromatica*), snowberry (*Symphoricarpus occidentalis*), and Nuttall saltbush. Draws in the extreme eastern part of the ecotype provide habitat for certain woody species not normally found elsewhere except in the Midwest. The tree most commonly encountered is green ash (*Fraxinus pennsylvanica*). Quaking aspen (*Populus tremuloides*) is occasionally found, and bur oak (*Quercus macrocarpa*) occurs in drainages of the extreme southeast (Hansen et al. 1988). Chokecherry and snowberry are shrubs commonly found in these situations. Relatively small timber stands are found scattered throughout most of the breaks area. Both ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziessii*) occur in these stands as far east as 108.5 degrees longitude; east of this point Douglas-fir drops out. The occurrence of these conifer species in the breaks is due to topoedaphic conditions since the area does not receive any more precipitation than the surrounding plains. A typical timber stand in the breaks forms a closed canopy consisting of ponderosa pine and Douglas-fir. The

understory shrub component is composed of some or all of the following: snowberry, aromatic sumac, chockecherry (*Prunus virginiana*), rose (*Rosa nutkana*), and Rocky Mountain juniper (*Juniperus scopulorum*). Frequent stand-replacing fires in the area result in communities composed of these shrub species but minus the tree overstory. Forbs and grasses include western yarrow (*Achillea millefolium*), aster (*Aster falcatus*), rose pussytoes (*Antennaria microphylla*), bluebunch wheatgrass, and plains muhly (*Muhlenbergia cuspidate*).

Forest

Landscape Characteristics

The plains forest ecotype includes 3,266,564 acres and represents 3.5 percent of Montana. Forested areas in the plains generally occupy higher areas that represent erosional remnants of resistant rock layers, particularly the Arikaree Formation near Ekalaka. These rock layers are younger than the layers supporting the surrounding grasslands (Ross et al. 1955). The stands of plains forest are located on hilly regions, mostly in the southern half of the plains portion of Montana. These hilly regions may be enough higher than surrounding grasslands, such that there is increased annual precipitation capable of supporting forests. Such hilly topography may also create topoedaphic conditions suitable for the establishment of tree cover. The difference in elevation between the forested hills and the adjacent grasslands is not great, generally in the neighborhood of a few hundred feet to at most 2,000 feet. Elevation differences much greater than this would generally result in a montane forest site. The forests of the Chalk Buttes, Longpines, and area near Hammond result from hills and/or buttes rising several hundred feet above base elevations of about 3,200 to 3,500 feet. The large forested area just east of Ashland occupies hills rising from low elevations of about 3,000 feet near the Tongue River to approximately 4,400 feet. The extensive forested region extending from near Custer through Lame Deer to Birney ranges in elevation from 4,000 to 5,000 feet. The lowest elevation of the Bull Mountains forested area is roughly 3,000 feet at points along the Musselshell River. Highest elevations are a little more than 4,000 feet. Most of the other scattered plains forest stands are due to elevation rises of a few to several hundred feet (e.g., east of Miles City, south of Rosebud, and north of Rapelje), topoedaphic effects (e.g., along the Yellowstone River near Columbus), or proximity to mountain areas (e.g., Longpines and Chalk Buttes).

Soils

The largest single category (80 percent) of soils occurring within the plains forest ecotype is described as having a relatively light-colored, thin topsoil horizon. Lime layers may be present if the parent material is calcareous. On the wettest sites (2.5 percent), the soil characteristics of montane forests are found. These tend to be acid with a duff layer (partially decomposed leaves, etc.) on top and a reddish brown clay layer beneath that. The remaining major category of soils is

the one where shale is the parent material.

Climate

The overall climate of the plains forest ecotype is determined by the same factors as the plains grassland, except that elevations of this ecotype are higher. These higher elevations have the effect of lowering temperatures and increasing yearly precipitation, allowing the establishment of forest.

Mean annual temperatures in the areas of plains forests generally are about 1 to 2 degrees F lower than the adjacent grasslands. In most cases this means temperatures from 43 to 44 degrees F. Since most of these are in the southern or western parts of the state, their annual temperatures are several degrees higher than at lower elevations in the northeast. January temperatures generally are 1 to 2 degrees lower than the surrounding grasslands, while July temperatures may be 3 to 4 degrees lower. This suggests that the slight differences in elevation have more effect on summer temperatures than winter temperatures.

Total annual precipitation over the entire ecotype averages approximately 14.5 inches. Some of the wettest areas receive more than 20 inches of annual precipitation. There does not appear to be any difference in the proportion of precipitation received during the growing season as compared to the adjacent lower elevation grasslands. Depending on exact location, May or June is the wettest month of the year and February is the driest.

The average frost-free season is typically shorter than that of the adjacent plains grasslands due to higher elevations and the reduction of overall temperatures. The frost-free season ranges from 90 to 115 days.

Anthropogenic

The plains forest ecotype is the smallest in landmass of the five major ecotypes. Recreational opportunities abound in these large pockets of forest. Activities include hiking, biking, snowmobiling, hunting, cross-country skiing, and wildlife watching. The primary industries in the area are livestock grazing, mining, and some timber extraction. The breakdown of landowner stewardship for the plains forest ecotype is as follows:

U.S. Federal Agencies:	547,647 acres, or 17.9% of total area, which include:
BLM:	156,850 acres, or 5.1% of total area
USFS:	390,797 acres, or 12.8% of total area
State Agencies:	155,059 acres, or 5.1% of total area
Tribal Lands:	285,716 acres, or 9.4% of total area
Private:	2,222,219 acres, 72.7% of total area

Vegetation

The plains forest ecotype occupies 4,610 square miles. The ecotype was intended to include only areas with relatively large contiguous tracts of potential forestland. The Missouri breaks woodlands are included with the plains grassland ecotype described earlier in this document. Because the plains forest areas are somewhat higher in elevation than the surrounding plains grassland, precipitation conditions (a combination of higher total amounts plus a favorable growing season wet moisture distribution) favor the establishment of a closed canopy forest.

Great Plains ponderosa pine (*Pinus ponderosa* var. *scopulorum*) is the sole conifer forming the plains forest ecotype, although various hardwood tree species (e.g., American elm [*Ulmus Americana*], green ash [*Fraxinus pennsylvanica*], American plum, [*Prunus Americana*], and bur oak [*Quercus macrocarpa*]) occur along some of the draws and ravines. In contrast to the ponderosa pine west of the Continental Divide, this variety tends to be shorter. Maximum tree heights range from 35 to 60 feet in dry situations and as much as 95 feet where there is more moisture (Arno 1979). Microclimatic conditions may be favorable in some places for Douglas-fir (*Pseudotsuga menziessii*), to establish, but apparently seed sources are too distant. The drier forests tend to be relatively open and support mostly grass understories. Grasses commonly found in these situations include little bluestem (*Andropogon scoparius*), big bluestem (*Andropogon gerardii*), bluebunch wheatgrass (*Agropyron spicatum*), blue grama (*Bouteloua gracilis*), and threadleaf sedge (*Carex filifolia*). Moist forests contain understory species common to montane forests to the west. Species include Canada buffaloberry (*Shepherdia canadensis*), kinnikinnick (*Arctostaphylos uvaursi*), Oregon grape (*Mahonia repens*), twinflower (*Linnaea borealis*), heartleaf arnica (*Arnica cordifolia*), fairy bells (*Disporum trachycarpum*), wintergreen (*Pyrola secunda*), and false Solomon’s seal (*Smilacina stellata*).

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Missouri Coteau (5,278,913 acres)

Figure 23. Missouri Coteau Focus Area

The Missouri Coteau area represents part of the large continental prairie grassland and pothole habitat that occurs in eastern Montana. This portion of Montana's prairie pothole country contains the highest density of natural wetlands. In most years springtime finds this area dotted with small wetlands. These shallow wetlands shine amongst the small glacial hilltops that are covered with short- to mid-grass prairie species. The density of wetlands on the landscape are unique to Montana, leading to diverse wildlife and vegetative species. This is the main portion of Montana that is considered to be part of the North American duck factory, the other being areas north of Chinook.

Landscape Characteristics

This area consists of hummocky plains, outwash and stream terraces, fans, and floodplains that formed in thin glacial till and river sediments that lie over shale, siltstone, and sandstone. Moraines, kames, kettles, and small lakes also occur. Elevations range from 1,650 to 3,050 feet. Drainage density is moderate. Mean annual precipitation ranges from 12 to 15 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and udic. Primary natural disturbances include extended droughts, insects, and severe storms. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly wheat farming and range and pasture lands. The breakdown for land stewardship in the Missouri Coteau area is as follows:

U.S. Federal Agencies:	147,337 acres, or 2.8% of total area, which include:
BLM:	117,375 acres, or 2.2% of total area

USFWS:	29,900 acres, or 0.6% of total area
NPS:	62 acres, or less than 0.1% of total area
State Agencies:	386,782 acres, or 7.3% of total area
Tribal Lands:	691,154 acres, or 13.1% of total area
Private:	4,040,173 acres, or 76.5% of total area
County and City:	62 acres, or less than 0.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Moderate/High Cover Grasslands	I	3.57
Agricultural Lands - Irrigated	III	5.39
Wetland and Riparian	I	6.13
Altered Herbaceous	II	12.69
Low/Moderate Cover Grasslands	I	27.71
Agricultural Lands - Dry	III	36.19

Note: A total of 91.69% of the Missouri Coteau area is represented; 8.31% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 318 terrestrial vertebrate species that are found within the Missouri Coteau Focus Area. Tier I species are listed below. All associations can be found in Table 27.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Smooth Greensnake

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Yellow Rail, Whooping Crane, Piping Plover, Long-billed Curlew, Interior Least Tern, Black Tern, Burrowing Owl, Sedge Wren, and Nelson's Sharp-tailed Sparrow

Mammals: Townsend's Big-eared Bat and Meadow Jumping Mouse

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion of native prairie to small grain crops	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion

	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Drainage of natural wetlands	Participate in government and private conservation partnerships to reduce the loss of wetland habitat and restore lost wetlands
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Fragmentation of habitat due to fossil fuel exploration and development activities	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Montana Sedimentary Plains (13,828,142 acres)

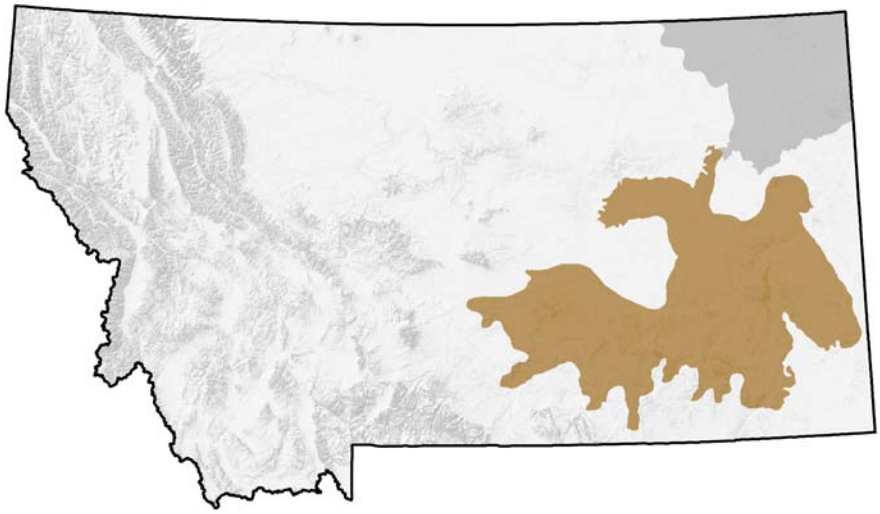


Figure 24. Montana Sedimentary Plains Focus Area

The gently sloping to rolling Montana Sedimentary Plains area contains scattered buttes and badlands. It sits on heavy clay soils and consists of mostly dry shrublands and mixed-grass prairies. It receives very little precipitation and is interspersed with woody draws that contain ponderosa pine, juniper, and snowberry. Agricultural practices can be found throughout the area that support many dryland native wildlife species such as antelope, mule deer, and greater sage-grouse.

Landscape Characteristics

This area includes plains and hills formed in residuum and alluvium from shale and sandstone. Some lacustrine sediments also occur. Elevations range from 2,100 to 4,150 feet. Drainage density is moderate. Mean annual precipitation ranges from 10 to 14 inches, with about 30 percent falling as snow. Soil temperature and moisture regimes are frigid and ardic ustic. The primary natural disturbances are fire and drought. Other important natural biotic disturbances include beaver activity in riparian areas and prairie dog complexes in grassland areas. Land use is predominantly livestock grazing with a small amount of dryland farming. The breakdown for land stewardship in the Montana Sedimentary Plains area is as follows:

U.S. Federal Agencies:	1,617,799 acres, or 11.7% of total area, which include:
BLM:	1,414,184 acres, or 10.2% of total area
USFS:	134,240 acres, or 1% of total area
USFWS:	10,934 acres, or less than 0.1% of total area
NPS:	680 acres, or less than 0.1% of total area
State Agencies:	792,405 acres, or 5.7% of total area

Tribal Lands:	566,427 acres, or 4.1% of total area
Private:	10,822,908 acres, or 78.3% of total area
County and City:	1,050 acres, or less than 0.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Xeric Shrub Grassland Associations	I	2.31
Moderate/High Cover Grasslands	I	2.42
Very Low Cover Grasslands	I	2.71
Agricultural Lands - Irrigated	III	2.86
Ponderosa Pine	II	4.52
Wetland and Riparian	I	4.64
Badlands	II	4.66
Sagebrush	I	6.77
Agricultural Lands - Dry	III	9.06
Mixed Xeric Shrubs	I	10.47
Low/Moderate Cover Grasslands	I	41.13

Note: A total of 91.54% of the Montana Sedimentary Plains area is represented; 8.46% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 346 terrestrial vertebrate species that are found within the Montana Sedimentary Plains Focus Area. Tier I species are listed below. All associations can be found in Table 28.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Mountain Plover, Long-billed Curlew, Interior Least Tern, Black Tern, and Burrowing Owl

Mammals: Spotted Bat, Townsend's Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, Black-footed Ferret, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat as a result of conversion of native prairie to agriculture	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Fragmentation of habitat due to fossil fuel exploration and development activities	Education and research on fossil fuel development and its impacts on natural landscape
	Work with corporations, land owners and other agencies to reduce impacts of exploration
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Streamside residential development	Develop statewide riparian best management principles
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team.76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Lower Missouri River (175 River Miles)

Figure 25. Lower Missouri River Focus Area

The Lower Missouri River area consists of badlands, breaks, coulees, and gently rolling hills. The river runs approximately 180 river miles from Fort Peck Dam to the North Dakota border. The section of river from the dam to the town of Wolf Point is uncharacteristically cool and clear, as water discharged from the bottom of the reservoir is devoid of sediment and very cold. Along with many native fish species, this area is occupied by non-native trout species. Even with flows from the Milk River, this section does not return to warmwater habitat until it reaches the town of Wolf Point, approximately 70 river miles downstream. From here to the North Dakota border the Missouri remains warm, with warmwater tributaries like the Poplar River, Red Water River, and Big Muddy Creek. The adjacent land along the Lower Missouri is primarily cottonwood-willow bottomlands and irrigated cropland. As with the area immediately below Fort Peck Dam, this area supports paddlefish, pallid sturgeon, shovelnose sturgeon, sauger, goldeye, and blue sucker, along with many other native fish species.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	3,021	
Lowland Reservoirs	III	374	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		175
Prairie Streams	I		3,228

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 55 aquatic species that are found within the Lower Missouri River Focus Area. Tier I species are listed below. All associations can be found in Table 29.

Fish: Pallid Sturgeon, Paddlefish, Shortnose Gar, Sturgeon Chub, Sicklefin Chub, Pearl Dace, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants

Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species

Lower Yellowstone River (278 River Miles)

Figure 26. Lower Yellowstone River Focus Area

The French used the term *Roche Jaune,* meaning “yellow rock,” to describe the lower section of the Yellowstone River, which is lined with trees and meanders through yellow bluffs and rimrocks on its journey toward North Dakota. This reach of the river cuts through a country of plateaus and wind-carved sandstone. By the time the Yellowstone reaches the mouth of the Bighorn River, it has turned from a crystal clear, cold mountain stream into a warm plains river. As it flows north and east, it picks up strength from the Powder and Tongue rivers. In the Lower Yellowstone are found species such as sauger, burbot, and paddlefish.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	6,577	
Lowland Reservoirs	III	1,119	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		278
Mountain Lakes	III	251	
Mountain Reservoirs	III	177	
Prairie Streams	I		11,326

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 65 aquatic species that are found within the Lower Yellowstone River Focus Area. Tier I species are listed below. All associations can be found in Table 30.

Fish: Pallid Sturgeon, Paddlefish, Shortnose Gar, Sturgeon Chub, Sicklefin Chub, Pearl Dace, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control invasive species and promote natural habitats that support native species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function

	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage

Powder River (220 River Miles)

Figure 27. Powder River Focus Area

The Powder River, a warm prairie river, originates along the eastern slopes of the Bighorn Mountains in Wyoming. Flowing 220 miles to reach the Yellowstone River, the Powder is aptly named, as it is rich in sediment load. A major spawning tributary for native fishes found in the Yellowstone system, the Powder River provides spawning and nursery habitat for sauger, shovelnose sturgeon, channel catfish, and many cyprinid minnow species. The flow regime of this river system can fluctuate from more than 2,000 cfs during the March spring snowmelt period to less than 5 cfs during the hot summer days of August. Fish in this prairie river system have evolved to utilize the Powder during periods of high flow. Sauger tagged in the Yellowstone River have been recaptured in Clear Creek, a headwater tributary to the Powder, equating to more than 220 miles of travel.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	926	
Lowland Reservoirs	III	80	
Prairie Rivers	II		220
Prairie Streams	I		3,703

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 38 aquatic species that are found within the Powder River Focus Area.Tier I species are listed below. All associations can be found in Table 31.

Fish: Sturgeon Chub, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
	Careful study waters entering the Powder River as a result of coal bed methane development in both Montana and Wyoming
Riprap and other streambank stabilization work	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition
	Develop statewide riparian best management principles
Invasive non-native fish species	Programs to control invasive species and promote natural habitats that support native species
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
	Modification of riparian management practices such that riparian vegetation is allowed to recover

	Develop statewide riparian best management principles
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage

Tongue River (221 River Miles)

Figure 28. Tongue River Focus Area

The headwaters of the Tongue River rise in the Bighorn Mountains of Wyoming. From these sources the river flows northeast to its confluence with the Yellowstone River at Miles City. A major spawning tributary for native fishes found in the Yellowstone system, the Tongue River provides spawning and nursery habitat for sauger, shovelnose sturgeon, channel catfish, and many cyprinid minnow species. The 3,500-acre Tongue River Dam controls the river's flow in Montana. Above the reservoir, the river meanders through a broad open valley. Here its main features are turbid water, slow velocity gravel and mud bottoms, and warm water temperatures. Downstream from the dam, the river flows for 10 miles through a narrow, restrictive canyon with increasing gradient and accompanying cooler water temperatures and gravel bottoms. The Tongue River again becomes a slow, meandering valley stream for its last 179 miles.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Lowland Lakes	III	665	
Lowland Reservoirs	III	2,176	
Mountain Lakes	III	54	
Prairie Rivers	II		221
Prairie Streams	I		4,843

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 49 aquatic species that are found within the Tongue River Focus Area. Tier I species are listed below. All associations can be found in Table 32.

Fish: Paddlefish, Sturgeon Chub, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Dewatering as a result of water diversion	Work with public and private land owners to improve efficiency of water use in order to maximize water return
	Protect instream flow reservations
Water chemistry problems due to irrigation return water and the discharge of wastewater from coal bed methane operations, and other sources	Support cooperative efforts to minimize impacts of return water due to sedimentation, increased salinity and temperature alteration
	Careful study waters entering the Tongue River as a result of coal bed methane development in both Montana and Wyoming
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles

Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats, simulate the natural hydrograph and also protect instream flows
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage
Loss of species (mountain whitefish and mountain sucker) below Tongue River Dam due to de-watering and drought	Support cooperative efforts to increase water flow and reduce barriers to migration specifically affecting these species

Shrub Grassland Ecotype

Figure 29. Shrub Grassland Ecotype

Montana's important, yet sporadic, shrub grasslands are found across the southern half of Montana in high-elevation valleys and along grassy slopes. The junipers and sagebrushes that characterize these generally dry slopes occupy only 8 percent of Montana. Typically interspersed with low-cover grasslands, the shrub grassland ecptype offers a unique transition area that supports many of Montana's species of greatest conservation need. More than half of Montana's shrub grasslands are privately owned. Increasingly, the high and flat benches that traditionally provided grazing lands for wildlife and livestock are prized for residential development because of their easy access with 100-mile views. In the coming years, long-term partnerships with landowners will be a crucial component of shrub grassland conservation.

Landscape Characteristics

The shrub grassland ecotype includes 7,240,566 acres and represents 7.7 percent of Montana. The southwestern segment of the shrub grassland ecotype is situated in high mountain valleys and on nonforested mountain slopes at elevations from 5,500 feet to 8,000 feet. Slopes vary from nearly level in valleys to sometimes more than 45 degrees on some mountainsides. Mountain valleys and drainages associated with this segment include the Centennial, Big Hole, upper Beaverhead, and the valley between the Butte Highlands and Fleecer Mountain. Shrub grasslands are found on slopes of the Centennial, Snowcrest, Beaverhead, Pintler, Highland, Ruby, south Bitterroot, Tendoy, and Tobacco Root mountains. A segment of shrub grassland occupies the valleys of the upper Shields and Smith rivers at elevations from 4,500 to 6,500 feet. These slopes are predominantly level or gently sloped. Other areas of shrub grassland are found in the north-central and southern plains region on mostly level or gentle slopes,

although where this ecotype occupies dissected river breaks, slopes can be locally steep. Major drainages where these shrub grasslands are located include the Clark Fork of the Yellowstone, upper Tongue, upper Powder, Bighorn, Musselshell, Milk, central Missouri, and Missouri rivers above Fort Peck Dam, and Dry Creek. Most are located in elevations ranging from 2,000 to 3,500 feet.

Soils

Land occupied by this ecotype in the southwest is geologically the same as the adjacent grasslands or forest. Shrub grasslands in the plains dominated by Wyoming big sagebrush most commonly occur on Cretaceous shales (Colorado Shale, Montane Group, and Pierre Shale) in the sedimentary plains area. Other shrub grasslands occupy a variety of geological substrates. Very little shrub grassland is found in the glaciated plains.

As well as being highly variable in terms of vegetation composition, geographic location, and geology, the shrub grassland ecotype is variable in terms of soil characteristics. Most of the major soil categories found in Montana, except for those of alpine and subalpine situations, are represented in this ecotype (Montagne et al. 1978).

Climate

Mean annual temperature in the intermountain/foothill segment of the ecotype varies from 36 to 40 degrees F. In the plains shrub grasslands, mean annual temperatures range from 43 to 45 degrees F.

Because this ecotype occurs as widely separated segments across most of the southern half of the state, temperatures at a given time of year vary broadly. Due to the relatively high elevations where shrub grassland is found in the intermountain region, January daily temperatures are comparatively cold for that part of the state (12 to 19 degrees F). January temperatures in the plains segments are typical for whichever area of the state they are in and range from 10 to 20 degrees F. July daily temperatures in the southwest segment range from 57 to 63 degrees F, and on the plains they vary from 64 to 66 degrees F. Mean annual extreme minimum temperatures across the ecotype vary from minus 24 to minus 31 degrees F, putting most of the area into the cold side of plant hardiness zone 4. Mean annual maximum temperatures may be anywhere from less than 85 degrees F in the southwest to over 102 degrees F in the southeast.

Average length of time without frost is shortest in the southwest and may only be 30 days in some places. The frost-free period is the greatest in those segments near the lower Yellowstone and Missouri rivers, where it may range from 115 to 130 days.

The percentage of precipitation received during the growing season is highly variable within the southwest segment, ranging from 35 to 60 percent depending on the shrub and grassland. The shrub and grassland around White Sulphur Springs receives 40 to 45 percent of its moisture in the growing season. In other segments of the shrub grassland ecotype, 50 to 62 percent of moisture falls during the growing season.

Snowfall for the shrub grassland areas in or near the mountains, except for the segment south of the Pryor Mountains, generally ranges from 31 to 90 inches each year. Mean number of days with snow cover in these areas varies from 90 to 160 days. An area of shrub grassland south of the Pryor Mountains averages less than 30 inches of mean annual snowfall and generally has snow on the ground for less than 60 days. The other areas generally average between 20 and 50 inches of snowfall with 60 to 100 days of snow cover.

Anthropogenic Uses

The shrub grassland ecotype is some of the most undeveloped habitat in the state. Recreationalists and agriculturalists enjoy and appreciate it. The breakdown of land stewardship for the shrub grassland ecotype is as follows:

U.S. Federal Agencies:	1,851,561 acres, or 25.7% of total area, which include:
BLM:	1,574,556 acres, or 21.8% of total area
USFS:	228,634 acres, or 3.2% of total area
USFWS:	42,008 acres, or 0.6% of total area
NPS:	1,977 acres, or less than 0.1% of total area
State Agencies:	668,049 acres, or 9.2% of total area
Tribal Lands:	260,264 acres, or 3.6% of total area
Private:	4,431,526 acres, or 61.5% of total area

Vegetation

In areas of the shrub grassland ecotype that has fine-textured soils and receives 10 to 14 inches of annual precipitation, the predominant species of vegetation is the big sagebrush (*Artemisia tridentata* ssp). Big sagebrush–dominated communities in this area normally are found on fine-textured to very fine textured soils. Such areas are estimated to cover 65 percent of the ecotype. Where there is more available moisture due to run-in or a high water table, silver sagebrush (*Artemisia cana*) or greasewood (*Sarcobatus vermiculatus*) may be abundant. Silver sagebrush is favored by medium-textured nonsaline soils; greasewood is usually found on dense clay saline and/or alkaline soils. Silver sagebrush bottomlands in Theodore Roosevelt National Park described by Hansen et al. (1988) are probably similar to such communities in eastern Montana. Dominant species in these areas are silver sagebrush, western wheatgrass (*Agropyron smithii*), and green needlegrass (*Stipa viridula*). The dominant understory species under big sagebrush in eastern areas are western wheatgrass, prairie junegrass

(*Koeleria macrantha*), and green needlegrass. Other common species include Nuttall saltbush (*Atriplex nuttallii*), bluebunch wheatgrass (*Agropyron spicatum*), and various milkvetches (*Astragulus* spp.). In the west, dominant grasses are bluebunch wheatgrass, western wheatgrass, and prairie junegrass. Common forbes are milkvetches, American vetch (*Vicia Americana*), and biscuitroot (*Lomatium* spp.).

Where big sagebrush is the dominant species on silty soils in the 10- to 14-inch precipitation zone, the most abundant grasses are needle-and-thread (*Stipa comata*) and western wheatgrass in the east and bluebunch wheatgrass in the west (Ross et al. 1976) (Mueuggler et al. 1980). On limy, shallow, and very shallow soils, bluebunch wheatgrass is typically dominant. Communities containing both low sagebrush (*Artemisia arbuscula*) and big sagebrush are found in some areas of extreme southwest Montana east of the Continental Divide. These sites are often on limestone. Subdominant grasses include prairie junegrass and sandberg bluegrass (*Poa secunda*). Common forbs are hood's plox (*Phlox hoodii*) and blue flax (*Linum perenne*). Curlleaf mountain mahogany (*Cercocarpus ledifolius*) is another shrub restricted to the extreme southwestern part of the state. A bitterbrush (*Purshia tridentata*)/bluebunch wheatgrass habitat type is recognized west of the divide, and an aromatic sumac (*Rhus aromatica*)/ bluebunch wheatgrass type occurs in south-central Montana. Other shrubs such as big sagebrush, rubber rabbitbrush (*Chrysothamnus nauseosus*), and Rocky Mountain juniper (*Juniperus scopulorum*) may be an important component of these habitat types. Finally, on saline lowlands, a greasewood/western wheatgrass habitat is recognized, and on uplands a greasewood/basin wildrye (*Elymus cinereus*) type.

The areas of the shrub grassland ecotype where annual precipitation is from 15 to 19 inches are usually higher in elevation than those with annual precipitation between 10 to 14 inches. The most abundant shrub species is generally mountain big sagebrush (*Artemisia tridentata* ssp. *vaseyana*), although there may be some Wyoming big sagebrush, rubber rabbitbrush, and bitterbrush. Where these shrub grasslands occur in southwestern Montana, bluebunch wheatgrass is still an important grass species as in the 10- to 14-inch precipitation areas, but Idaho fescue is considered to be dominant. North of the 46th parallel, Idaho fescue is replaced by rough fescue (*Festuca scabrella*) as the dominant grass. These sites generally have more abundant and diverse forbs than the drier areas. In the higher precipitation areas that are well drained, typically with steep slopes, coarse-textured shallow soils, and often southerly exposures, the most abundant species is generally bitterbrush. West of the divide and north of the 47th parallel, rough fescue is the most productive grass. South of that Idaho fescue or Idaho fescue and bluebunch wheatgrass are the most productive. On some sites mountain big sagebrush may be as abundant as bitterbrush. Arrowleaf balsamroot (*Balsamorhiza sagitatta*) and silky lupine (*Lupinus sericeus*) are very common both north and south of the 47th parallel.

Terrestrial Conservation Focus Areas in Greatest Need (Tier I)

Bighorn Intermontane Basin (290,287 acres)

Figure 30. Bighorn Intermontane Basin Focus Area

The Bighorn Intermontain Basin area protrudes across Montana's border from Wyoming and sits in the rain shadow of the Beartooth Range. The area is home to a very diverse wildlife community and represents a limited geographic area at the end of its range that resembles communities more typical of the Great Basin and Colorado Plateau than Montana. Riparian areas are limited minor drainages, and it is the driest area in Montana, typically receiving only 6 inches of precipitation annually. Snow seldom lasts long due to the predominant and seemingly ever present southwest winds. Native vegetation is generally dominated by shrubs, primarily black sagebrush, Wyoming big sagebrush, and greasewood. Understory grasses are generally sparse, with invading annuals such as cheatgrass often dominating. This is the home of the prairie rattlesnake as well as the sagebrush and greater short-horned lizards. Greater sage-grouse are abundant as are gray partridges. This is the only habitat in Montana that supports the chukar partridge. However, given the desert nature of the habitat, mule deer and pronghorn antelope can exist only in low densities.

Landscape Characteristics

This subsection consists of dissected plains, hills, terraces, and fans that formed in shale, siltstone, and sandstone overlain by some alluvium and lacustrine sediment. Elevations range from 3,700 to 4,700 feet. Drainage density is moderate. Mean annual precipitation ranges from 5 to 12 inches. The soil temperature and moisture regimes are mesic and aridic ustic. Winters are very dry. The primary natural disturbance is drought. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock

grazing and irrigated cropland. The breakdown for land stewardship in the Bighorn Intermontane Basin area is as follows:

U.S. Federal Agencies:	163,275 acres, or 56.2% of total area, which include:
BLM:	157,097 acres, or 54.1% of total area
USFS:	3,707 acres, or 1.3% of total area
NPS:	2,471 acres, or 0.8% of total area
State Agencies:	14,517 acres, or 5% of total area
Tribal Lands:	4,819 acres, or 1.7% of total area
Private:	107,676 acres, or 37.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Agricultural Lands - Irrigated	III	2.46
Low/Moderate Cover Grasslands	I	3.44
Utah Juniper	III	3.73
Xeric Shrub Grassland Associations	I	5.67
Badlands	II	17.19
Very Low Cover Grasslands	I	28.28
Sagebrush	I	33.78

Note: A total of 94.55% of the Bighorn Intermontane Basin area is represented; 5.45% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 174 terrestrial vertebrate species that are found within the Bighorn Intermontane Basin Focus Area. Tier I species are listed below. All associations can be found in Table 33.

Amphibians: Northern Leopard Frog

Reptiles: Western Hog-nosed Snake and Milksnake

Birds: Bald Eagle, Greater Sage-Grouse, Mountain Plover, Long-billed Curlew, and Burrowing Owl

Mammals: Spotted Bat, Pallid Bat, Black-tailed Prairie Dog, White-tailed Prairie Dog, Gray Wolf, and Black-footed Ferret

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion agriculture	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
Drainage of natural wetlands	Participate in government and private conservation partnerships to reduce the loss of wetland habitat and restore lost wetlands
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Fragmentation of habitat due to fossil fuel exploration and development activities	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape

References

A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountain Ecoregion: Report to the Nature Conservancy. 2001. R. Noss, G. Wuerthner, K. Vance-Borland, and C. Carroll. Conservation Science, Inc. 125 pp. + Executive Summary and Appendix D.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Montana Glaciated Plains (17,806,106 acres)

Figure 31. Montana Glaciated Plains Focus Area

The Montana Glaciated Plains area is dominated by level to rolling till plains covered by sagebrush grasslands and mixed short-grass prairie and croplands. This area also encompasses two island mountain ranges: the Bears Paw and Highwood mountains. The major river drainages of the area include the Milk, Missouri, Marias, and Musselshell. In the east, this focus area is characterized by prairie that is dissected by badlands of the major tributaries to the Milk, Missouri, Marias, and Musselshell drainages. From the bluffs dotted with ancient tepee rings, one can observe numerous prairie wildlife species. To the west, the area is characterized by the numerous rugged breaks that support diverse assemblages of ponderosa pine and cottonwoods depending on the availability of moisture. This area also is considered very fertile wheat growing country, most notable in the Golden Triangle to the west.

Landscape Characteristics

This area consists of plains, terraces, fans, and floodplains that formed in glacial till, gravel deposits, and alluvium over clay shale, sandstone, and siltstone. Elevations range from 1,800 to 7,500 feet in the Highwood and Bears Paw mountains. Drainage density is moderate and glacial potholes are common, especially in the northern part of the subsection. Mean annual precipitation ranges from 10 to 15 inches, with about 20 to 30 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Primary natural disturbances are drought and fire. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing and dryland farming. The breakdown for land stewardship in the Montana Glaciated Plains area is as follows:

U.S. Federal Agencies:	3,394,302 acres, or 19.1% of total area, which include:
BLM:	3,003,010 acres, or 16.9% of total area
USFS:	62 acres, or less than 0.1% of total area
USFWS:	283,492 acres, or 1.6% of total area
NPS:	247 acres, or less than 0.1% of total area
State Agencies:	1,253,566 acres, or 7% of total area
Tribal Lands:	1,141,133 acres, or 6.4% of total area
Private:	11,995,485 acres, or 67.4% of total area
County and City:	494 acres, or less than 0.1% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Wetland and Riparian	I	3.22
Moderate/High Cover Grasslands	I	3.38
Altered Herbaceous	II	4.33
Sagebrush	I	4.67
Very Low Cover Grasslands	I	4.79
Agricultural Lands - Irrigated	III	13.87
Agricultural Lands - Dry	III	20.19
Low/Moderate Cover Grasslands	I	33.66

Note: A total of 88.11% of the Montana Glaciated Plains area is represented; 11.89% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 364 terrestrial vertebrate species that are found within the Montana Glaciated Plains Focus Area. Tier I species are listed below. All associations can be found in Table 34.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Bird: Common Loon, Bald Eagle, Greater Sage-Grouse, Yellow Rail, Whooping Crane, Piping Plover, Mountain Plover, Long-billed Curlew, Interior Least Tern, Black Tern, and Burrowing Owl

Mammals: Spotted Bat, Townsend's Big-eared Bat, Black-tailed Prairie Dog, Black-footed Ferret, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Conversion of native prairie to small grain production	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
	Implement practices (economic and ecological) that sustain ranching profitability and promote public access
Petroleum exploration and development impacts	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape
	Evaluate ecological implications of road development as well as reservoir and pit retention construction related to petroleum development
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural fire disturbance processes and hydrologic regimes	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Loss of natural wetlands	Maintain existing structure and functional uses of wetlands on private and federally managed lands

References

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper

Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Whitewater Wetlands Conservation Area Plan. 2004. B. Martin and J. Stutzman. 16 pp + appendices.

Montana Shale Plains (2,403,965 acres)

Figure 32. Montana Shale Plains Focus Area

Much of the Montana Shale Plains area can be considered mountain foothill terrain that contains many woody draws with ponderosa pine and cedar stands throughout.

Landscape Characteristics

This subsection consists of dissected plains, hills, terraces, fans, and floodplains that formed in shale, siltstone, and sandstone. Elevations range from 1,500 to 3,500 feet. Drainage density is moderate to high. Mean annual precipitation ranges from 10 to 14 inches, with about 30 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Summers are dry. Primary natural disturbances are drought and erosion. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing with some dryland farming. The breakdown for land stewardship in the Montana Shale Plains area is as follows:

U.S. Federal Agencies:	278,550 acres, or 11.6% of total area, which include:
BLM:	275,461 acres, or 11.5% of total area
USFWS:	3,089 acres, or 0.1% of total area
State Agencies:	158,889 acres, or 6.6% of total area
Private:	1,965,538 acres, or 81.8% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Wetland and Riparian	I	2.46
Agricultural Lands - Dry	III	4.66
Xeric Shrub Grassland Associations	I	4.68
Moderate/High Cover Grasslands	I	5.04
Very Low Cover Grasslands	I	6.45
Badlands	II	8.04
Sagebrush	I	8.48
Mixed Xeric Shrubs	I	16.51
Low/Moderate Cover Grasslands	I	36.35

Note: A total of 92.67% of the Montana Shale Plains area is represented; 7.33% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 307 terrestrial vertebrate species that are found within the Montana Shale Plains Focus Area. Tier I species are listed below. All associations can be found in Table 35.

Amphibians: Northern Leopard Frog

Reptiles: Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl,

Mammals: Townsend's Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, Black-footed Ferret, Canada Lynx, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes or fire regimes	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Conversion of natural habitat to croplands	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion

	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Powder River Basin/Breaks/Scoria Hills (2,095,021 acres)

Figure 33. Powder River Basin/Breaks/Scoria Hills Focus Area

Much of this unglaciated area extends across Montana's border into Wyoming. The flat to rolling mixed-grass prairie contains considerable areas of sagebrush grassland as well as ponderosa pine and juniper woodlands that are broken by occasional rugged breaks. The Powder River cutting through the area provides significant riparian habitat for many species. This area supports irrigated and dryland crops.

Landscape Characteristics

This subsection consists of dissected plains and hills, terraces, and fans with some river breaks and badlands that formed in alluvium and colluvium from sandstone, shale, and siltstone. Elevations range from 2,100 to 4,980 feet. Drainage density is moderate to high. Mean annual precipitation ranges from 10 to 14 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Summers are dry. Primary natural disturbances are drought and erosion. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing and irrigated and dryland crops. The breakdown for land stewardship in the Powder River Basin/Breaks/Scoria Hills area is as follows:

U.S. Federal Agencies:	503,292 acres, or 24% of total area, which include:
BLM:	197,993 acres, or 9.5% of total area
USFS:	304,928 acres, or 14.5% of total area
NPS:	371 acres, or less than 0.1% of total area
State Agencies:	90,873 acres, or 4.3% of total area
Tribal Lands:	313,824 acres, or 15% of total area
Private:	1,186,909 acres, or 56.7% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Very Low Cover Grasslands	I	2.70
Mixed Mesic Shrubs	II	3.31
Sagebrush	I	5.30
Wetland and Riparian	I	6.21
Mesic Shrub Grassland Associations	I	7.42
Low Density Xeric Forest	II	8.15
Mixed Xeric Shrubs	I	10.04
Ponderosa Pine	II	11.60
Low/Moderate Cover Grasslands	I	31.86

Note: A total of 86.59% of the Powder River Basin/Breaks/Scoria Hills area is represented; 13.41% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 299 terrestrial vertebrate species that are found within the Powder River Basin/Breaks/Scoria Hills Focus Area. Tier I species are listed below. All associations can be found in Table 36.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Trumpeter Swan, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Long-billed Curlew, Black Tern, and Burrowing Owl,

Mammals: Spotted Bat, Townsend's Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, Black-footed Ferret, and American Bison

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat as a result of conversion of native habitat to agriculture	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship

	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands
Fragmentation of habitat due to fossil fuel exploration and development activities	Education and research on fossil fuel development and its impacts on natural landscape
	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Careful study impacts of road development and retention pond construction as a result of coal bed methane development in both Montana and Wyoming
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

Shale Scablands (417,176 acres)

Figure 34. Shale Scablands Focus Area

The very dry Shale Scablands area is covered mostly by sagebrush grassland that is intersected by woody draws. The species that make up the woody draws are mostly green ash, buffaloberry, chokecherry, and some juniper.

Landscape Characteristics

This subsection consists of dissected shale plains formed in calcareous shale, claystone, and sandstone. Elevations range from 2,650 to 4,100 feet. Drainage density is high. Mean annual precipitation ranges from 11 to 15 inches, with about 20 percent falling as snow. The soil temperature and moisture regimes are frigid and aridic ustic. Primary natural disturbances are drought and fire. Another important natural disturbance regime is prairie dog complexes. Land use is predominantly livestock grazing. The breakdown for land stewardship in the Shale Scablands area is as follows:

U.S. Federal Agencies:	126,889 acres, or 30.4% of total area, which include:
BLM:	126,889 acres, or 30.4 of toal area
State Agencies:	21,992 acres, or 5.3% of total area
Private:	268,295 acres, or 64.3% of total area

Associated Habitats

Habitat	Habitat Tier	Percentage of Area
Mixed Broadleaf Forest	I	2.22
Mesic Shrub Grassland Associations	I	3.01
Low Density Xeric Forest	II	3.17

Moderate/High Cover Grasslands	I	3.47
Rock	III	4.40
Mixed Mesic Shrubs	II	4.60
Mixed Xeric Shrubs	I	5.42
Very Low Cover Grasslands	I	5.49
Badlands	II	7.60
Wetland and Riparian	I	8.50
Salt-desert Shrub/ Dry Salt Flats	I	8.56
Low/Moderate Cover Grasslands	I	13.01
Sagebrush	I	25.05

Note: A total of 94.52% of the Shale Scablands area is represented; 5.48% is made up of a combination of other habitat types.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 245 terrestrial vertebrate species that are found within the Shale Scablands Focus Area. Tier I species are listed below. All associations can be found in Table 37.

Amphibians: Northern Leopard Frog

Reptiles: Snapping Turtle, Spiny Softshell, Western Hog-nosed Snake, and Milksnake

Birds: Common Loon, Bald Eagle, Greater Sage-Grouse, Whooping Crane, Mountain Plover, Long-billed Curlew, Black Tern, and Burrowing Owl,

Mammals: Townsend's Big-eared Bat, Black-tailed Prairie Dog, Meadow Jumping Mouse, and Black-footed Ferret

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion of native prairie to crops	Policy-based approaches that encourage the conservation of natural communities, rather than support their conversion
	Support public and private conservation programs/activities that encourage and support private land use stewardship
	Increased cooperative efforts to maintain ecological features or processes on public, private, and tribal lands

Drainage of natural wetlands	Participate in government and private conservation partnerships to reduce the loss of wetland habitat and restore lost wetlands
Invasive or exotic plant species	Cooperative efforts to reduce the abundance of exotic plant species
Disruption of natural disturbance processes, especially fire	Work with other agencies, tribes and private organizations to restore the natural disturbance processes
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)

References

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

Aquatic Conservation Focus Areas in Greatest Need (Tier I)

Middle Missouri River (540 River Miles)

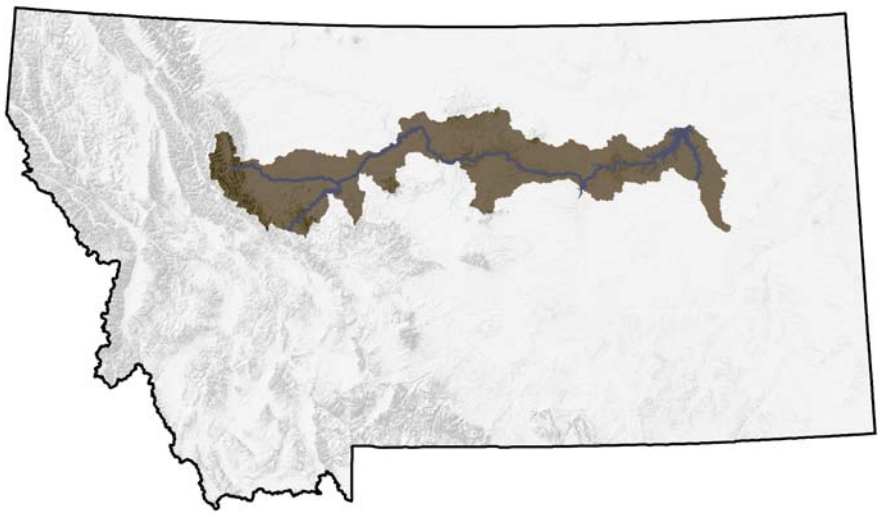


Figure 35. Middle Missouri River and Tributaries Focus Area

Once the Missouri River reaches the confluence with Hardy Creek, it becomes wide and slow for the next 60 miles and then turns into whitewater as it flows over the falls at Great Falls. Although dams have effectively covered the falls, the original cascade posed a tremendous obstacle for Lewis and Clark. From here downstream for more than 200 miles to the Fort Peck Reservoir is the longest free-flowing section of the entire Missouri River. One hundred and fifty miles of this stretch has been designated as Wild and Scenic and flows through cottonwood forests and canyons.

Associated Habitats

Habitat Type	Habitat Tier	Acres	Miles
Intermountain Valley Streams	II		2,170
Lowland Lakes	III	281,756	
Lowland Reservoirs	III	4,505	
Mixed Source Rivers (Intermountain and Prairie Flow)	II		438
Mountain Lakes	III	1,139	
Mountain Reservoirs	III	1,445	
Mountain Streams	I		2,289
Prairie Rivers	II		148
Prairie Streams	I		8,909

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 63 aquatic species that are found within the Middle Missouri River and Tributaries Focus Area. Tier I species are listed below. All associations can be found in Table 38.

Fish: Pallid Sturgeon, Paddlefish, Sturgeon Chub, Sicklefin Chub, Blue Sucker, Burbot, and Sauger

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores fish passage to ensure full migratory movement
Modification and degradation of stream channels caused by various construction or land management practices	Restoration of stream channels or streambanks to a condition that simulates their natural form and function
Riparian vegetation effected by range and forest management practices and streamside residential development (such activities destabilize streambanks, increase sediment inputs, reduced shading, and remove woody debris)	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
Entrainment of juvenile and adult fishes by irrigation diversions or other water intakes	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Alterations of the quantity or timing of stream flows, causing dewatering or unnatural flow fluctuations that diminish the quantity or quality of essential habitats	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
	Protect Instream flow reservations

Water chemistry problems that arise due to municipal discharge, irrigation return water, and other sources	Work with municipal government and private landowners to reduce point source pollutants
Unnatural hydrograph and water temperatures associated with the presence and operations of large dams	Work with appropriate authorities to restore hydrograph that mimics the natural regime
Non-native fish species	Support activities to promote natural habitats that support native species

Component II: Community Types of Greatest Conservation Need

> *"This is a high-leverage strategy to address the conservation concerns of whole ecological communities or species groupings. Implementing conservation strategies at this level will comprehensively benefit many fish and wildlife species."*

Fish and wildlife communities have not been formally defined for Montana's complex biological systems. For this strategy, landscape characteristics, vegetative cover type, and associated fish and wildlife species were linked in order to begin describing community types. Future efforts to provide complete classifications of Montana's fish and wildlife communities will be critical for implementing this strategy and monitoring conservation success.

Conservation at the community level provides the potential to leverage conservation resources to benefit large numbers of species. Community types also provide a way to associate numerous species through common habitat requirements. These communities of plants and animals often face similar conservation concerns that can be addressed simultaneously. In the focus area component of this strategy, geographic areas were identified that offer some of the greatest potential to conserve the community types and species in greatest need of conservation. The following community types have been identified as Tier I (in greatest need of conservation, with a status of low or declining), and efforts to conserve them should not be limited to the focus areas identified in Component I. Efforts should be made to address the conservation strategies identified for these community types across the state regardless of where they occur. Tables 3 and 4 list the different communities and their evaluated tiers based on Montana GAP analysis coverages.

Grassland Complexes (31,551,627 acres or 33.53% of Montana)

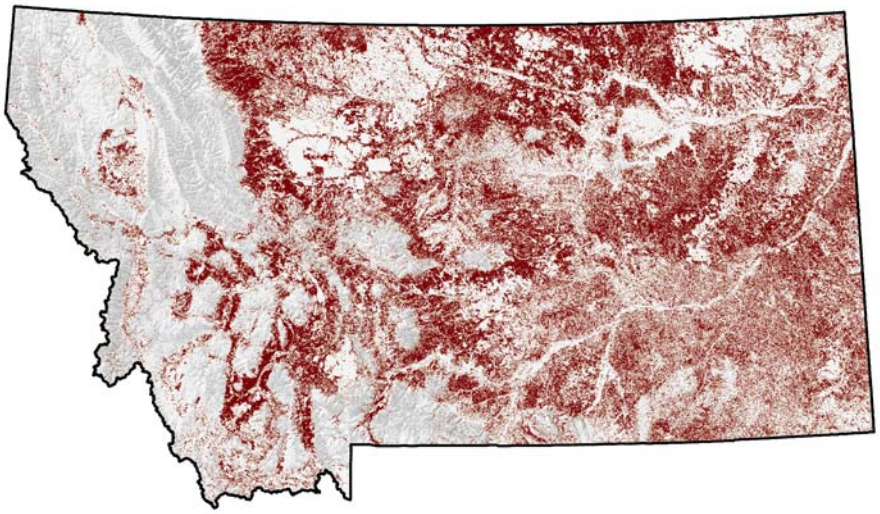


Figure 36. Distribution of Grassland Community Types

Grassland communities occur in broad western mountain valleys, high mountain meadows, and on the plains of eastern Montana. Very low to high cover grasses are characteristic of these areas, and this array of grass types is found in open lands, often interspersed among shrubs. This community type is essentially associated with more terrestrial species in greatest need of conservation than any other community type in Montana.

Grassland habitats are difficult to meaningfully differentiate using only remotely sensed data like the GAP mapping. Types based on the relative cover of grass are not ecologically based or directly related to habitat conditions. Descriptions of GAP grassland types are very broad and include some species that are not common in Montana or do not occur together. A classification and mapping system that incorporates ecological data and is associated with a recognized vegetation classification like the National Vegetation Classification System will have greater management applicability in the future and should be supported.

Three main categories of grassland complexes are found throughout Montana. Very low cover grasslands occur primarily in central and eastern Montana valleys. These grasslands range from semi-desert grasslands with total grass cover from 10 to 30 percent to grasslands dominated by short grasses and forbs that have high amounts of bare soil (20 to 60 percent cover). Very low cover grasslands have production ranges from 50 to 300 pounds per acre and are usually associated with alkaline soils and/or disturbed sites.

Low to moderate cover grasslands occur across the state in valleys and foothills, on middle to high-elevation mountain slopes on south aspects. Low to moderate cover grasslands have total grass cover from 20 to 70 percent and are

dominated by short- to medium-height grasses and forbs, with production ranges from 300 to 1,800 pounds per acre. These grasslands Include rangelands and non-irrigated pastures.

Moderate to high cover grasslands include total grass cover from 50 to 100 percent. They are dominated by medium to tall grasses in prairie areas. Moderate to high cover grasslands have production ranges from 1,000 to 7,000 pounds per acre and are usually associated with wet sites.

Essential Associated Plant Community

Arrowleaf Balsamroot *(Balsamorhiza sagittata)*
Big Bluestem *(Andropogon gerardii)*
Bluebunch Wheatgrass *(Agropyron spictatum)*
Blue grama *(Bouteloua gracilis)*
Bluestem *(Andropogon* spp.)
Carex species *(Carex* spp.)
Clubmoss *(Selaginella densa)*
Elk Sedge (*Carex gereyi*)
Green Needlegrass *(Stipa viridula)*
Hood's Phlox *(Phlox hoodii)*
Idaho Fescue *(Festuca idahoensis)*
Indian grass *(Sorghum nutans)*
Little Bluestem *(Andropogon scoparium)*
Lupine *(Lupinus* spp.)
Missouri Goldenrod *(Solidago missouriense)*
Needle-and-Thread grass *(Stipa comata)*
Prairie June grass *(Koeleria* spp.)
Prairie Sandreed *(Calamovilfa longifolia)*
Rough Fescue *(Festuca scabrella)*
Sandberg's bluegrass *(Poa sandbergii)*
Sun Sedge *(Carex heliophila)*
Switchgrass *(Panicum virgatum)*
Threadleaf Sedge *(Carex filifolia)*
Timothy *(Phleum pratensis)*
Western Wheatgrass *(Agropyron smithii)*

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 358 terrestrial vertebrate species that are found within the grassland complexes community type, with 199 of these species being essentially associated (essentially associated species are shown in bold). All associations can be found in Table 39.

Amphibians: Northern Leopard Frog

Reptiles: Western Hog-nosed Snake, Milksnake, and **Smooth Greensnake**

Birds: Trumpeter Swan, **Greater Sage-Grouse, Columbia Sharp-tailed Grouse,** Yellow Rail, **Whooping Crane,** Piping Plover, **Mountain Plover, Long-billed Curlew,** Black Tern, **Burrowing Owl, Sedge Wren,** and **Nelson's Sharp-tailed Sparrow**

Mammals: Spotted Bat, Townsend's Big-eared Bat, Pallid Bat, Black-tailed Prairie Dog, White-tailed Prairie Dog, Great Basin Pocket Mouse, **Meadow Jumping Mouse,** Grizzly Bear, **Black-footed Ferret,** and **American Bison**

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Spread of noxious weeds and non-native plants, especially knapweed, leafy spurge, and cheatgrass	Prevent the introduction and spread of noxious weeds on existing tracts of palouse prairie
	Maintain the appropriate native species composition using resource management strategies
	Restore areas infested with the highly flammable, invasive cheatgrass, returning them to native grasses and forbs
	Create a stable native seed source for grass restoration
Impacts from oil, gas, geothermal, and coal extraction and development	Monitor leasing and development decisions and regulations applying to geophysical exploration
	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Education and research on fossil fuel development and its impacts on natural landscape
	Conduct research to determine impacts from petroleum exploration and extraction activities
Impacts from un-managed recreational use	Work with the public and other agencies to establish sustainable recreation management practices, including designations of lands open, limited, or closed to off-road vehicle use

Fragmentation and habitat loss due to agricultural and subdivision development	Promote incentives and education for private landowners to protect natural habitat
	Support strategic conservation easements by conservation organizations and public agencies to provide large blocks of short grass types in a diverse mosaic of habitats
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
	Support state/federal tax incentives that discourage habitat fragmentation
	Promote further development of county ordinances that help guide future residential and commercial development
	Maintain vertical and horizontal soil structure on existing public tracts by developing appropriate resource management strategies
Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
Loss of natural fire disturbance	Work with public and private activities to re-establish natural fire regime
Lack of sufficient habitat cover data layers	Support cooperative efforts to develop up to date, comprehensive habitat cover layers

References

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Conservation Management of America's Public Lands: An Assessment and Recommendations for Progress 25 Years after FLPMA. 2001. National Wildlife Federation and the Natural Resources Defense Council.

Ostlie, W. R., R. E. Schneider, J. M. Aldrich, T. M. Faust, R. L. B. McKim, and S. J. Chaplin. 1997. The status of biodiversity in the Great Plains. The Nature Conservancy, Arlington, VA. 326 pp + XII.

Statewide Habitat Plan. 1994. Implementation of Fish, Wildlife & Parks Commission. Habitat Montana Policy.

Mixed Broadleaf Forests (883,498 acres or 0.94% of Montana)

Figure 37. Distribution of Mixed Broadleaf Forest Community Types

Aspen Galleries

Galleries often occur within grassland openings or along the border between grassland openings and coniferous forests. When mature, these galleries often support native tall-grass or mixed-grass prairie plants. When occurring in lowland areas, they are often home to wet meadow species or may contain small wetlands. Sunlight passes easily through the canopy of healthy, mature aspen galleries, promoting understory growth of a rich variety of grasses, wildflowers and sometimes shrubs. In combination, this complex of trees, grasses, and shrubs provide unique foods (including seeds, berries, or nuts) for an equally diverse array of wildlife.

Woody Draws

Draws are a prominent feature across eastern Montana. A much drier, upland environment often surrounds these more diverse dry streambed type areas. Water is not present long enough each year in order to classify them as a wetland, but they are characterized by a greater diversity and density of vegetation that serves a similar function. Woody draws provide essential cover, food, and water for many wildlife species in eastern Montana that otherwise would not exist. Draws are ribbons of life that support some of the highest concentrations of wildlife in the area. Information exists that indicates woody draws are declining throughout the northern Great Plains (Lesica 2005). Conserving these draws will depend on the success of green ash, the dominant plant species in most stands.

Essential Associated Plant Community

Aspen *(Populus tremuloides)*
Birch *(Betula* spp.)
Bur Oak *(Quercus macrocarpa)*
Green Ash *(Fraxinus pennsylvanica)*
Plains Cottonwood *(Populus deltoides)*

There are a total of 26 terrestrial vertebrate species that are found within the mixed broadleaf forest community type, with 5 of these species being essentially associated. All associations can be found in Table 40. Note: Wildlife associations within the mixed broadleaf forest community type were underestimated due to unresolvable issues. This should be considered when interpreting species associations with mixed broadleaf forest in this Strategy. Future revisions should clarify and resolve these wildlife associations with the mixed broadleaf forest community type.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
All Broadleaf Forests	
Loss of broadleaf forest habitat due to rangeland and forest management practices, clearing for agricultural use, and impacts related to human population growth	Work with agency and private land conservation efforts to place easements on lands and implement resource management for aspen galleries, cottonwood forests and woody draws
	Promote incentives and education for private landowners to protect all three broadleaf forest types
	Work with other agencies, organizations and private land owners to develop best management principals for broadleaf forests
	Work with local governments to support growth and development plans that recognize the importance of broadleaf forests
	Support education efforts to inform the public concerning the critical need for conserving broadleaf forests
	Develop statewide riparian best management principles

Aspen Galleries	
Altered natural fire regime in aspen galleries (increases encroachment of conifers)	Work with other agencies of authority to re-establish natural fire regime to promote aspen gallery health
Woody Draws	
Loss of mature snags in woody draw areas	Promote public education of the need to preserve older snags in woody draws
	Support initiatives to reestablish and maintain green ash in woody draws
Loss of shrub layers and lack of overstory recruitment due to range management practices in woody draws	Work with public and private landowners to provide incentives for sustainable management
	Work to develop best management principals for woody draw habitats

References

Bartos, Dale L., and Robert B. Campbell. February 1998. Decline of Quaking Aspen in the Interior West—Examples from Utah. Rangelands. Vol. 20, No. 1.

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Elis, Janet H., and Jim Richard. A planning guide for protecting Montana's wetlands and riparian areas. Montana Watercourse, Montana Department of Environmental Quality and Montana Audubon Society.

Hansen, A., J. Rotella, L. Klass, and D. Gyskiewicz. 2003. Riparian Habitat Dynamics and Wildlife Along the Upper Yellowstone River. Technical Report #1. Landscape Biodiversity Lab, Montana State University, Bozeman, MT. In cooperation with the Governor's Upper Yellowstone River Task Force.

Kootenai Tribe of Idaho and Montana Fish, Wildlife & Parks. 2004. Public Review Draft Kootenai Subbasin Plan. Executive Summary. Report prepared for the Northwest Power and Conservation Council. Portland, OR.

Lesica. 2005. Restoring green ash regeneration from seed in declining hardwood draws. Unpublished report.

Statewide Habitat Plan. 1994. Implementation of Fish, Wildlife & Parks Commission. Habitat Montana Policy.

Mixed Shrub/Grass Associations (4,159,693 acres or 5.34% of Montana)

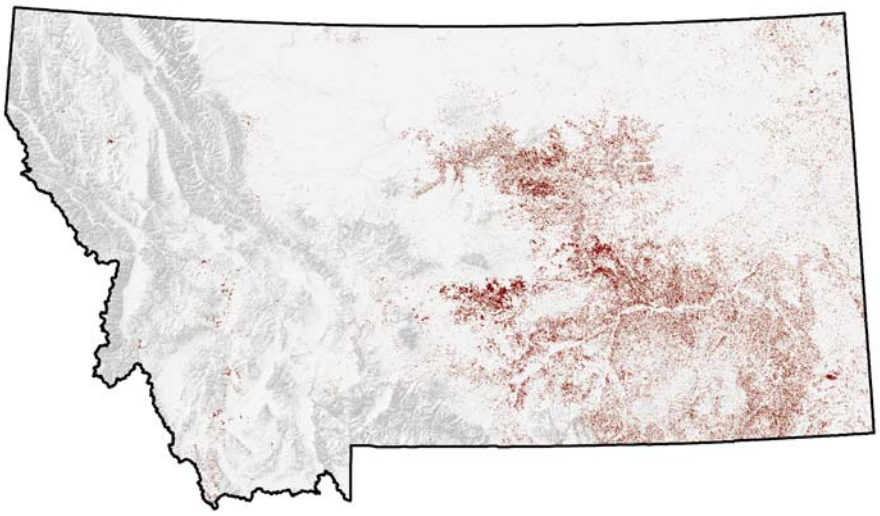


Figure 38. Distribution of Mixed Shrub/Grass Associations Community Types

The mixed shrub/grass associations community types include the shrub-dominated areas that also support grass. These types can be either moist (mesic) or dry (xeric) but usually occur at low elevation and often along lower slopes. These communities are the transition between pure shrub and grass communities and support a very unique assembly of associated species.

Mesic

Mesic occurs primarily in central and eastern Montana valleys and along some low mountain slopes. Mesic shrub-grassland associations occur with codominance between the shrub and grass species. Shrub and grass cover ranges from 10 to 50 percent. It is found on moist sites usually between pure grass- and shrub-dominated regions.

Essential Associated Plant Community

Grass

Bluebunch Wheatgrass *(Agropyron spictatum)*
Bluestem *(Andropogon* spp.)
Fescue *(Festuca* spp.)
Needle-and-Thread grass *(Stipa comata)*
Threadleaf Sedge *(Carex filifolia)*
Western Wheatgrass *(Agropyron smithii)*

Shrubs

Buffalo Berry *(Shepherdia argentea)*
Choke Cherry *(Prunus virginiana)*
Silver Sage *(Artemisia cana)*
Snowberry *(Symphoricarpos* spp.)
Sumac *(Rhus* spp.)

Xeric

Xeric occurs primarily in central and eastern Montana valleys and along some low mountain slopes. Xeric shrub-grassland associations occur with codominance between the shrub and grass species. Shrub and grass cover ranges from 10 to 50 percent. It is found on dry sites in valleys and is usually between grass-dominated and shrub-dominated regions.

Essential Associated Plant Community

Grass

Blue grama *(Bouteloua gracilis)*
Bluebunch Wheatgrass *(Agropyron spictatum)*
Bluestem *(Andropogon* spp.)
Fescue *(Festuca* spp.)
Needle-and-Thread grass *(Stipa comata)*
Western Wheatgrass *(Agropyron smithii)*

Shrubs

Rabbitbrush *(Chrysothamnus* spp.)
Sagebrush *(Artemisia* spp.)

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 39 terrestrial vertebrate species that are found within the mixed shrub/grass associations community type, with 10 of these species being essentially associated (essentially associated species are shown in bold). All associations can be found in Table 41. Note: Wildlife associations within the mixed shrub/grass associations community type were underestimated due to unresolvable issues. This should be considered when interpreting species associations with mixed shrub/grass associations in this Strategy. Future revisions should clarify and resolve these wildlife associations with the mixed shrub/grass associations community type.

Reptiles: Western Hog-nosed Snake and **Milksnake**

Birds: Greater Sage-Grouse, Mountain Plover, and Burrowing Owl

Mammals: Spotted Bat and **Black-tailed Prairie Dog**

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of habitat due to conversion of native habitat to agriculture or as a result of human population growth/development	Support private land easements that protect natural habitat to provide large blocks of a diverse mosaic of shrub/grass habitats
	Incentives and education for private landowners to protect natural habitat
	Support government and private conservation programs/activities that encourage and support private land stewardship
	Promote further development of county ordinances that help guide future residential and commercial development in mixed shrub grass habitat
	Identify and prioritize key wildlife linkage areas in this community, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity
Invasive species and potential for spreading	Work with off-road vehicle users to help reduce spread of invasive weed
	Create a stable native seed source for shrubs and grass restoration
	Support cooperative efforts to reduce the abundance of exotic or invasive plant species
Oil, gas, coal, coal bed methane, and geothermal development	Monitor leasing and development decisions and regulations applying to geophysical exploration
	Research the impacts such as road building and water retention pond construction as they relate gas and oil development activities

Range or forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)
	Work with other agencies, organizations and private land owners to develop incentives that will promote the conservation of native shrub/grass habitats

References

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Conservation Management of America's Public Lands: An Assessment and Recommendations for Progress 25 Years after FLPMA. 2001. National Wildlife Federation and the Natural Resources Defense Council.

Ostlie, W. R, R. E. Schneider, J. M. Aldrich, T. M. Faust, R. L. B. McKim, and S. J. Chaplin. 1997. The status of biodiversity in the Great Plains. The Nature Conservancy, Arlington, VA. 326 pp + XII.

Riparian and Wetland (3,724,224 acres or 3.94% of Montana)

Figure 39. Distribution of Riparian and Wetland Community Types

Montana's riparian and wetland communities vary widely depending on the area of the state and elevation where they are located, but generally they represent the green zones along rivers, streams, lakes, and reservoirs and include potholes, wet meadows, marshes, and fens. This community type also includes the cottonwood forests that occur throughout Montana. Cottonwood stands 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 stands, including Great Plains or black cottonwoods, help stabilize banks, keep waters cool in summer, and help their associated plants support diverse wildlife species. As a result of the adjacent water and diverse vegetation, these communities support the greatest concentration of plants and animals in Montana and serve as a unique transition zone between the aquatic and the terrestrial environments.

Riparian and wetland communities often occur as narrow linear bands or small depressions that are not recognized at the scale of the GAP mapping used in this analysis. More accurate and inclusive knowledge of riparian/wetland locations and types will be available if National Wetlands Inventory mapping or a similar product is completed for Montana. These types of efforts should be supported in order to improve future revisions of this Strategy.

Conifer Riparian

Conifer riparian occurs in riparian areas in western and south-central Montana. These are riparian areas dominated by conifer forest, with total tree cover from 20 to 100 percent. Associated shrub species include alder *(Alnus* spp.), red-osier dogwood (*cornus stolonifera*), bunchberry *(Cornus canadensis)*, willows *(Salix*

spp.), thimbleberry *(Rubus parviflorum)*, and twin flower *(Linnaea borealis)*. Associated grass and forb species include queens cup beadlily *(Clintonia uniflora)*.

Essential Associated Plant Community

Douglas-fir *(Pseudotsuga menziesii)*
Engelmann Spruce *(Picea engelmannii)*
Grand Fir *(Abies grandis)*
Red-osier Dogwood (*Cornus stolonifera*)
Subalpine Fir *(Abies lasiocarpa)*
Western Hemlock *(Tsuga heterophylla)*
Western Red Cedar *(Thuja plicata)*

Broadleaf Riparian

Broadleaf riparian occurs in riparian areas across Montana. These are riparian areas dominated by broadleaf (cottonwood) forest, with total tree cover from 20 to 100 percent. Associated shrub species include alder *(Alnus* spp.), bunchberry *(Cornus canadensis)*, serviceberry *(Amelanchier alnifolia)*, thimbleberry *(Rubus parviflorum)*, common chokecherry (*Prunus virginiana*), and willow *(Salix* spp.). Associated grass and forb species include queens cup beadlily *(Clintonia uniflora)* and carex *(Carex* spp.).

Essential Associated Plant Community

Aspen *(Populus tremuloides)*
Birch *(Betula* spp.)
Black Cottonwood *(Populus trichocarpa)*
Bur Oak *(Quercus macrocarpa)*
Green Ash *(Fraxinus pennsylvanica)*
Plains Cottonwood *(Populus deltoides)*

Broadleaf and Conifer Riparian

Broadleaf and conifer riparian occurs in riparian areas in western and south-central Montana. These are riparian areas dominated by mixed broadleaf (cottonwood) and conifer forest, with total tree cover from 20 to 100 percent. Associated shrub species include alder *(Alnus* spp.), bunchberry *(Cornus canadensis)*, serviceberry *(Amelanchier alnifolia)*, thimbleberry *(Rubus parviflorum)* and willow *(Salix* spp.). Associated grass and forb species include queens cup beadlily *(Clintonia uniflora)* and carex *(Carex* spp.).

Essential Associated Plant Community

Aspen *(Populus tremuloides)*
Birch *(Betula* spp.)
Black Cottonwood *(Populus trichocarpa)*
Grand Fir *(Abies grandis)*
Douglas-fir *(Pseudotsuga menziesii)*
Engelmann Spruce *(Picea engelmannii)*
Subalpine Fir *(Abies lasiocarpa)*
Western Larch *(Larix occidentalis)*
Western Hemlock *(Tsuga heterophylla)*
Western Red Cedar *(Thuja plicata)*

Graminoid and Forb Riparian

Graminoid and forb riparian occurs in riparian areas across the state. These are riparian areas dominated by herbaceous species, with total herbaceous cover from 30 to 100 percent. Riparian areas with tree and shrub cover comprise less than 15 percent. Standing water may be present in the riparian area (cattail marshes).

Essential Associated Plant Community

Baltic Rush *(Juncus balticus)*
Bluejoint Reedgrass *(Calamagrostis canadensis)*
Bog Sedge *(Carex rostrata)*
Cinquefoil *(Potentilla* spp.)
Cattails *(Typha* spp.)
Lake Sedge *(Carex lacustris)*
Maritime Sedge *(Carex incurviformis)*
Northern Reedgrass *(Calamagrostis inexpensa)*
Rushes *(Juncus* spp.)
Saxifrage *(Saxifraga* spp.)
Sedges *(Carex* spp.)
Tufted Hairgrass *(Deschampsia cespitosa)*

Shrub Riparian

Shrub riparian occurs in riparian areas across the state. These are riparian areas dominated by shrubs, with total shrub cover from 20 to 100 percent. Tree cover is less than 15 percent, and shrubs dominate over the herbaceous species. Standing water may be present in the riparian area (willow marshes).

Essential Associated Plant Community

Alder *(Alnus* spp.)

Black Hawthorn *(Crataegus douglasii)*
Bog Birch *(Betula glandulosa)*
Choke Cherry *(Prunus virginiana)*
Currant *(Ribes* spp.)
Red-osier Dogwood *(Corus stolonifera)*
Rose *(Rosa* spp.)
Shrubby Cinquefoil *(Potentilla fruticosa)*
Silver Sage *(Artemisia cana)*
Snowberry *(Symphorcarpos* spp.)
Thimbleberry *(Rubus parviflorum)*
Twin-berry *(Lonicera involucrata)*
Utah Honeysuckle *(Lonicera* spp.)
Water Birch *(Betula occidentalis)*
Willows *(Salix* spp.)

Mixed Riparian

Mixed riparian occurs in riparian areas across the state. These are riparian areas dominated by a mix of shrub and herbaceous species, with codominance of shrub and grass species present. Tree cover is less than 15 percent.

Essential Associated Plant Community

Grass species (*see Graminoid and Forb Riparian species)*
Shrub species (*see Shrub Riparian species)*

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 265 terrestrial vertebrate species that are found within the riparian and wetland community type, with 196 of these species being essentially associated (essentially associated species are shown in bold). All associations can be found in Table 42. While the riparian and wetland community type comprises only 3.94 percent of Montana, it is critical to conservation. Seventeen of the 19 (89 percent) species of greatest conservation need found in the riparian and wetland community type are essentially associated.

Amphibians: Coeur d' Alene Salamander, Western Toad, and **Northern Leopard Frog**

Reptiles: Snapping Turtle, Spiny Softshell, and Western Hog-nosed Snake

Birds: Common Loon, Trumpeter Swan, Harlequin Duck, Bald Eagle, Yellow Rail, Piping Plover, Interior Least Tern, Black Tern, Sedge Wren, and **Nelson's Sharp-tailed Sparrow**

Mammals: Townsend's Big-eared Bat, **Northern Bog Lemming,** and **Meadow Jumping Mouse**

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
All Riparian and Wetland	
Draining and conversion of wetlands to agricultural cropland and subdivisions	Work with other groups to identify riparian areas wetlands that are critically important to wildlife diversity and work toward protection and enhancement
	Work with local governments and organizations to address loss of riparian and wetland areas associated with residential development through riparian setbacks
	Develop statewide best management principals for Montana's riparian and wetland areas
Loss of riparian habitat due to streamside residential development	Support strategic conservation easements by conservation organizations and public agencies
	Develop statewide best management principals for Montana's riparian and wetland areas
Adjacent uplands effected by range and forest management practices	Support government and private conservation activities that encourage and support sustainable land management practices
	Develop statewide best management principals for Montana's riparian and wetland areas
Invasive or exotic plant species	Support efforts to eradicate exotic or invasive plant species
Lack of a GIS coverage of wetlands across Montana	Partner with other agencies to develop an up-to-date comprehensive wetland and riparian GIS coverage
	Support efforts to complete the National Wetlands Inventory mapping for Montana
Degradation of habitat by land management practices or recreation use	Increase current efforts to improve river recreation management and monitoring

	Work with other agencies to promote land management and recreational uses along riparian areas that are conducive to natural streambank stability
Contaminated runoff from agriculture in wetland and riparian areas	Work on education campaign to broaden the understanding of how activities adjacent to wetland/riparian areas are connected to their health
Road construction that disrupts hydrologic patterns	Work with department of transportation to minimize and mitigate impacts of new and existing road development including streambank stabilization
Dams, channelization, and riprap for flood and erosion control disrupting natural stream dynamics, affecting successional patterns	Work with appropriate authorities to restore or mimic natural hydrograph and dynamic nature of riparian and wetland areas
	Work with landowners or reservoir operators to provide water levels compatible with natural regimes
Draining and conversion of wetlands to agricultural cropland and subdivisions	Work with other groups to identify wetlands that are critically important to wildlife diversity and work toward protection and enhancement
	Support efforts to complete National Wetlands Inventory mapping for Montana
	Work with local governments and organizations to address loss of riparian and wetland areas associated with residential development through setbacks and other means
Cottonwood Stands	
Flood control and channelization through riprap and dams. Culverts, dams, irrigation diversions, and other instream barriers that fully or partially alter natural flood regimes (eliminates cottonwood regeneration)	Work with appropriate authorities to restore or mimic historic hydrograph to promote productive cottonwood stands in river corridors
Unsustainable harvest of older cottonwoods for lumber or pulp	Maintain and recruit old-growth trees for snags used by cavity-nesting species

References

A Landowner's Guide to Montana Wetlands. Montana Watercourse.

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Elis, Janet H., and Jim Richard. A planning guide for protecting Montana's wetlands and riparian areas. Montana Watercourse, Montana Department of Environmental Quality, and Montana Audubon Society.

Hansen, A., J. Rotella, L. Klass, and D. Gyskiewicz. 2003. Riparian Habitat Dynamics and Wildlife Along the Upper Yellowstone River. Technical Report #1. Landscape Biodiversity Lab, Montana State University, Bozeman, MT. In cooperation with the Governor's Upper Yellowstone River Task Force.

Kootenai Tribe of Idaho and Montana Fish, Wildlife & Parks. 2004. Public Review Draft Kootenai Subbasin Plan. Executive Summary. Report prepared for the Northwest Power and Conservation Council. Portland, OR.

Ostlie, W. R, R. E. Schneider, J. M. Aldrich, T. M. Faust, R. L. B. McKim, and S. J. Chaplin. 1997. The status of biodiversity in the Great Plains. The Nature Conservancy, Arlington, VA. 326 pp + XII.

Statewide Habitat Plan. 1994. Implementation of Fish, Wildlife & Parks Commission. Habitat Montana Policy.

Sagebrush and Salt Flats (5,625,886 acres or 5.97% of Montana)

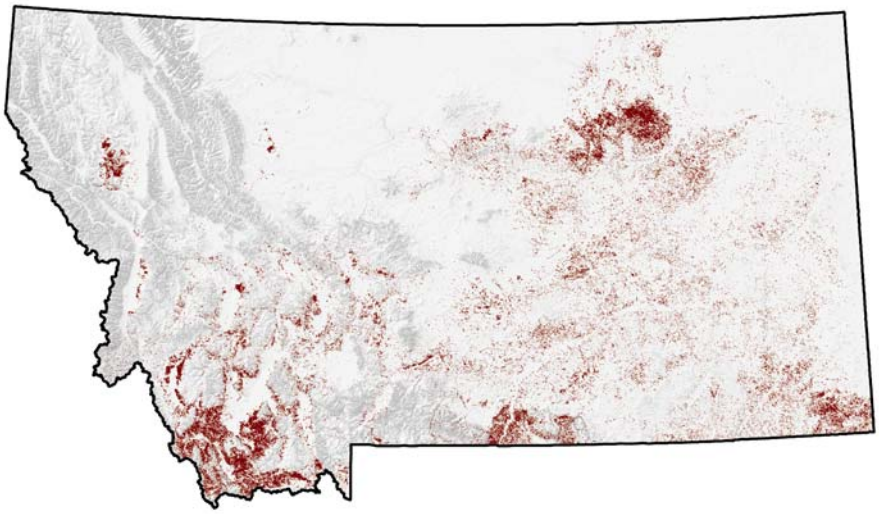


Figure 40. Distribution of Sagebrush and Salt Flats Community Types

The sagebrush community includes all sagebrush and associated grass and shrubs, although specific attention should be focused on the “shrub steppe,” a transitional zone between arid shrubland and semiarid grassland and saltsage that occurs primarily in eastern and southeastern Montana alkali flats. The community can be visualized as a mosaic of sagebrush communities that occur in discontinuous pockets throughout Montana although mostly in the eastern two thirds.

These communities occur primarily in valleys across the state. Occasionally they occur on low- to mid-elevation mountain slopes. Shrublands are dominated by sagebrush *(Artemisia* spp.), with 20 to 80 percent cover.

Essential Associated Plant Community

Basin Big Sagebrush *(Artemisia tridentata tridentata)*
Black Sagebrush Steppe *(Artemisia nova)*
Mountain Big Sage *(Artemisia tridentata vaseyana)*
Wyoming Big Sage *(Artemisia tridentata wyomingensis)*
Saltsage (*Atriplex nuttallii*)

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 78 terrestrial vertebrate species that are found within the sagebrush and salt flats community type, with 23 of these species being essentially associated (essentially associated species are shown in bold). All associations can be found in Table 43.

Birds: Greater Sage-Grouse, Mountain Plover, Long-billed Curlew, and **Burrowing Owl**

Mammals: Spotted Bat, Pallid Bat, Pygmy Rabbit, Great Basin Pocket Mouse, Black-tailed Prairie Dog, and **White-tailed Prairie Dog**

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Range management practices and conversion to agriculture, which alter the distribution and condition of Montana's sagebrush habitat	Protect large blocks of healthy sagebrush through conservation easements
	Work with private landowners through landowner incentives and conservation easements to protect critical habitats
	Cooperate with government and private conservation programs/activities that encourage and support private land stewardship
	Promote grazing plans that encourage a mosaic of sagebrush, native grasses, and forbs
Invasion of weeds and woody and non-native species	Support cooperative efforts to reduce invasive and exotic plant species
	Work with off-road vehicle users to help reduce spread of invasive weeds
	Create a stable native seed source for sage restoration after fires
Loss of sagebrush as a result of human population growth/development	Support strategic conservation easements by conservation organizations and public agencies
	Support state/federal tax incentives that discourage sagebrush habitat loss
	Promote further development of county ordinances that help guide future residential and commercial development in sagebrush habitat
	Identify and prioritize key wildlife linkage areas, and work with other state and federal agencies, conservation groups, and landowners to restore wildlife connectivity

Oil, gas, and geothermal exploration and development	Monitor leasing and development decisions and regulations applying to geophysical exploration
	Work with corporations, land owners and other agencies to reduce impacts of exploration
	Conduct research on fossil fuel development and its impacts on sagebrush
Impacts from recreational use	Work with the public and other agencies to establish sustainable recreation management practices, including designations of lands open, limited, or closed to off-road vehicle use

References

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Conservation Management of America's Public Lands: An Assessment and Recommendations for Progress 25 Years after FLPMA. 2001. National Wildlife Federation and the Natural Resources Defense Council.

Frisina, Michael R., and John J. McCarthy. 2001. Montana Sagebrush Bibliography. Montana Fish, Wildlife & Parks. 69 pp.

Ostlie, W. R, R. E. Schneider, J. M. Aldrich, T. M. Faust, R. L. B. McKim, and S. J. Chaplin. 1997. The status of biodiversity in the Great Plains. The Nature Conservancy, Arlington, VA. 326 pp + XII.

Mountain Streams (59,364 Stream Miles in Montana)

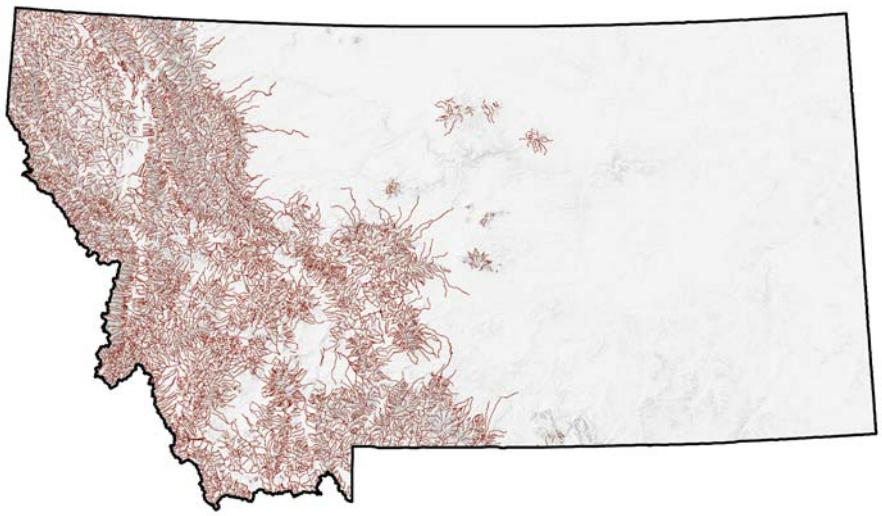


Figure 41. Distribution of Mountain Stream Community Types

Mountain streams of western and central Montana are typically cold and clear, and serve as the headwaters for all major river systems in Montana. Mountain streams often flow through montane conifer forests beginning at the highest elevations, and can range diversely from high-alpine, steep gradient reaches to low-gradient, meadow stream types (Stagliano 2005). These streams are home to abundant native fish species, which are the targets of anglers from around the country. Many of these native species are declining due to habitat degradation, dams, hybridization, overfishing, and being outcompeted by introduced salmonids. These streams support the remaining genetically pure stocks of Montana's Yellowstone and westslope cutthroat and bull trout.

Essential Associated Plant Community

This information has not been defined for the mountain stream community type.

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 18 fish, mussel, and crayfish species that are found within the mountain streams community type, with 17 of these species being essentially associated (essentially associated species are shown in bold). All associations can be found in Table 44.

Invertebrates: Western Pearlshell

Fish: Yellowstone Cutthroat Trout, Westslope Cutthroat Trout, Columbia Basin Redband Trout, Bull Trout, and **Arctic Grayling**

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Riparian habitats effected by roads, housing developments, and range and forest management practices that degrade the adjacent riparian habitat and stream channel	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
	Modification of riparian management practices such that riparian vegetation is allowed to recover
	Develop statewide riparian best management principles
	Conservation easements and cooperative efforts to address human population growth and related impacts
	Work with Department of Transportation to mitigate for impacts of new and existing roads and highways
Stream dewatering	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
	Protect instream flow reservations
	Increased installation of stockwater wells in place of irrigation ditches
	Increase instream flows through water leasing and water conservation measures
Entrainment of fish in irrigation diversions	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Stream channel alteration	Restoration of stream channels, streambanks and riparian areas to a condition that simulates their natural form and function
Introductions of non-native fishes	Programs to help control exotic species and promote natural habitats that support native species

	Protection of native species through habitat protection and enhancement, controlling and in some cases removing non-native species, and restoring or introducing native fishes into suitable waters

References

Fuller, P. L., G. Nico, and J. D. Williams. 1999. Nonindigenous fishes introduced into inland waters of the United States. American Fisheries Society, Bethesda, MD.

Marcuson, P.E. 1977. Overgrazed streambanks depress fishery production in Rock Creek, Montana, pp. 143–156. In: Proc. of the workshop on livestock and wildlife-fisheries relationships in the Great Basin. University of California, Agricultural Station, Sci. Spec. Publ. 3301, Berkeley, CA.

Platts, W. S. 1991. Livestock grazing, pp. 389–424. In: W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19:389–423.

Platts, W. S. 1989. Compatibility of livestock grazing strategies with fisheries, pp. 103–110. In: R. E. Gresswell, B. A. Barton, and J. L. Kershner, eds. Practical approaches to riparian resource management. U.S. Bureau of Land Management, P.O. Box 36800, Billings, MT.

Platts, W. S. 1981b. Influence of forest and rangeland management on anadromous fish habitat in western North America: 7. Effects of livestock grazing. U.S.D.A. Forest Service General Technical Report PNW-124.

Rahel, F. J. 2002. Homogenization of freshwater faunas. Annual Review of Ecology and Systematics 33:291–315.

Rahel, F. J. 2000. Homogenization of fish faunas across the United States. Science 288:854–856.

Rahel, F. J. 1990. The hierarchical nature of community persistence: a problem of scale. American Naturalist 136:328–334.

Schulz, T. T., and W. C. Leininger. 1990. Differences in riparian vegetation structure between grazed areas and exclosures. Journal of Range Management 43:295–299.

Stagliano, D. M. 2005. Aquatic Community Classification and Ecosystem Diversity in Montana's Missouri River Watershed. Report to the Bureau of Land Management. Montana Natural Heritage Program, Helena, Montana. 65 pp. plus appendices.

Tennant, Donald. Instream Flow Regimes for Fish, Wildlife, Recreation, and Related Environmental Resources (Billings, Mont.: U.S. Fish and Wildlife Service, 1975).

Prairie Streams (91,189 Stream Miles in Montana)

Figure 42. Distribution of Prairie Stream Community Types

There are at least 18,000 miles of prairie streams in Montana that have water either intermittently or permanently flowing through them in an otherwise dry region. Eight specific types of prairie streams were delineated for Montana (Stagliano 2005). These low-elevation streams east of the Rocky Mountains are warmer than their counterparts in western Montana and support a richer and quite different variety of fish. Stagliano (2005) also documented nine fish species group assemblages (SPAs), or community associations, for the prairie stream systems. Many of these streams are slow moving and sometimes turbid and weedy, while those in the northern glaciated plains can be just as clear as a mountain stream. They offer good rearing habitat for associated fish species, support many amphibians and reptiles, and are crucial for populations of terrestrial wildlife. Please refer to Stagliano 2005 for more detailed information regarding aquatic communities in Montana's Missouri River watershed.

Essential Associated Plant Community

Wet sedge (*Carex* spp.)
Bulrush (*Scirpus* spp.)
Rushes (*Juncus* spp.)

Associated Species of Greatest Conservation Need (Tier I Species)

There are a total of 32 aquatic species that are found within the prairie stream community type, with 25 of these species being essentially associated (essentially associated species are shown in bold). All associations can be found in Table 45.

Fish: Pearl Dace

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Prairie stream riparian habitat effected by range management practices	Support government and private conservation activities that encourage and support sustainable land management practices
	Support all management practices that maintain riparian vegetation and streambank and channel stability in excellent condition
Stream diversions and dewatering	Implementation of various water conservation or flow management practices that restore essential habitats and simulate the natural hydrograph
	Protect instream flow reservations
	Increased installation of stockwater wells in place of irrigation ditches
	Increase instream flows through water leasing and water conservation measures
Entrainment of fish in irrigation diversions	Screening or modification of irrigation diversions or other water intakes in a manner that prevents entrainment of fishes
Poorly understood impacts of petroleum exploration and extraction	Increase research and scientific studies on impacts of coal bed methane on prairie stream environments in both Montana and Wyoming
Introductions of non-native fishes	Programs to help control exotic species and promote natural habitats that support native species
	Protection of native species through habitat protection and enhancement, controlling and in some cases removing non-native species, and restoring or introducing native fishes into suitable waters

References

Flores, R., G. Stricker, J. Meyer, T. Doll, P. Norton, R. Livingston, and M. Jennings. 2001. A Field Conference on Impacts of Coal Bed Methane Development in the Powder River Basin, Wyoming. USGS Open File Report 01-126.

Fuller, P. L., G. Nico, and J. D. Williams. 1999. Nonindigenous fishes introduced into inland waters of the United States. American Fisheries Society, Bethesda, MD.

Marcuson, P. E. 1977. Overgrazed streambanks depress fishery production in Rock Creek, Montana, pp. 143–156. In: Proc. of the workshop on livestock and wildlife-fisheries relationships in the Great Basin. University of California, Agricultural Station, Sci. Spec. Publ. 3301, Berkeley, CA.

Platts, W. S. 1991. Livestock grazing, pp. 389–424. In: W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19:389–423.

Platts, W. S. 1989. Compatibility of livestock grazing strategies with fisheries, pp. 103–110. In: R. E. Gresswell, B. A. Barton, and J. L. Kershner, eds. Practical approaches to riparian resource management. U.S. Bureau of Land Management, P.O. Box 36800, Billings, MT.

Platts, W. S. 1981b. Influence of forest and rangeland management on anadromous fish habitat in western North America: 7. Effects of livestock grazing. U.S.D.A. Forest Service General Technical Report PNW-124.

Rahel, F. J. 2002. Homogenization of freshwater faunas. Annual Review of Ecology and Systematics 33:291–315.

Rahel, F. J. 2000. Homogenization of fish faunas across the United States. Science 288:854–856.

Rahel, F. J. 1990. The hierarchical nature of community persistence: a problem of scale. American Naturalist 136:328–334.

Schulz, T. T., and W. C. Leininger. 1990. Differences in riparian vegetation structure between grazed areas and exclosures. Journal of Range Management 43:295–299.

Stagliano, D. M. 2005. Aquatic Community Classification and Ecosystem Diversity in Montana's Missouri River Watershed. Report to the Bureau of Land Management. Montana Natural Heritage Program, Helena, Montana. 65 pp. plus appendices.

Tennant, Donald. Instream Flow Regimes for Fish, Wildlife, Recreation, and Related Environmental Resources (Billings, Mont.: U.S. Fish and Wildlife Service, 1975).

United States Geological Survey. November 2001. Fact Sheet FS-110-01. Online: http://pubs.usgs.gov/fs/fs-0110-01/.

United States Geological Survey. 1988. Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming. USGS Water-Resources Investigations Report 88-4046. Prepared by L. J. Martin, D. L. Naftz, H. W. Lowham, and J. G. Rankl in cooperation with the Wyoming Department of Environmental Quality and the U.S. Office of Surface Mining, Cheyenne, WY.

Wheaton, J., and J. J. Metesh. 2002. Potential groundwater drawdown and recovery for coal bed methane development in the Powder River Basin, Montana. Montana Bureau of Mines and Geology Open File Report 458. 59 pp.

Component III: Species of Greatest Conservation Need (Tier I Species)

> *"These are species whose needs must be specifically addressed, whether through focus areas, community types, or individually."*

Conservation efforts at the landscape and community scales offer great potential to leverage resources in order to benefit multiple species. However, some species are too specialized for broad-scale conservation efforts to do much good, or their populations have declined to the point where individually focused conservation is required. For these reasons the conservation concerns and needs range from surveys and monitoring or reintroduction to landscape level habitat restoration or protection. Fish, Wildlife & Parks has a clear obligation to use its resources and work with its partners to conserve Tier I species, regardless of the scale of conservation strategies identified.

Species of greatest conservation need (Tier 1) are covered in greatest detail. However, this does not mean that the other species are excluded. All verterbrate species as well as crayfish and mussels were assessd for conservation need. Most invertebrates were not included in the assessment due to lack of data. The need for data about invertebrates has been addressed in the inventory component of this Strategy. A complete list of species tier assignments can be found in Table 2. All species that have been assigned Tier I in this startegy have a status of low, declining or imperiled.

Invertebrates

During the initial planning stages, the FWP technical and steering committees determined that the Strategy would not include Montana's invertebrate species. With nearly 1,000 species of aquatic invertebrates in the state, and at least twice that number of terrestrial invertebrates, it is impossible at this time to develop a Strategy to comprehensively address invertebrate conservation in Montana. However, it was decided to include aquatic mussels and crayfish. The possibility of securing long-term funding will allow for greater inventory and surveying of invertebrates. These species are especially important because many are considered bioindicators of overall habitat health.

Mussels

Western Pearlshell (*Margaritifera falcata*)

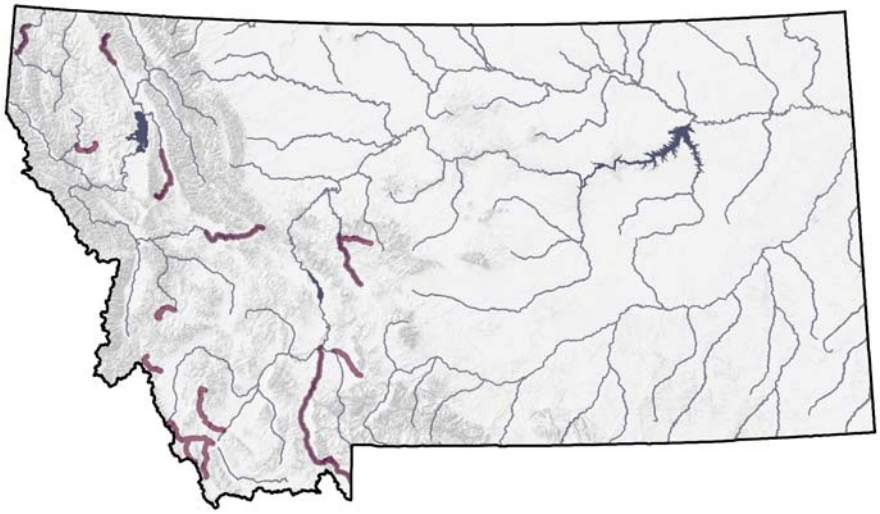


Figure 43. Distribution of the Western Pearlshell Mussel

Range

This is a headwater species occurring very near the Continental Divide in trout streams and rivers west of the divide and in Missouri River headwaters. Outside of Montana this species is reported in Pacific drainages, from southern Alaska to central California. It does not seem to occur anywhere in the central part of the continent.

Habitat

The normal fish hosts in the area are probably the *Oncorhynchus* species, but *Salmo* and *Salvelinus* and even *Rhinicthys* and *Catostomus* are reported to be suitable. The western pearlshell mussel likely crossed the divide with the westslope cutthroat trout, which is the native salmonid of the upper Missouri River drainage. This species occurs in sand, gravel, and even between cobbles and boulders.

Management

Mussels are a regulated species, but a better understanding of mussel distribution throughout the state is needed.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat degradation and fragmentation (e.g., dams, stream channelization, diversions, dredging, and dewatering)	Consider preparing a management plan for the western pearlshell mussel or include it into other comprehensive taxonomic management plans
Point and nonpoint source pollution	Enforcement of regulations that address the dumping of pollutants into waterways
Stream deterioration because of high sediment loads	Restoration of stream channels, streambanks , riparian areas to a condition that simulates their natural form and function
	Support land use practices that encourage minimizing sedimentation form runoff (example, stream set backs)
Threats to host fish also jeopardize mussel survival	Restore connectivity of habitat and manage for healthy populations of native fish including cutthroat trout and bull trout
Reduced dissolved oxygen content in water	Work with agencies, organizations and the public to identify point source pollution that reduces dissolved oxygen contents in water
	Encourage forest management practices that maintain healthy canopy cover over streams to stabilize temperature

Management Plan

None

Citations

Gustafson, D. L. 1996. http://www.esg.montana.edu/dlg/aim/mollusca/marfal.html

Kovalak, W. P., S. D. Dennis, and J. M. Bates. 1986. Sampling effort required finding rare species of freshwater mussels. Pp. 34–45 in B. G. Isom, ed. Rationale for sampling and interpretation of ecological data in the assessment of freshwater ecotypes. American Society for Testing and Material, Special Technical Publication No. 894.

Payne, B. S., A. C. Miller, and R. Whiting. 1997. Designing a riverine mussel survey. Pp. 150–156 in K. S. Cummings, A. C. Buchanan, C. A. Mayer, and T. J. Naimo, eds. Conservation and management of freshwater mussels II: initiatives for the future. Proceedings of a UMRCC symposium, October 16–18, 1995, St. Louis, Missouri. Upper Mississippi River Conservation Committee, Rock Island, IL.

Stagliano, D. 2004. Systematic Survey Plan for the Freshwater Mussels in Montana. Montana Natural Heritage Program, Helena MT. 10 pp.

Vaughn, C. C., C. M. Taylor, and K. J. Eberhard. 1996. A Comparison of the Effectiveness of Timed Searches vs. Quadrate Sampling in Mussel Surveys. K. S. Cummins, A. C. Buchanan, and L. M. Koch, eds. The conservation and management of freshwater mussels II: initiatives for the future. Upper Mississippi River Conservation Committee, Rock Island, IL.

Vertebrates

There are 636 vertebrate species that have been documented in Montana. Sixty of these were determined to be Tier I (greatest need of conservation), 143 Tier II (moderate conservation need), 281 Tier III (lower conservation need), and 152 Tier IV (non-native, peripheral).

Fish

White Sturgeon (Kootenai River Population) (*Acipenser transmontanus*)

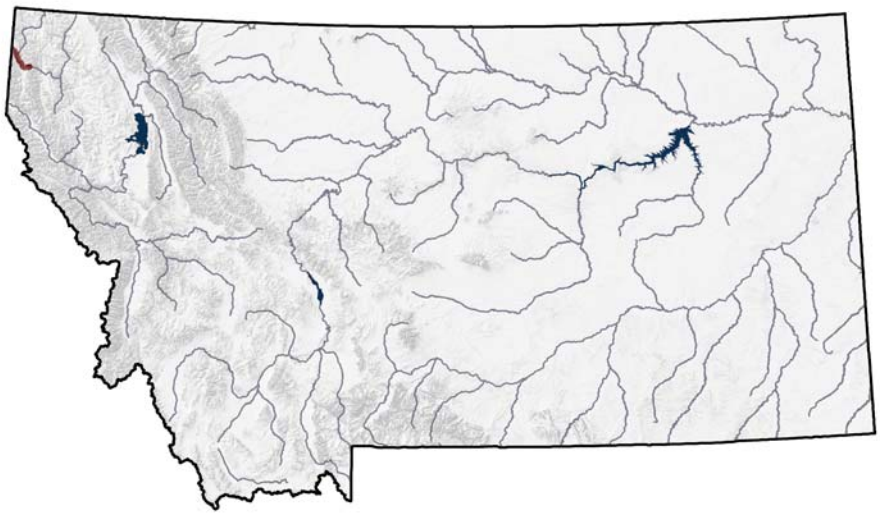


Figure 44. Distribution of the White Sturgeon

Range

The white sturgeon's range extends from Kootenai Falls in Montana, located 50 river kilometers downstream of Libby Dam, to the Corra Linn Dam at the outlet from Kootenay Lake in British Columbia. A natural barrier at Bonnington Falls downstream of Kootenay Lake has isolated the white sturgeon in the Kootenai River from other populations in the Columbia River since the last ice age approximately 10,000 years ago (Alden 1953; Northcote 1973; Duke et al. 1999; USFWS 1999) (AFS website 2003).

Habitat

The white sturgeon is landlocked in Montana and lives in the large, cool Kootenai River.

Management

Recovery of the white sturgeon population in the Kootenai River is contingent upon reestablishing natural recruitment, minimizing additional loss of genetic variability, and successfully mitigating biological and habitat alterations that continue to harm the population. Refer to the White Sturgeon Recovery Plan (USFWS 1999) for specific details promoting management of white sturgeon. The Kootenai River White Sturgeon Study and Conservation Aquaculture Project was initiated to preserve the genetic variability of the population, begin rebuilding natural age class structure, and prevent extinction while measures are implemented to restore natural recruitment (Anders and Westerhof 1996, USFWS 1999, Ireland 2000, Ireland et al. 2001 in press). A breeding plan has been implemented to guide management in the systematic collection and spawning of wild adults before they are lost from the breeding population (Kincaid 1993). The implementation of the breeding plan includes measures to minimize potential detrimental effects of conventional stocking programs (AFS website 2003).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Reduced spring flows, unnatural flow fluctuations, and altered thermal regime caused by Libby Dam operation, which may have interrupted spawning behavior and recruitment	Coordinate flow fluctuations in Libby Dam as more natural to enhance natural production
A suite of post-fertilization early life mortality factors (embryo suffocation, predation on early life stages, resource limitations) and possible intermittent female stock limitation have been reported as possibly contributing to observed recruitment failure for Kootenai River white sturgeon	Management of non-native species that may prey on young white sturgeon
	Implement a conservation aquaculture program to prevent extinction and preserve genetic variability
Habitat conditions in the spawning areas may also affect spawning and rearing success. Cessation of periodic flushing flows has allowed fine sediments to build up in the Kootenai River bottom substrates. Fine sediments fill interstitial spaces in riverbed cobbles, reducing fish egg survival, larval and juvenile fish security, cover, and insect production	Decrease fine sediments found in lake area

	Habitat conservation of surrounding terrestrial habitat
	Reestablish suitable habitat conditions to increase white sturgeon survival past the embryonic and larval stages

Management Plan

U.S. Department of the Interior, Fish and Wildlife Service. 1999. White Sturgeon: Kootenai River Population Recovery Plan. Region 1, USFWS, Portland, OR.

Citations

Alden, W. C. 1953. Physiographic and glacial geology of western Montana and adjacent areas. Geological Survey Professional Paper 231. U.S. Government Printing Office.

American Fisheries Society Montana Chapter website. http://www.fisheries.org/AFSmontana/SSCpages/White%20Sturgeon%20Status.htm

Anders, P. J., and D. L. Richards. 1996. Implications of ecotype collapse on white sturgeon (*Acipenser transmontanus*) in the Kootenai River, Idaho, Montana, and British Columbia. Pp. 27–40 in Proceedings from the International Congress on the Biology of Fishes: Culture and Management of Sturgeon and Paddlefish Symposium Proceedings. San Francisco State University, July 14–18, 1996.

Anders, P. J., and R. E. Westerhof. 1996. Conservation aquaculture of endangered white sturgeon (*Acipenser transmontanus*) in the Kootenai River, Idaho. Pp. 51–62 in Proceedings from the International Congress on the Biology of Fishes: Culture and Management of Sturgeon and Paddlefish Symposium Proceedings. San Francisco State University, July 14–18, 1996.

Apperson, K. A., and P. J. Anders. 1991. Kootenai River white sturgeon investigations and experimental culture. Annual Progress Report FY 1990. Bonneville Power Administration. 75 pp.

Apperson, K. A., and P. J. Anders. 1990. Kootenai River white sturgeon investigations and experimental culture. Annual Progress Report FY 1989. Idaho Department of Fish and Game and the Bonneville Power Administration. Contract No. DE-AI79-88BP93497, Project No. 88-65. Portland, OR. 67 pp.

Duke, S., P. Anders, G. Ennis, R. Hallock, J. Hammond, S. Ireland, J. Laufle, L. Lockard, B. Marotz, V. Paragamian, and R. Westerhof. 1999. Recovery plan for

Kootenai River white sturgeon (*Acipenser transmontanus)*. Journal of Applied Ichthyology (15):157–163.

Ireland, S. C. 2000. Kootenai River White Sturgeon Studies and Conservation Aquaculture. Annual Progress Report. Prepared for U.S. Department of Energy, Bonneville Power Administration. Contract No. 88 BI 93743, Project No. 88-64. Portland, OR.

Kincaid, M. L. 1993. A breeding plan to preserve the genetic variability of the Kootenai River white sturgeon. Contract No. DE-AI79-93BP02886. Bonneville Power Administration, Portland, OR.

Korman, J., and C. J. Walters. 1999. Summary of the Kootenai River Adaptive Environmental Assessment modeling exercise. Prepared for the Kootenai Tribe of Idaho. Ecometric Research Inc., Vancouver, B.C., Canada.

Northcote, T. G. 1973. Some impacts of man on Kootenay Lake and its salmonids. Great Lakes Fisheries Commission Technical Report 25.

Pallid Sturgeon (*Scaphirhynchus albus*)

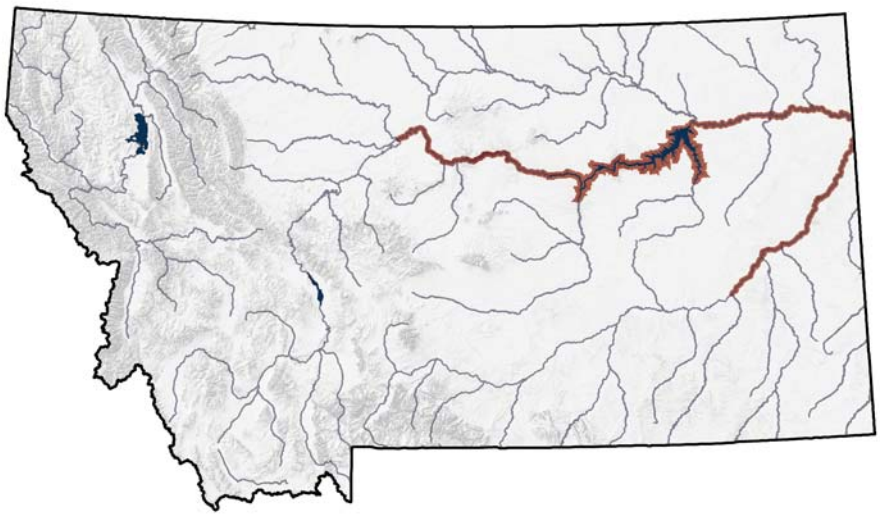


Figure 45. Distribution of the Pallid Sturgeon

Range

The pallid sturgeon is native in major rivers in eastern Montana including the Missouri River below Fort Benton and the Yellowstone River below the Carterville Diversion Dam near Forsyth.

Habitat

Pallid sturgeon use large, turbid rivers over sand and gravel bottoms, usually in strong current. In Montana, pallid sturgeon use large turbid streams including the Missouri and Yellowstone rivers (Brown 1971; Flath 1981). They also use all channel types, primarily straight reaches with islands (Bramblett 1996). They primarily use areas with substrates containing sand (especially bottom sand dune formations) and fines (93 percent of observations) (Bramblett 1996). Stream bottom velocities range between 0.0 and 1.37 meters per second, with an average of 0.65 meter per second (Bramblett 1996). Depths used are 0.6 to 14.5 meters, averaging 3.30 meters, and they appear to move deeper during the day (Bramblett 1996). Channel widths from 110 to 1,100 meters are used and average 324 meters (Bramblett 1996). Water temperatures used range from 2.8 to 20 degrees C. (Tews 1994; Bramblett 1996). Water turbidity ranges from 12 to 6,400 NTU (Turbidity Units) (Tews 1994).

Management

Beginning in 1996, research efforts focused on pallid sturgeon recovery and preserving the pallid sturgeon genetic pool through stocking. The primary purpose of the stocking program is to preserve the genetic pool and reconstruct

an optimal population size within the habitat's carrying capacity (Krentz 1997a) (AFS website 2003). In 2000 the U.S. Fish and Wildlife Service (USFWS) completed an Endangered Species Act consultation with the U.S. Army Corps of Engineers regarding operation of Missouri River dams. Through an informal agreement the U.S. Bureau of Reclamation (BOR) has agreed to provide a dominant discharge spring pulse out of the Tiber Reservoir every four to five years for Missouri River fish migrations that could help the Upper Missouri River pallid sturgeon population. To address pallid sturgeon passage and entrainment on the Yellowstone River, the USFWS has begun consultation with BOR regarding problems at the Intake Diversion Dam. The future for pallid sturgeon recovery may continue to be uncertain even after positive changes have been implemented because pallid sturgeon populations are so depleted and the newly stocked fish will take at least 15 years before the females first reach sexual maturity and begin to spawn. Therefore, it is important to realize that immediate evaluations are impractical, and recovery will take a dedicated, long-term commitment (AFS website 2003). Implementing the pallid sturgeon recovery program in this area is a multistate and multiagency task. To facilitate this, the Montana/Dakota Pallid Sturgeon Work Group was organized in 1993. The group is composed of representatives from FWP, NDGF, USFWS, USBOR, WAPA, and PPL-MT, and acts in an advisory role identifying research needs and funding sources, developing work plans, and providing an opportunity for communication between biologists and agency personnel (AFS website 2003).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat modifications such as dams prevent movement to spawning and feeding areas, alter flow regimes, turbidity, and temperature, and reduce food supply	Restore more natural flow and temperature conditions in the rivers below mainstream and tributary dams
	Protect minimum instream flow reservations to ensure that the pallid sturgeon population will not be harmed
Upstream and nearby land use practices may degrade water quality	Support government and private conservation activities that encourage and support sustainable land management practices in riparian areas
Heavy metals and organic compounds may affect reproduction	Work with agencies, organizations and public to identify and reduce point source pollutants
Hybridization with shovelnose sturgeon, possibly caused by reductions in habitat diversity	Support research to better understand hybridization issues as they relate to habitat

Low population numbers	Establish multi-aged pallid sturgeon populations in the Middle Missouri, Lower Missouri, and Yellowstone rivers to prevent extinction
	Improve knowledge of pallid sturgeon life cycle requirements and continue to research limiting factors affecting its existence

Management Plan

Dryer, M. P., and A. J. Sandvol. 1993. Recovery plan for the pallid sturgeon (*Scaphirhynchus albus*). U.S. Fish and Wildlife Service. Bismarck, ND. 55 pp.

Citations

American Fisheries Society (AFS), Montana Chapter website.

Bramblett, R. G. 1996. Habitats and movements of pallid and shovelnose sturgeon in the Yellowstone and Missouri rivers, Montana and North Dakota. Ph.D. dissertation, Montana State University, Bozeman, MT. 210 pp.

Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books. Montana State University, Bozeman, MT.

Flath, D. L. 1981. Vertebrate species of special concern. Montana Department of Fish, Wildlife & Parks. 74 pp.

Keenlyne, K. D. 1989. A report on the pallid sturgeon. U. S. Fish and Wildlife Service, Pierre, SD. Unpublished report.

Krentz, Steven. 1997a. Stocking/augmentation plan for the pallid sturgeon (*Scaphirhynchus albus)* in Recovery Priority Management Areas 1 and 2 in Montana and North Dakota. U.S. Fish and Wildlife Service. Bismarck, ND. 38 pp.

Ruelle, R., and K. D. Keenlyne. 1991. A contaminant evaluation of Missouri River pallid sturgeon. U.S. Fish and Wildlife Service. Pierre, SD. 25 pp.

Tews, A. 1994. Pallid sturgeon and shovelnose sturgeon in the Missouri River from Fort Peck Dam to Lake Sacagawea and in the Yellowstone River from Intake to its mouth. Fort Peck Pallid Sturgeon Study. Submitted to U.S. Army Corps of Engineers, Planning Branch, Omaha, NE.

Paddlefish (*Polyodon spathula*)

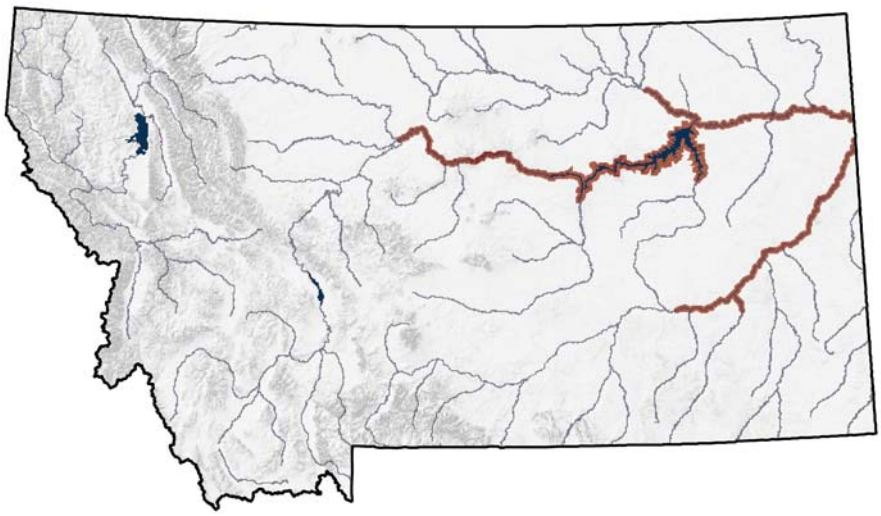


Figure 46. Distribution of the Paddlefish

Range

In Montana, two distinct paddlefish stocks are recognized. The Yellowstone-Sakakawea stock is distributed from the eastern boundary of the state up the Yellowstone River westward to the Cartersville Diversion Dam at Forsyth, as well as up the Missouri River westward to Fort Peck Dam (Scarnecchia et al. 1996b; Holton 2003). Most fish of this stock rear in Lake Sakakawea, a Missouri River mainstem reservoir in North Dakota (Fredericks and Scarnecchia 1997; Scarnecchia et al. 1997), and ascend the two rivers (mainly the Yellowstone) into Montana in spring to spawn (Firehammer 2004). Upriver distribution is more westerly in years of higher discharge. A few fish reside year-round in the dredge cuts below Fort Peck Dam. An important recreational snag fishery exists for this stock at the Intake Diversion Dam, near Glendive (Montana-North Dakota Paddlefish Management Plan 1995). Other sites on the Yellowstone River (e.g., Sidney Bridge, Richland Park, State Line) and on the Missouri River below Fort Peck Dam (e.g., Wolf Point, Frazer Rapids) also are fished. A modest bow-and-arrow fishery also exists in the dredge cuts.

The Fort Peck stock is distributed from Fort Peck Dam up the Missouri River westward at least as far as the mouth of the Marias River (Berg 1981). Most fish of this stock rear in the Fort Peck Reservoir and ascend the river in spring to spawn. Upriver distribution is more westerly in years of higher discharge. Since the closure of Fort Peck Dam, Fort Peck stock fish have been isolated from fish below the dam, although some upriver fish can pass downstream. An important recreational snag fishery exists for this stock at several sites near the Fred Robinson Bridge (Scarnecchia et al. 2000).

Habitat

The paddlefish is a large river species that utilizes a wide variety of habitats seasonally and at different life stages. Optimal spawning habitat consists mainly of turbid, faster flowing main channel areas with gravel substrates, whereas feeding habitat is typically slower moving backwaters, side channels, and sloughs where their zooplanktonic food is more abundant. In the twentieth century, Montana's paddlefish have adapted successfully to feeding in Missouri River reservoir habitat, resulting in an increased population size over historical (pre-reservoir) levels (Scarnecchia et al. 1996b). Young-of-the-year paddlefish utilize turbid headwater reaches of Fort Peck Reservoir (Kozfkay and Scarnecchia 2002) and Lake Sakakawea (Fredericks and Scarnecchia 1997) for particulate feeding. Larger juveniles and adults large enough to more effectively avoid predation (Parken and Scarnecchia 2002) filter feed throughout the reservoirs.

Management

Historical information on the Yellowstone-Sakakawea stock and fisheries in the Yellowstone River is provided in Robinson (1966), Rehwinkel (1978), and a series of Federal Aid reports (e.g., Stewart 1984) as summarized in the Montana-North Dakota Paddlefish Management Plan (1995) and Scarnecchia and Stewart (1996). Socioeconomic information on paddlefish anglers is provided in Scarnecchia et al. (1996) and Scarnecchia and Stewart (1997). Recent harvest data is summarized in a series of Federal Aid reports (e.g., Riggs 1999). Historical information on the Fort Peck stock and fisheries is provided by Berg (1981) and a series of Federal Aid reports (e.g., Needham 1984; Gilge and Liebelt 2001). Some of the latter reports also provide information on the Yellowstone-Sakakawea stock fish inhabiting the dredge cuts. Socioeconomic information on the Fort Peck stock fishery is provided in Scarnecchia et al. (2000).

Montana's goals, objectives, and approaches for paddlefish management are outlined in the Montana-North Dakota Paddlefish Management Plan (1995). This plan is being revised and updated as of 2005. Management of the Yellowstone-Sakakawea stock is a cooperative, interstate effort involving coordinated and uniform management goals, objectives, data collection, and stock assessment by the Montana Department of Fish, Wildlife & Parks and the North Dakota Game and Fish Department. For the Fort Peck stock, which is located entirely within Montana, management goals, objectives, data collection, and stock assessment are designed where possible to be consistent with that of the Yellowstone-Sakakawea stock.

Harvest management for both stocks is designed to prevent overharvest and ensure sustainable wild fisheries. An extensive data collection program for the Yellowstone-Sakakawea stock has permitted a more rigorous scientific approach

to harvest management. A harvest cap of 1,000 fish per state per year is intended to stabilize the population at its present level of about 30,000 adult fish. The harvest cap is considered a maximum acceptable harvest rather than a target catch to be met. The number of fish allowed to be harvested is based on a straightforward harvest model involving determination of population size and age structure. Population size is estimated based on jaw-tag recoveries from adult fish. Biologists accurately estimate and validate the ages of the fish caught in the fishery (Scarnecchia et al. 2005) to ensure that young adult fish are added and old fish are retained in the stock. The harvest cap is set to not exceed the most recent five-year estimated recruitment of young adults (ages 10 to 14 males and ages 17 to 21 females). Monitoring and stock assessment approaches for the Fort Peck stock (including population estimation and age determination) are being developed to permit the implementation of a similar approach to harvest management for that stock. No harvest cap for that stock currently exists.

Harvest regulations differ for the two stocks. For the Yellowstone-Sakakawea stock, harvest regulations on the Yellowstone River include an open season from May 15 through June 30, or until the harvest cap is reached. In the Missouri River below Fort Peck Dam, harvest is open all year or until the harvest cap is reached. All snagged paddlefish must be retained and tagged with a locking, individually identifiable paddlefish tag purchased by the angler. The annual bag limit for this stock is one fish per person. Catch-and-release fishing (with mandatory release), which when monitored has been shown to not cause excessive mortality (Scarnecchia and Stewart 1997b), is also permitted for two six-hour periods per week at the Intake fishing site. For the Fort Peck stock, anglers may harvest up to two fish per year (but only one if the angler already caught one from the Yellowstone-Sakakawea stock). The season is open all year, and high-grading (immediate release of captured fish) is permitted (Montana Department of Fish, Wildlife & Parks 2005). No limit is set on the total number of tags sold for either stock.

For both stocks, extensive collection of harvest data as well as adult tagging and juvenile monitoring are conducted to obtain information on age composition, population size, reproductive success, and recruitment of young adult fish. On-site and telephone creel surveys provide additional information on the fishery and harvest.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of spawning habitat. Paddlefish spawn most effectively in turbid, free-flowing rivers with natural hydrographs and gravel, cobble, and perhaps sand substrates	Maintenance of instream flows and spawning habitat in large rivers (especially the Yellowstone River and Missouri River above Fort Peck Reservoir)

Water depletions. Excessive and increasing water depletions for irrigation during drought or low-flow years influence paddlefish migratory and spawning behavior. Adequate flows in spring and early summer are needed to initiate spawning migrations	Increased reservoir water retention during times of drought
Potential introduction of exotic competitors (e.g., bighead carp [Aristichthys nobilis])	Improved public awareness of paddlefish conservation concerns and impacts of non-native species
Overfishing. Although much progress has been made to prevent legal overfishing, vigilance is needed to prevent illegal harvest	Improving harvest management

Management Plan

Montana-North Dakota Paddlefish Management Plan. 1995. North Dakota Game and Fish Department and Montana Department of Fish, Wildlife & Parks. Bismarck, ND, and Helena, MT.

Citations

Berg, R. K. 1981. Fish populations of the wild and scenic river, Montana. Montana Department of Fish, Wildlife & Parks, Federal Aid to Fish Restoration Project FW-3-R. Helena, MT.

Firehammer, J. A. 2004. Spawning migration of adult paddlefish (*Polyodon spathula*) of the Yellowstone-Sakakawea stock in the Yellowstone and Missouri rivers, Montana and North Dakota. Doctoral dissertation, University of Idaho, Moscow, ID.

Fredericks, J. F., and D. L. Scarnecchia. 1997. The use of surface visual counts for estimating the relative abundance of age-0 paddlefish in Lake Sakakawea. North American Journal of Fisheries Management 17:1014–1018.

Gilge, K., and J. Liebelt. 2001. Northeast Montana warmwater ecosystems investigations. Montana Department of Fish, Wildlife & Parks, Federal Aid to Fish Restoration Project F-113-R-1. Helena, MT.

Holton, G. D. 2003. A field guide to Montana fishes. Montana Department of Fish, Wildlife & Parks, Helena, MT.

Kozfkay, J. R., and D. L. Scarnecchia. 2002. Year-class strength and feeding ecology of age-0 and age-1 paddlefish (*Polyodon spathula*) in Fort Peck Lake, Montana. Journal of Applied Ichthyology 18:601–607.

Montana Department of Fish, Wildlife & Parks. 2005. Montana fishing regulations. Helena, MT.

Parken, C., and D. L. Scarnecchia. 2002. Predation on age-0 paddlefish by piscivorous fishes in a Great Plains reservoir. North American Journal of Fisheries Management 22:750–759.

Needham, R. G. 1984. Paddlefish investigations. Montana Department of Fish, Wildlife & Parks, Federal Aid to Fish Restoration Project F-11-R-32. Progress report. Helena, MT.

Rehwinkel, B. J. 1978. The fishery for paddlefish at Intake, Montana, during 1973 and 1974. Transactions of the American Fisheries Society 107:263–268.

Riggs, V. 1999. Yellowstone River paddlefish investigations. Montana Department of Fish, Wildlife & Parks, Federal Aid to Fish Restoration Project F-78-R-5&6. Helena, MT.

Robinson, J. R. 1966. Observations on the life history, movement, and harvest of paddlefish (*Polyodon spathula*) in Montana. Proceedings of the Montana Academy of Science 26:33–44.

Scarnecchia, D. L., L. F. Ryckman, Y. Lim, G. Power, B. Schmitz, and V. Riggs. 2005. A long-term program for validation and verification of dentaries for age estimation in the Yellowstone-Sakakawea paddlefish stock. Manuscript in review.

Scarnecchia, D. L., K. Gilge, and P. A. Stewart. 2000. Profile of recreational paddlefish snaggers on the Upper Missouri River, Montana. Intermountain Journal of Sciences 6:68–77.

Scarnecchia, D. L., and P. A. Stewart. 1997. Implementation and evaluation of a catch-and-release fishery for paddlefish. North American Journal of Fisheries Management 17:795–799.

Scarnecchia, D. L., and P. A. Stewart. 1997a. Angler response to harvest regulations in Montana's Yellowstone River paddlefish (*Polyodon spathula*) fishery. Intermountain Journal of Sciences 3:94–100.

Scarnecchia, D. L., F. Ryckman, and J. Lee. 1997b. Capturing and tagging of wild age-0 and age-1 paddlefish in a Great Plains reservoir. North American Journal of Fisheries Management 17:800–802.

Scarnecchia, D., and P. Stewart. 1996. Managing Montana's paddlefish: new approaches. Montana Outdoors 27(3):10–14.

Scarnecchia, D. L., P. A. Stewart, and Y. Lim. 1996a. Profile of recreational paddlefish snaggers on the Lower Yellowstone River, Montana. North American Journal of Fisheries Management 16:872–879.

Scarnecchia, D. L., P. A. Stewart, and G. Power. 1996b. Age structure of the Yellowstone-Sakakawea paddlefish stock, 1963–1993, in relation to reservoir history. Transactions of the American Fisheries Society 125:291–299.

Stewart, P. A. 1984. Paddlefish investigations. Montana Department of Fish, Wildlife & Parks, Federal Aid to Fish Restoration Project F-30-R-20. Helena, MT.

Shortnose Gar (*Lepisosteus platostomus*)

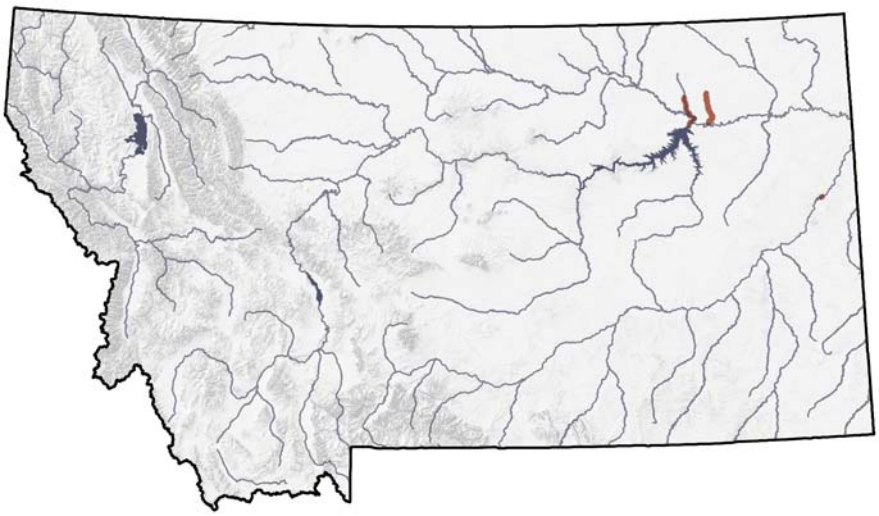


Figure 47. Distribution of Shortnose Gar

Range

The distribution of the shortnose gar within Montana is very limited, with its presence being documented primarily in the Missouri River dredge cuts downstream of Fort Peck Dam (Brown 1971; Holton 2003). The only other documented observation of shortnose gar in Montana is a single specimen collected on the Yellowstone River approximately 15 miles upstream of its confluence with the Missouri River in 1998 (K. Kapuscinski, FWP, personal communication, February 2003) (AFS website 2003).

Habitat

Due to its limited distribution little is known about the shortnose gar within Montana. The shortnose gar is typically found in large rivers, quiet pools, backwaters, and oxbow lakes. It has a higher tolerance to turbid water than the other four gar species found in North America. Gar also have the unique ability to supply a highly vascularized swim bladder with supplemental oxygen by engaging in a behavior of “breaking,” where air is gulped at the surface (Pflieger 1975). This allows gar to occupy waters with extremely low dissolved oxygen concentrations, which would not be suitable for most other fish inhabitation.

Management

Due to low numbers and poor quality flesh, the shortnose gar is not considered a sport fish in Montana (AFS website 2003). There is no management plan for the shortnose gar in Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Limited information in Montana	Consider preparing a management plan for the shortnose gar or include it into other comprehensive taxonomic plans
Limited habitat used in Montana	Increase survey and monitoring efforts
Backwater habitat filled in for agriculture and modified by lack of channel maintenance flows	Increase conservation initiatives for backwater sloughs and channels
Cold water release, lack of turbidity, and artificial hydrograph below Fort Peck Dam may inhibit abundance in the lower Missouri River	Regulate water regimes to be more closely tied to natural water regimes

Management Plan

None

Citations

American Fisheries Society Montana Chapter website: http://www.fisheries.org/AFSmontana/SSCpages/Shortnose%20Gar%20Status.htm

Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books, The Endowment and Research Foundation, Montana State University, Bozeman, MT.

Holton, G. D. 2003. A field guide to Montana fishes. Montana Department of Fish, Wildlife & Parks. 95 pp.

Pflieger, W. L. 1975. The fishes of Missouri. Missouri Department of Conservation, Jefferson City, MO.

Yellowstone Cutthroat Trout (*Oncorhynchus clarki bouvieri*)

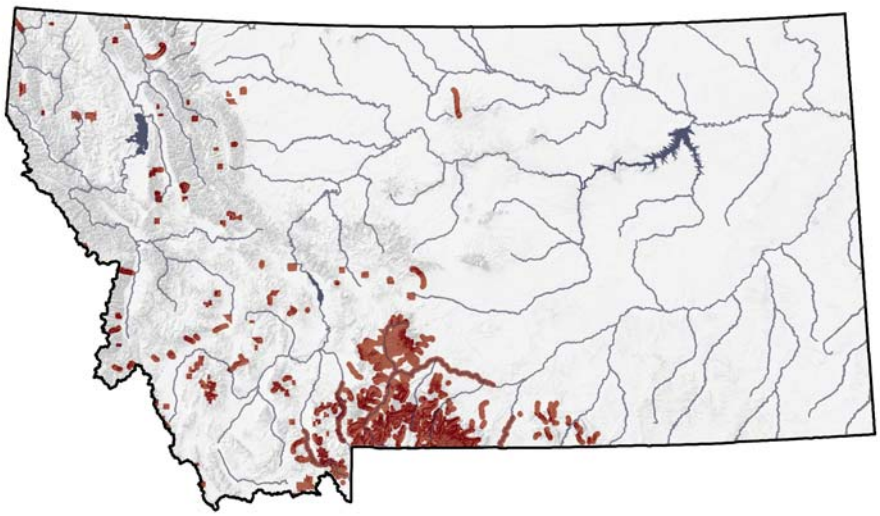


Figure 48. Distribution of the Yellowstone Cutthroat Trout (includes introduced populations)

Range

Historically, the Yellowstone cutthroat trout was believed to have occupied much of the Yellowstone River basin, including portions of the Clarks Fork of the Yellowstone River, Bighorn River, and Tongue River basins in Montana and Wyoming, and parts of the Snake River basin in Wyoming, Idaho, Utah, and Nevada (Behnke 1992). The lower portions of some primary stem rivers (e.g., the Tongue River) may have been too warm to support populations. Range wide, Yellowstone cutthroat trout have undergone substantial declines in distribution and abundance. Populations in Utah and Nevada are limited to one to two basins (May 1996). Based on a survey of biologists, May (1996) concluded that in Idaho, Yellowstone cutthroat trout occupied 43 percent of their historical range, in Wyoming, 42 percent, and in Montana, 32 percent. Most remaining indigenous populations in Montana inhabit headwater streams, though the Yellowstone River primary stem also supports large numbers of this subspecies. More recent estimates suggest that in Montana, 10 percent of the historically occupied fluvial habitat still contains genetically pure populations (May 1998; Anonymous 1999). Yet all these estimates must be regarded as approximations because many waters in its historical range were probably barren of fish because of barriers to upstream migration (May 1996; Dufek et al. 1999). Also, stocking in previously barren waters in historically occupied basins has been commonplace. For example, in Montana only 2 to 6 lakes historically were occupied, whereas more than 100 lakes now support genetically pure Yellowstone cutthroat trout (May 1996; May et al. 1998). Finally, recent comprehensive field surveys of Montana waters are lacking. Similar surveys in northwestern Wyoming outside Yellowstone National Park revealed that of 1,700 kilometers of potential historical

habitat, only 245 kilometers contained reasonably genetically pure Yellowstone cutthroat trout distributed in four populations, all of which had been exposed to introgression with Snake River fine-spotted cutthroat trout (Kruse et al. 2000).

Habitat

Yellowstone cutthroat trout inhabit relatively clear, cold streams, rivers, and lakes. Optimal temperatures have been reported to be from 4 to 15 degrees C., with occupied waters ranging from 0 to 27 degrees C. (Gresswell 1995) (AFS website 2003).

Management

To maintain healthy populations of Yellowstone cutthroat trout and to ensure the wide-ranging persistence of this subspecies in Montana and elsewhere, a number of tactics have been proposed in recent status assessments (Yellowstone Cutthroat Trout Working Group 1994; Gresswell 1995; May 1996; May et al. 1998; Anonymous 1999; Dufek et al. 1999; Wyoming Game and Fish Department 2000). Please refer to these assessments for more information.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Persistence of non-native fish	Continue field surveys and monitioring
	Continue harvest management of non-native trout
Widespread stocking of non-indigenous populations of Yellowstone cutthroat trout	Decrease stocking of non-indigenous Yellowstone cutthroat trout to decrease genetic homogenization
	Decrease stocking of non-native trout
Susceptibility to infection by Myxobolus cerebralis, a European protozoan and the causative agent of whirling disease	Increased funding for studying whirling disease
Tributary dewatering by unsustainable irrigation practices	Decreased channels and irrigation developments
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede fish movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores beneficial fish passage
River channelization or riprap	Work with new stabilization projects to reduce impacts and support efforts to restore existing rip-rap areas to natural condition

Range, forest, or mining management practices	Support government and private conservation activities that encourage and support sustainable land management practices (example; rest and rotation schedules)

Management Plans

Cooperative Conservation Agreement for Yellowstone Cutthroat Trout within Montana between Crow Tribe, Montana Department of Fish, Wildlife & Parks (FWP), Montana Department of Environmental Quality (DEQ), Montana Department of Natural Resources and Conservation (DNRC), USDA Forest Service–Northern Region, Gallatin and Custer national forests, USDI Bureau of Land Management–Montana (BLM), USDI Fish and Wildlife Service (FWS), USDI Bureau of Indian Affairs (BIA), Yellowstone National Park. 2000. Montana Department of Fish, Wildlife & Parks.

May, B. E., W. Urie, and B. B. Shepard. Montana Cooperative Fishery Research Unit. 2003. Range-wide status of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*): 2001.

May, B. E. 1998. Yellowstone cutthroat trout: current status and conservation recommendations with the state of Montana. U.S. Forest Service, Gallatin National Forest, Bozeman, MT.

Yellowstone Cutthroat Trout Working Group. 1994. Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) management guide for the Yellowstone River drainage. Montana Department of Fish, Wildlife & Parks, Helena, MT, and Wyoming Game and Fish Department, Cheyenne, WY.

Citations

American Fisheries Society Montana Chapter website. http://www.fisheries.org/AFSmontana/SSCpages/yellowstone_cutthroat_trout.htm.

Anonymous. 1999. Yellowstone cutthroat trout: current status and recommendations within the state of Montana. Gallatin and Custer national forests, Regions 3 and 5, Montana Department of Fish, Wildlife & Parks, and U.S. Fish and Wildlife Service Montana Technical Assistance Office.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6, Bethesda, MD.

Bergersen, E. P., and D. E. Anderson. 1997. The distribution and spread of *Myxobolus cerebralis* in the United States. Fisheries 22(8):6–7.

Chamberlin, T. W., R. D. Harr, and F. H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. Pp. 181–206 in W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.
Clancy, C. G. 1988. Effects of dewatering on spawning by Yellowstone cutthroat trout in tributaries to the Yellowstone River, Montana. American Fisheries Society Symposium 4:37–41.

Corsi, C. 988. The life history and status of the Yellowstone cutthroat trout (*Salmo clarki bouvieri*) in the Willow Creek drainage, Idaho. Masters thesis, Idaho State University, Pocatello, ID.

Dufek, D., K. Johnson, J. Kiefling, B. McDowell, R. McKnight, S. Roth, and S. Yekel. 1999. Status and management of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). Wyoming Game and Fish Department, Cheyenne, WY.

Dunham J. B., G. L. Vinyard, and B. E. Rieman. 1997. Habitat fragmentation and extinction risk of Lahontan cutthroat trout. North American Journal of Fisheries Management 17:1126–1133.

Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road construction and maintenance. Pp. 297–324 in W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Gresswell, R. E. 1995. Yellowstone cutthroat trout. Pp. 36–54 in M. K. Young, tech. ed. Conservation assessment for inland cutthroat trout. U.S.D.A. Forest Service General Technical Report RM-GTR-256.

Gresswell, R. E., W. J. Liss, and G. L. Larson. 1994. Life history organization of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) in Yellowstone Lake. Canadian Journal of Fisheries and Aquatic Sciences 51 (Supplement 1): 298–309.

Kruse, C. G., W. A. Hubert, and F. J. Rahel. 2000. Status of Yellowstone cutthroat trout in Wyoming waters. North American Journal of Fisheries Management 20:693–705.

May, B. E., and twelve others. 1998. Yellowstone cutthroat trout conservation program within the state of Montana. Prepared for the Montana Department of Fish, Wildlife & Parks, Helena, MT.

May, B. E. 1996. Yellowstone cutthroat trout. Pp. 11–34 in D. Duff, ed. Conservation assessment for inland cutthroat trout: distribution, status and habitat management implications. U.S.D.A. Forest Service–Northern, Rocky Mountain, Intermountain, and Southwestern regions.

Nelson, R. L., M. L. McHenry, and W. S. Platts. 1991. Mining. Pp. 425–458 in W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Thurow, R. F., C. E. Corsi, and V. K. Moore. 1988. Status, ecology, and management of Yellowstone cutthroat trout in Upper Snake River Drainage, Idaho. American Fisheries Society Symposium 4:25–36.

Varley, J. D., and R. E. Gresswell. 1988. Ecology, status, and management of the Yellowstone cutthroat trout. American Fisheries Society Symposium 4:13–24.

Wyoming Game and Fish Department. 2000. Yellowstone cutthroat trout management summary. Wyoming Game and Fish Department, Fish Division, Cheyenne, WY.

Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*)

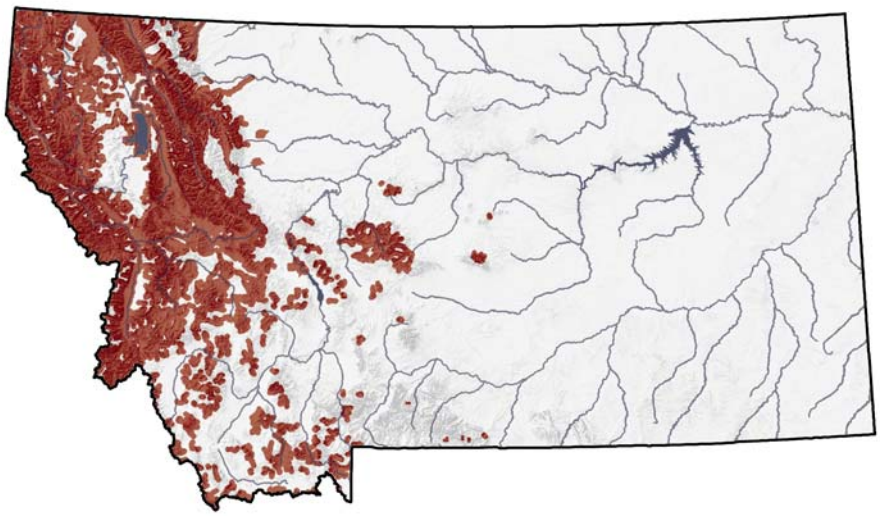


Figure 49. Distribution of the Westslope Cutthroat Trout (includes introduced populations)

Range

The westslope cutthroat trout is found in the Kootenai watershed, the Clark Fork watershed, the headwaters of the Missouri River, and the headwaters of the Saskatchewan River. Westslope cutthroat trout were first described by Lewis and Clark and were once extremely abundant. Unfortunately, the species has lost a lot of ground. Various studies have estimated that the westslope cutthroat trout now only occupies between 19 to 27 percent of its historical range in Montana and about 36 percent of its historical range in Idaho (Van Eimeren 1996). In addition, westslope cutthroat trout can hybridize with other cutthroat trout subspecies and rainbow trout. Thus, genetically pure westslope cutthroat trout are estimated to exist in only 2 to 4 percent of their historical stream distribution (McIntyre and Rieman 1995). East of the Continental Divide, westslope cutthroat trout are confined to headwater reaches, and most of these small populations face an extremely high risk of extinction (AFS website 2003).

Habitat

Spawning and rearing streams tend to be cold and nutrient poor. Westslope cutthroat trout seek out gravel substrate in riffles and pool crests for spawning habitat. Cutthroat trout have long been regarded as sensitive to fine sediment (generally defined as 6.3 millimeters or less). Although studies have documented negative survival as fine sediment increases (Weaver and Fraley 1991), it is difficult to predict their response in the wild (McIntyre and Rieman 1995). This is due to the complexity of stream environments and the ability of fish to adapt somewhat to changes in microhabitat (Everest et al. 1987) (AFS website 2003).

Westslope cutthroat trout also require cold water, although it has proven elusive to define exact temperature requirements or tolerances. Likewise, cutthroat trout tend to thrive in streams with more pool habitat and cover than uniform, simple habitat (Shepard, Pratt, and Graham 1984). Juvenile cutthroat trout overwinter in the interstitial spaces of large stream substrates. Adult cutthroat trout need deep, slow-moving pools that do not fill with anchor ice in order to survive the winter (Brown and Mackay 1995) (AFS website 2003).

Management

Management of this species involves protecting the population strongholds and making tough decisions on restoration priorities for the depressed populations. The state of Montana has altered fishing regulations to reduce fishing mortality. Montana has also developed a conservation agreement signed by nine government agencies and conservation groups (Montana Department of Fish, Wildlife & Parks 1999). This agreement prioritizes protecting genetically pure populations first, then slightly introgressed populations. Recovering depressed populations will involve habitat restoration and the removal of non-native species. To a large degree management activities are different between the state west of the Continental Divide (focus on barriers and non-native trout) and east (focus on habitat restoration). Research suggests that it is not a good idea to bolster populations with stocked fish from other watersheds due to considerable genetic variation between watersheds (Leary, Allendorf, and Kanda 1998). It will be especially challenging to recover migratory individuals. Government agencies will need to work together to share expertise, pool financial resources, and monitor progress toward restoration of this species (AFS website 2003).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss due to range, forest, mining, or agricultural management practices, residential development, and the impact of roads	Conservation of habitat, including better natural resource use practices
Fish spawning habitat loss due to dewatering of streams for irrigation and because of barriers created by dams and road culverts	
Overcompetition and predation by non-native species	Educate the public on need of westslope cutthroat trout
	Increase limits of non-native fish
	Removal of non-native fish where appropriate

Increased hybridization with other species	Continue to conserve genetically pure populations
	Creation of barriers to protect remaining populations
Isolated and small population sizes	Increase stock populations of genetically pure westslope cutthroat trout
	Reintroduction of westslope cutthroat trout
Overfishing	Reduce limits on westslope cutthroat trout

Management Plans

Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout (*Onchorhynchus clarki lewisi*) in Montana. 1999. Montana Fish, Wildlife & Parks.

Shepard, Brad B., B. E. May, W. Urie. 2003. Status of westslope cutthroat trout (*Onchorhyncus clarki lewisi*) in the United States, 2002. Westslope Cutthroat Conservation Team.

Citations

American Fisheries Society Montana Chapter website. http://www.fisheries.org/AFSmontana/SSCpages/westslope_cutthroat_trout.htm.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.

Brown, R. S., and W. C. Mackay. 1995. Fall and Winter Movements of and Habitat Use by Cutthroat Trout in the Ram River, Alberta. Transactions of the American Fisheries Society 124:873–885.

Everest, F. H., R. L. Beschta, J. C. Scrivener, K. V. Koski, J. R. Sedell, and C. J. Cederholm. 1987. Fine Sediment and Salmonid Production: A Paradox. In Streamside Management: Forestry and Fishery Interactions. E. O. Salo and T. W. Cundy, tech. eds. Pp. 98–142.University of Washington, Seattle, WA.

Leary, R. F., F. W. Allendorf, and N. Kanda. 1998. Lack of Genetic Divergence between Westslope Cutthroat Trout from the Columbia and Missouri River Drainages. Wild Trout and Salmon Genetics Laboratory Report 97/1. Missoula, MT.

McIntyre, J. D., and B. E. Rieman. 1995. Westslope Cutthroat Trout. Pp. 1–15 in Conservation Assessment for Inland Cutthroat Trout. M. K. Young, tech. ed.

General Technical Report RM-256. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Montana Department of Fish, Wildlife & Parks. 1999. Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) in Montana. Helena, MT.

Novinger, D. C., and F.J. Rahel. 1999. Exploring Competitive Mechanisms that Allow Nonnative Brook Trout to Displace Native Cutthroat Trout in a Rocky Mountain Stream. American Fisheries Society 129th Annual Meeting Abstracts. Charlotte, NC.

Shepard, B. B., K. L. Pratt, and P. J. Graham. 1984. Life Histories of Westslope Cutthroat Trout and Bull Trout in the Upper Flathead River Basin, Montana. Montana Department of Fish, Wildlife & Parks, Helena, MT.

Tews, A., M. Enk, S. Leathe, W. Hill, S. Dalbey, and G. Liknes. 2000. Overview of Status and Restoration Strategies for Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) in Northcentral Montana. Special Report by Montana Fish, Wildlife & Parks in collaboration with the Lewis and Clark National Forest. Great Falls, MT.

Van Eimeren, P. 1996. Westslope Cutthroat Trout (*Oncorhynchus clarki lewsi*). In Conservation Assessment for Inland Cutthroat Trout. Distribution, Status and Habitat Management Implications. D. A. Duff, tech. ed. Pp. 1–10. U.S.D.A. Department of Agriculture, Forest Service, Intermountain Region, Ogden, UT.

Columbia Basin Redband Trout (*Oncorhynchus mykiss gairdneri*)

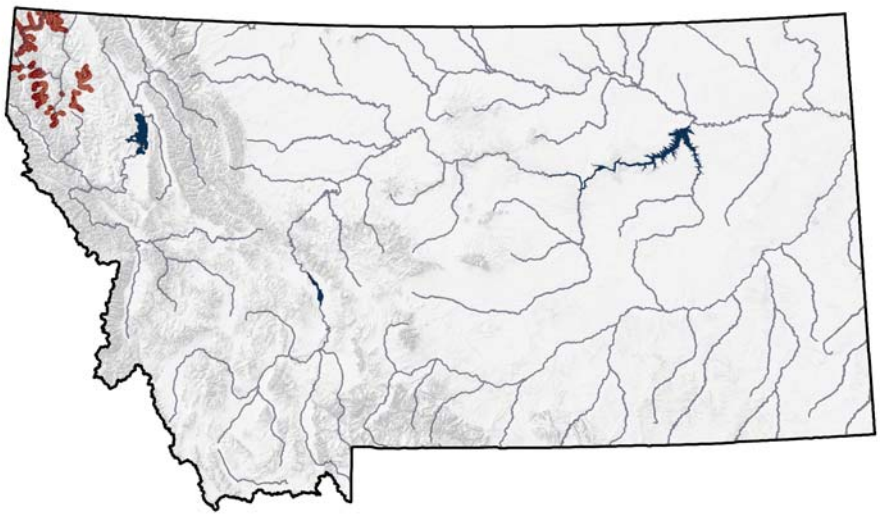


Figure 50. Distribution of the Columbia Basin Redband Trout

Range

The Kootenai River drainage population of the redband trout is Montana's only native rainbow trout and represents the farthest inland penetration of redband trout in the Columbia River Basin. Until recently, the upper distribution of redband trout in the Columbia River Basin was believed to extend upstream to Kootenai Falls, which was considered a barrier falls located approximately 8 kilometers east of Troy, Montana (Allendorf et al. 1980). Recent information suggests that the barrier was not Kootenai Falls, but one that existed in geologic time near the present-day Libby Dam or Fisher River (Hensler et al. 1996).

Presently, populations of redband trout have been identified using starch gel electrophoresis in the following streams in the Kootenai River drainage in Montana: Callahan Creek, North Fork Yaak River and East Fork Yaak River, upper Libby Creek and several tributaries, and several tributaries of the Fisher River including Wolf Creek (Allendorf et al. 1980; Leary et al. 1991; Huston 1995; Hensler et al. 1996; M. Hensler, MFWP, personal communication).

Results of genetic surveys indicate that redband trout historically preferred low-gradient valley-bottom streams throughout the Kootenai River drainage but are presently restricted to headwater areas or streams with barriers. Allendorf et al. (1980) concluded that the redband trout is a native rainbow trout to the Kootenai River in Montana, and that "planting of hatchery rainbow trout has created a situation of tremendous genetic divergence among local populations" (e.g., hybridization).

Kootenai redband trout are effectively separated into two primary regions: those below Kootenai Falls and those above. Fish known to inhabit these streams may mix downstream but are unlikely to traverse up the falls (Chapman 1986). Below Kootenai Falls, redband trout inhabiting Callahan Creek and the upper Yaak River drainage are isolated into two separate regions by Yaak River Falls, a falls-chute barrier located 4 kilometers from the mouth of Callahan Creek, and a barrier falls located in the lower East Fork of the Yaak River. These remnant populations, which are spatially fragmented and isolated from genetic exchange, represent the only known remaining sources of native redband trout capable of refounding their historical distribution in Montana downstream of Kootenai Falls.

There are no barriers to protect redband trout from hybridization upstream of Kootenai Falls. Still, there are several tributaries to the Fisher River drainage and Libby Creek drainage that maintain non- or nearly nonintrogressed populations and could be used for refounding if necessary (M. Hensler, MFWP, personal communication).

Perkinson (1993) hypothesized that of 300 kilometers of habitat originally used by redband trout in Montana, only 100 kilometers (33 percent) of their historical range is presently occupied by a stock that is at least 95 percent pure. More recent genetic evaluation of the species showed that the historical range was more on the order of 1,200 kilometers and current range, 493 kilometers. The current distribution includes instances where redband trout are sympatric with westslope cutthroat trout. These populations show small first-generation hybridization and almost no post-first-generation hybridization. Approximately 152 kilometers, or 13 percent, of the historical distribution remains as sources of native redband trout due to barriers in the Callahan Creek and Yaak River drainages.

Habitat

The seasonal habitat requirements of redband trout in the Kootenai River drainage in Montana were investigated during 1997 and 1998 (Hensler and Muhlfeld 1999; Muhlfeld 1999; Muhlfeld et al. 2001 in-press). Summer results demonstrated that juvenile (36 to125 mm) and adult (less than 126 mm) redband trout prefer deep microhabitats (more than 0.4 m) with low to moderate velocities (less than 0.5 m/s) adjacent to the thalweg. Conversely, age-0 (less than 35 mm) redband trout select slow water (less than 0.1 m/s) and shallow depths (less than 0.2 m) located in lateral areas of the channel. All ages of redband trout strongly selected pools and avoided riffles; runs were used generally as expected (based on availability) by juveniles and adults and more than expected by age-0 redband trout. At the macrohabitat scale, a multiple regression model indicated that low-gradient, midelevation reaches with an abundance of complex pools are critical areas for the production of redband trout. Mean reach densities ranged from 0.01 to 0.10 fish/m^2. During the fall and winter period, adult redband trout occupied small home ranges and found suitable overwintering habitat in deep pools with

extensive amounts of cover in headwater streams. In Basin Creek, adult redband trout commenced spawning (e.g., redd construction) during June as spring flows subsided following peak runoff. Redband trout generally selected redd sites in shallow pool tail-out areas (mean depth = 0.27 m; range: 0.20 to 0.46) with moderate water velocities (mean velocity = 0.50 m/s; range: 0.23 to 0.69 m/s) dominated by gravel substrate.

Management

Long-term conservation and management of this subspecies will require state and federal agencies to develop a comprehensive plan to protect and restore redband trout throughout their native range in Montana. Montana Fish, Wildlife & Parks (MFWP) and the U.S. Forest Service and local conservation groups have scheduled future habitat improvement and conservation efforts for the foreseeable future.

Another objective should be the consideration of reintroductions throughout the Kootenai River drainage in the redband trout's historical range. To that end, MFWP is in the process of assessing redband trout performance at the Libby Field Station and Murray Springs State Fish Hatchery and in two lakes (M. Hensler, personal communication). Reintroduction efforts should be implemented with caution. Introduction of a species to any aquatic habitat requires many considerations because species interactions are complex and difficult to predict (Li and Moyle 1981). Results of microsatellite analyses based on allozyme electrophoresis of several populations of redband trout in Montana and British Columbia indicate significant differences between watersheds and relatively small differences between populations within watersheds (Knudsen et al. 2002). In order for potential reintroduction programs to be genetically rational, drainage-specific stocks are needed for successful recovery programs.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Range and forest management practices, which include use of pesticides	Reduce stream intake of pesticides and herbicides
	Management of riparian zones and waters where redband trout reside
Culverts, dams, irrigation diversions, and other instream barriers that fully or partially impede movement and reduce connectivity of habitat	Removal or modification of barriers in a manner that restores beneficial fish passage

	Consider preparing a management plan for the Columbia Basin redband trout or include it into other comprehensive taxonomic plans
Hybridization	Reduce stocking of non-native trout in sensitive areas
	Protect genetic composition by raising hatchery Columbian Basin redband trout
Geographical restricted range	Consider reintroduction efforts
	Habitat surveys in areas where reintroduction efforts could occur

Management Plan

None

Citations

Allendorf, F. W., D. M. Esperlund, and D. T. Scow. 1980. Coexistence of native and introduced rainbow trout in the Kootenai River drainage. Proceedings of the Montana Academy of Sciences 39:28–36.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6. Bethesda, MD.

Chapman, D. W. 1986. Downstream movement of rainbow trout past Kootenai Falls, Montana. North American Journal of Fisheries Management 6:47–51.

Hensler, M. E., and C. C. Muhlfeld. 1999. Spawning ecology of redband trout in Basin Creek, Montana. A report to the Whirling Disease Foundation. Montana Fish, Wildlife & Parks, Bozeman, MT.

Hensler, M. E., J. E. Huston, and G. K. Sage. 1996. A Genetic Survey of Lakes in the Cabinet Wilderness Area and Proposed Inland Rainbow Trout Recovery. Montana Fish, Wildlife & Parks, Kalispell, MT.

Huston, J. E. 1995. A Report on the Kootenai River Drainage Native Species Search. A report to the U.S. Fish and Wildlife Service. Montana Fish, Wildlife & Parks, Kalispell, MT.

Knudsen, K. L., C. C. Muhlfeld, G. K. Sange, and R. F. Leary. 2002. Genetic structure of Columbia River redband trout populations in the Kootenai River drainage, Montana, revealed by microsatellite and allozyme loci. Transactions of the American Fisheries Society 131:1093–1105.

Leary, R. F, F. W. Allendorf, and K. G. Sage. 1991. Genetic analysis of trout populations in the Yaak River drainage, Montana. Wild trout and salmon genetics laboratory report 91/3. University of Montana, Missoula, MT.

Li, H. W., and P. B. Moyle. 1981. Ecological analysis of species introductions into aquatic systems. Transactions of the American Fisheries Society 110:772–782.

Muhlfeld, C. C., D. H. Bennett, and B. Marotz. 2001 (in press). Summer habitat use by redband trout in the Kootenai River drainage, Montana. North American Journal of Fisheries Management (February).

Muhlfeld, C. C. 1999. Seasonal habitat use by redband trout (*Oncorhynchus mykiss gairdneri*) in the Kootenai River drainage, Montana. Masters thesis, University of Idaho, Moscow, ID.

Perkinson, R. D. 993. Presentation to the American Fisheries Society, Montana Chapter, February 17, 1993.

Williams, J. E., J. E Johnson, D. A. Hendrickson, S. Contreras-Balderas, J. D. Williams, M Avarro-Mendoza, D. E. McAllister, and J. E. Deacon. 1989. Fishes of North America endangered, threatened, or of special concern: 1989. Fisheries 14(6):2–20.

Bull Trout (*Salvelinus confluentus*)

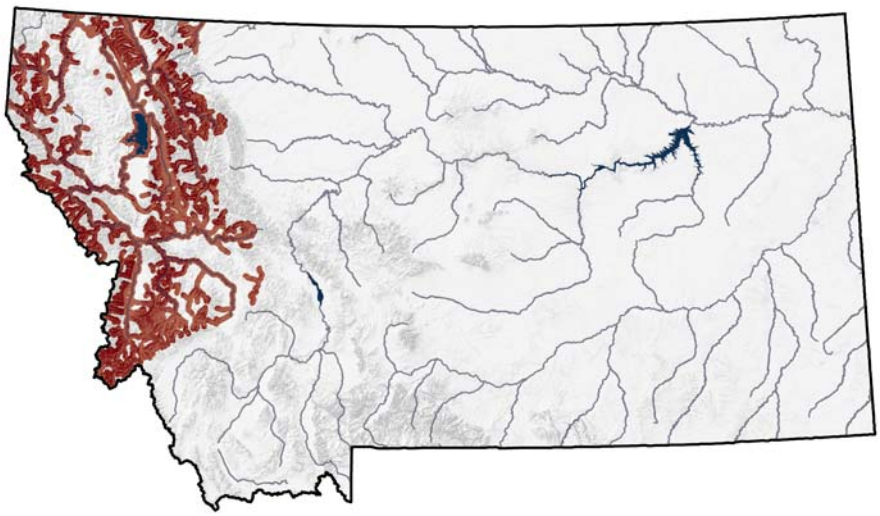


Figure 51. Distribution of the Bull Trout

Range

Montana populations of the bull trout are limited to the Columbia River and Saskatchewan River basins. Major bull trout drainages are the Kootenai River and Clark Fork River (including Bitterroot, Flathead/Swan and Blackfoot systems). Metaline Falls (Tom Weaver, FWP, personal communication) and Bonnington Falls have isolated the Clark Fork River and Kootenai River populations from downstream Columbia Basin populations for approximately 10,000-plus years (Montana Bull Trout Restoration Team (MBTRT) 2000). The St. Mary's River in the Saskatchewan basin, draining north into Canada, contains the only bull trout populations east of the Continental Divide in the United States.

Habitat

Subadult and adult fluvial bull trout reside in larger streams and rivers and spawn in smaller tributary streams, whereas adfluvial bull trout reside in lakes and spawn in tributaries. They spawn in cold headwater streams with clean gravel bottoms (Brown 1971; Holton 1981).

Management

Several studies report bull trout local population genetic divergence down to the geographic scale of adjacent tributaries (Leary et al. 1993; Kanda et al. 1997; Spruell et al. 1999; Taylor et al. 1999). Based on similar patterns of population genetic structure in steelhead, Parkinson (1984) suggested that populations in geographically adjacent streams be managed as separate stocks.

Because of their opportunistic feeding habits and late maturity, bull trout are vulnerable to overharvest and poaching/accidental harvest, especially during spawning migrations and when in tributaries (Leathe and Enk 1985; Long 1997; Schmetterling and Long 1999; Carnefix 2002). Some Montana bull trout populations (e.g., Swan, South Fork Flathead, Kootenai, and Blackfoot rivers) have responded well to more restrictive angling regulations or closures (Tom Weaver, FWP, personal communication), and initial conservation efforts in Montana focused on such measures. The first minimum length limit was imposed in 1951 (Long 1997). From 1953 to 1972, 11 of 33 major North and Middle Fork Flathead River spawning tributaries were closed to fishing, and an 18-inch minimum size limit was established in 1982 to protect pre-spawners in the rivers and Flathead Lake (Fraley et al. 1981; Deleray et al. 1999). Regulations closing all state waters except Swan Lake and the Hungry Horse Reservoir to intentionally fishing for and/or harvesting bull trout became effective in 1993 (Deleray et al. 1999). Harvest is currently permitted in Swan Lake, the Hungry Horse Reservoir (South Fork Flathead), and the Koocanusa Reservoir (Kootenai). Some level of poaching (Swanberg 1996; Long 1997) and accidental harvest due to misidentification (Schmetterling and Long 1999) probably continues to impact bull trout populations, but it is difficult to detect, quantify, prosecute, or prevent. Recent efforts to reduce misidentification include a bull trout identification and education webpage at the FWP website (http://fwp.state.mt.us/bulltroutid/default.htm).

The state of Montana began development of a bull trout restoration plan in 1993. The final plan, published in June 2000, identifies 115 bull trout core areas and connecting “nodal habitats” within 12 restoration/conservation areas (RCAs); sets goals, objectives, and criteria for restoration; outlines actions to meet those criteria; and establishes a structure to monitor implementation and evaluate effectiveness of the plan. The stated goal of the plan is “to ensure the long-term persistence of complex (all life histories represented), interacting groups of bull trout distributed across the species’ range and manage for sufficient abundance within restored RCAs to allow for recreational utilization” (MBTRT 2000). Bull trout conservation is also a stated goal of the Plum Creek Timber Company’s Native Fish Habitat Conservation Plan (HCP) (http://www.plumcreek.com/environment/HCP-fish.cfm), for which agreement was reached with the U.S. Fish and Wildlife Service (USFWS) in October 2000. Though approved, this HCP/take permit is currently in litigation.

With a “threatened” listing (USFWS 1998), USFWS has separate responsibility under the Endangered Species Act for development of a federal recovery plan and designation of critical habitat. A draft recovery plan built on the foundation of state restoration plans (USFWS 2002a, Internet-accessible at http://pacific.fws.gov/bulltrout/recovery/Default.htm) and proposed critical habitat (USFWS 2002b, http://pacific.fws.gov/bulltrout/criticalhab.htm) was released. Although all bull trout within the United States are now listed as threatened, this draft recovery plan and proposed critical habitat are organized hierarchically by

“local populations” within “core areas” within “recovery subunits” within 24 “recovery units” within three (of five) designated “distinct population segments” (DPSs). The draft recovery plan covers the Klamath basin, Columbia River, and St. Mary-Belly River DPSs. Although extensive bull trout habitat was proposed for critical designation in Montana, including 5,341 stream kilometers (3,319 miles) and 88,051 hectares (217,577 acres) of lake and reservoir, the final critical habitat designation did not include any habitat in Montana. Ten local populations within four core areas have been identified within the Kootenai River Recovery Unit in Montana. About 119 local populations distributed among 36 core areas within three recovery subunits (Flathead, Upper Clark Fork, and Lower Clark Fork) are identified within Montana in the Clark Fork Recovery Unit. Nine local populations within six core areas are identified within Montana in the St. Mary-Belly River Recovery Unit.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat degradation and loss due to land and water management practices	Restoration of degraded habitat and preservation of existing healthy habitat
Loss of the migratory component of bull trout life history diversity by isolation and fragmentation of populations by both structural (e.g., dams) and environmental (e.g., thermal or pollution) barriers	Reestablish connectivity between habitats isolated by constructed barriers
Introduction of non-native fishes resulting in competition, predation, and hybridization threats	Increased management of non-native fishes
	Prevent illegal introductions of fish species
Historical overharvest and eradication efforts	Management of water bodies from overfishing
Ongoing poaching and accidental harvest due to misidentification	Education of what bull trout look like and where they are distributed

Management Plans

Flathead Lake and River Co-Management Plan, 2001–2010. November 2000. Montana Fish, Wildlife & Parks, Kalispell, MT, and Confederated Salish and Kootenai Tribes, Pablo, MT.

MBTRT (Montana Bull Trout Restoration Team). 2000. Restoration plan for bull trout in the Clark Fork River basin and Kootenai River basin, Montana. Montana Department of Fish, Wildlife & Parks, Helena, MT. 116 pp.

USFWS (United States Fish and Wildlife Service). 2002. Bull Trout (*Salvelinus confluentus*) Recovery Plan. U.S. Fish and Wildlife Service, Portland OR. 137 pp.

USFWS (United States Fish and Wildlife Service). 2002a. Endangered and Threatened Wildlife and Plants: Bull Trout *(Salvelinus confluentus)* Draft Recovery Plan. Available: http://pacific.fws.gov/bulltrout/recovery/Default.htm. (February 2003).

USFWS (United States Fish and Wildlife Service) 2002b. Endangered and Threatened Wildlife and Plants: proposed designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout. Federal Register 67:71235–71284. Available at http://pacific.fws.gov/bulltrout/criticalhab.htm. (February 2003).

Citations

American Fisheries Society. http://www.fisheries.org/AFSmontana/SSCpages/Bull%20Trout.htm.

Bond, C. E. 1992. Notes on the nomenclature and distribution of the bull trout and the effects of human activity on the species. Pp. 1–4 in P. J. Howell and D. V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, OR.

Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books, Montana State University, Bozeman, MT. 207 pp.

Carnefix, G. 2002. Movement patterns of fluvial bull trout in relation to habitat parameters in the Rock Creek drainage, Missoula and Granite counties, Montana. M.Sc. thesis, University of Montana, Missoula, MT. 185 pp.

Deleray, M., L. Knotek, S. Rumsey, and T. Weaver. 1999. Flathead Lake and River System Fisheries Status Report. Montana Fish, Wildlife & Parks, Kalispell, MT. 200 pp + appendices.

Donald, D. B., and J. D. Stelfox. 1997. Effects of fisheries enhancement and access on adfluvial bull trout populations in mountain lakes of southern Alberta. Pp. 227–234 in W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Fraley, J. J., and B. B. Shepard. 1989. Life history, ecology, and population status of migratory bull trout *(Salvelinus confluentus)* in the Flathead Lake and River System, Montana. Northwest Science 63:133–143.

Fraley, J., D. Read, and P. Graham. 1981. Flathead River fisheries study. Montana Department of Fish, Wildlife & Parks.

Goetz, F. 1989. Biology of the bull trout (*Salvelinus confluentus*): a literature review. Willamette National Forest. Eugene, OR. 53 pp.

Holton, G. D. 1981. Identification of Montana's most common game and sport fishes. Montana Outdoors reprint.

Kanda, N., R. F. Leary, and F. W. Allendorf. 1997. Population genetic structure of bull trout in the upper Flathead River drainage. Pp. 299–308 in W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Kitano, S., K. Maekawa, S. Nakano, and K. D. Fausch. 1994. Spawning behavior of bull trout in the upper Flathead drainage, Montana, with special reference to hybridization with brook trout. Transactions of the American Fisheries Society 123:988–992.

Leary, R. F., F. W. Allendorf, and S. H. Forbes. 1993. Conservation genetics of bull trout in the Columbia and Klamath River drainages. Conservation Biology 7:856–865.

Leathe, S. A., and M. D. Enk. 1985. Cumulative effects of micro-hydro development on the fisheries of the Swan River drainage, Montana. Report prepared for Bonneville Power Administration, Division of Fish and Wildlife. 114 pp. + appendices.

Long, M. H. 1997. Sociological implications of bull trout management in northwest Montana: illegal harvest and game warden efforts to deter poaching. Pp. 71–73 in W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Marnell, L. F. 1985. Bull trout investigations in Glacier National Park, Montana. Pp. 33–35 in D. D. MacDonald, ed. Proceedings of the Flathead River Basin bull trout biology and population dynamics modeling information exchange. Fisheries Branch, British Columbia Ministry of Environment, Cranbrook, B.C.

Meehan, W. R., and T. C. Bjornn. 1991. Salmonid distributions and life histories. Pp. 76–78 in Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats, W. R. Meehan, ed. American Fisheries Society Special Publication 19, Bethesda, MD.

Parkinson, E. A. 1984. Genetic variation in populations of steelhead trout (*Salmo gairdneri*) in British Columbia. Canadian Journal of Fisheries and Aquatic Sciences 41:1412–1420.

Ratliff, D. E. 1992. Bull trout investigations in the Metolius River-Lake Billy Chinook system. Pp. 37–44 in P. J. Howell and D. V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, OR.

Ratliff, D. E. and P. J. Howell. 1992. The status of bull trout populations in Oregon. Pp. 10–17 in P. J. Howell and D. V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, OR.

Riehle, M., W. Weber, A. M. Stuart, S. L. Thiesfeld, and D. E. Ratliff. 1997. Progress report of the multiagency study of bull trout in the Metolius River system, Oregon. Pp. 137–144 in W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Rieman, B. E., and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. U.S.D.A. Forest Service, General Technical Report INT-302. 40 pp.

Schmetterling, D. A., and M. H. Long. 1999. Montana anglers' inability to identify bull trout and other salmonids. Fisheries 24:24–27.

Spruell, P., B. E. Rieman, K. L. Knudsen, F. M. Utter, and F. W. Allendorf. 1999. Genetic population structure within streams: microsatellite analysis of bull trout populations. Ecology of Freshwater Fish 8:114–121.

Swanberg, T. R. 1996. The movement and habitat use of fluvial bull trout in the upper Clark Fork River drainage. Master's thesis, University of Montana, Missoula, MT. 61 pp.

Taylor, E. B., S. Pollard, and D. Louie. 1999. Mitochondrial DNA variation in bull trout (*Salvelinus confluentus*) from northwestern North America: implications for zoogeography and conservation. Mol. Ecol. 8:1155–1170.

U.S. Fish and Wildlife Service). 1998. Endangered and threatened wildlife and plants: determination of threatened status for the Klamath River and Columbia River distinct population segments of bull trout. Federal Register 63:31647–31674.

Lake Trout (native lakes) (*Salvelinus namaycush*)

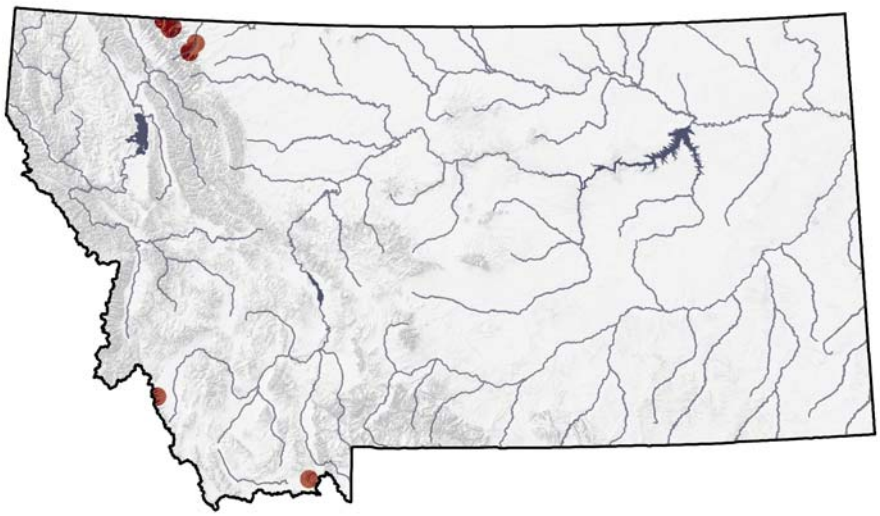


Figure 52. Distribution of Native Populations of Lake Trout

Range

Montana's native lake trout populations remain in Waterton Lake, Glenns Lake, Cosley Lake, and St. Mary Lake in Glacier National Park, and Lower St. Mary Lake in the Blackfeet Indian Reservation. All of these waters are in drainages that eventually reach the Hudson Bay. Other native populations occur in Twin Lake in the Big Hole River drainage and Elk Lake in the Red Rock River drainage, both tributaries to the upper Missouri River drainage. Although there are records of some stocking of lake trout into Cosley, Glenns, and Lower St. Mary lakes, mtDNA analysis by Wilson and Hebert (Wilson and Hebert 1998) gives evidence of the native status of the listed populations. Other lake trout populations in Montana are the result of legal and illegal introductions and are not remnant native populations.

Habitat

While the lake trout can be found in cold rivers and shallow lakes in the northern portion of its range (Scott and Crossman 1973) in Montana, native lake trout inhabit a few deep, cold lakes remaining from the Pleistocene glaciations. Lake trout prefer water temperatures in the 50- to 57-degree F range and, therefore, spend most of their lives in the deeper, benthic habitats with these water temperatures. Lake trout can occasionally be found in shallow water habitats, usually immediately after ice-out when surface waters are within their preferred temperature range. They spawn in the fall on the rocky substrate of the shoreline. Lake trout scatter or broadcast their spawn, a rarity in the trout group.

Management

Management recommendations within this document pertain only to the Elk Lake and Twin Lake populations. Little is known about the status of Montana's native lake trout populations. The populations in Waterton, Cosley, Glenns, and St. Mary lakes are afforded the protection of their location within Glacier National Park. The Waterton population is believed to be abundant and stable. (Leo Marnell, NPS, personal communication).

St. Mary Lake is a 3,500-acre lake at 4,473 feet above mean sea level. The St. Mary Lake population is believed to be abundant and stable. Lake trout are the most dominant fish species after lake whitefish. There are records of stocking lake trout into St. Mary Lake, so the genome of this population may contain exotic alleles. DNA analysis has been performed, but not reported, to identify the source stock for these introductions (Leo Marnell, NPS, personal communication; Robbin Wagner, USFWS, personal communication).

Some question whether the Glenns and Cosley lakes populations are native due to the location of a downstream high-barrier falls (Leo Marnell, NPS, personal communication). Holton and Johnson (1996) did not list these as native populations; however, Wilson and Hebert (1998) found that there is genetic evidence that the Cosley Lake haplotype is consistent with the other populations that formed the Alberta/Montana refuge. The Cosley and Glenns lakes populations also are believed to be stable. There are records of stocking lake trout of unknown origin into Cosley and Glenns lakes, so the genome of these populations may contain exotic alleles. DNA analysis has been performed, but not reported, to identify the source stock for these introductions (Leo Marnell, NPS, personal communication; Robbin Wagner, USFWS, personal communication).

Lower St. Mary Lake is located within the Blackfeet Indian Reservation. This population is stable and abundant. Lake trout are the most dominant fish species after lake whitefish and comprise 10 to 30 percent of the commercial lake whitefish catch. Again, there are records of stocking lake trout of unknown origin into Lower St. Mary Lake. Water level fluctuations and dewatering due to lake management for irrigation impacts this population (Robbin Wagner, USFWS, personal communication).

Elk Lake is a 283-surface-acre lake at 6,674 feet elevation with a maximum depth of 70 feet (USFS 2004). The lake trout population in Elk Lake is small (250 to 1,000 fish) and declining. This population has a poor age structure due to limited recruitment (Oswald, unpublished FWP data).

Twin Lake is a 75-surface-acre lake at 7,235 feet elevation with a maximum depth of 72 feet (USFS 2004). The Twin Lake population is also small (50 to 250 fish) and declining, with little recruitment (Oswald, unpublished FWP data).

The genetic uniqueness and significance of Montana's lake trout populations to the postglacial distribution of the species mandate that these remnant native populations be conserved.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Little information on native populations	Consider preparing a management plan for the lake trout (native lakes) or include it into other comprehensive taxonomic plans
Irregular recruitment	Increased monitoring and surveying
Genetic bottlenecks caused by small size of remaining populations	Reintroduce genetically pure native populations
Limiting factors unknown	Identify and remedy limiting factors

Management Plan

None

Citations

Marnell, Leo. 2004. NPS, personal communication.

Scott, W. B., and E. J. Crossman. 1973. Freshwater Fishes of Canada. Bulletin 184. Fisheries Research Board of Canada, Ottawa. 966 pp.

Snyder, Bob, and Richard Oswald. 2004. Status of Native Lake Trout in Montana. Montana Fish, Wildlife & Parks. Helena, MT. Draft (in progress).

U.S. Forest Service. 2004. Beaverhead National Forest Lake Inventory. Available at http://www.fs.fed.us/r1/b-d/ (accessed August 27, 2004).

Wagner, Robbin. 2004. USFWS, personal communication.

Wilson, C. C., and P. D. N. Hebert. 1998. Phylogeography and postglacial dispersal of lake trout (*Salvelinus namaycush*) in North America. Canadian Journal of Fish and Aquatic Sciences 55:1010–1024.

Arctic Grayling (Thymallus arcticus)

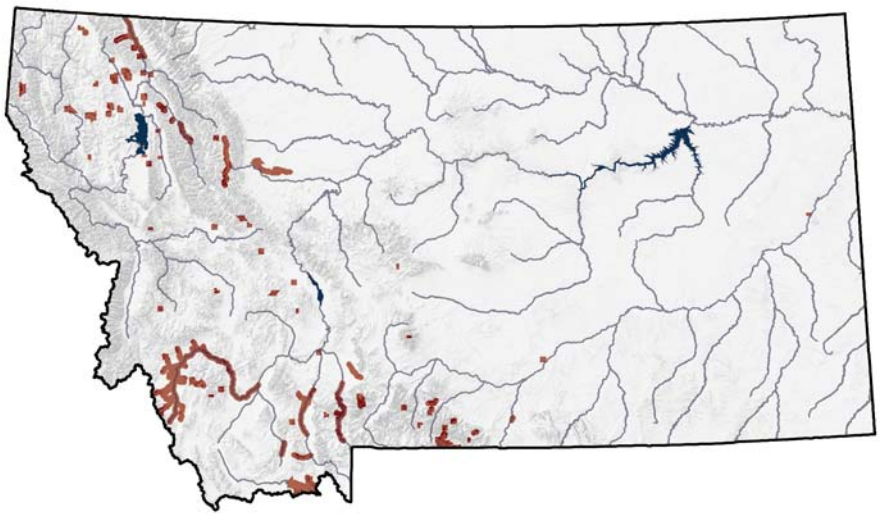


Figure 53. Distribution of the Arctic Grayling (includes introduced populations)

Range

At the end of the 19th century, fluvial arctic grayling were intermittently distributed throughout the upper Missouri drainage above Great Falls (Vincent 1962). During the 20th century, the range of fluvial arctic grayling has been restricted to the Big Hole River of southwest Montana, about 4 percent of its native range (Kaya 1992a). Vincent (1962) attributed the decline of fluvial arctic grayling throughout their native range to four factors: habitat degradation, introduction of non-native salmonids, climatic change, and exploitation by anglers.

Habitat

The arctic grayling occurs in both ponds/lakes as well as riverine systems; however, these differences make two distinct populations of either adfluvial or fluvial populations. Cool temperatures are needed to sustain populations, and a gravelly substrate is needed for breeding purposes.

Management

The Fluvial Arctic Grayling Workgroup (FGW) developed a plan to research, protect, and restore fluvial arctic grayling (FGW 1995). A primary objective was to develop a brood stock from wild Big Hole River arctic grayling to preserve their genetic identity. Gametes were collected from spawning arctic grayling in the Big Hole River between 1988 and 1992 until a sufficient founding population was represented (Leary 1991). Progeny of the brood stock with genetic diversity equivalent to the wild stock were available in 1995. Arctic grayling derived from

the brood may be used to augment the Big Hole River population, if necessary, and to reestablish other populations within their native range.

Another objective of FGW is to expand the range of fluvial arctic grayling beyond the Big Hole River basin. Kaya (1992b) identified streams suitable for reintroductions of fluvial grayling. Experimental reintroductions have occurred in Cougar Creek, Yellowstone National Park, and in the West and East Gallatin rivers using progeny of the brood stock. Intensive reintroduction efforts in 1997 for the Ruby River of southwestern Montana and the Firehole and Gibbons rivers in Yellowstone National Park occurred and are being monitored at this time.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Low flows during severe drought decrease survival of older arctic grayling due to high water temperatures, increased susceptibility to predation, and diminished habitat volume	Riparian rehabilitation projects to identified degraded habitats on the Big Hole River
Displacement by non-native rainbow and brook trout	Less stocking of non-native fish
Arctic grayling are easily caught by anglers and are susceptible to overharvest	Increased management of harvest
Riparian vegetation and streambanks effected by range or forest management practices, mass willow removal, and dewatering of the river for agricultural uses have negatively impacted fish habitat	Support management of grazing to maintain riparian vegetation and streambank and channel stability in excellent condition
Blockage of fish passage by irrigation diversions	Decreased water runoff for irrigation purposes to increase stream volumes

Management Plans

Kaya, Calvin M. 1990. Status Report on Fluvial Arctic Grayling (*Thymallus arcticus*) in Montana. Biology Department, Montana State University. Bozeman, MT. Prepared for Montana Fish, Wildlife & Parks. Helena, MT

Magee, J. P. 2000. Montana fluvial arctic grayling recovery project: annual monitoring report.

Montana Fluvial Arctic Grayling Workgroup. 1995. Montana Fluvial Arctic Grayling Restoration Plan. Montana Department of Fish, Wildlife & Parks, Helena, MT.

Citations

Byorth, P. A. 1993. Big Hole River arctic grayling recovery project: annual monitoring report, 1992. Submitted to Montana Fluvial Arctic Grayling Workgroup. Montana Department of Fish, Wildlife & Parks, Bozeman, MT.

Clark, R. A. 1992. Influence of stream flows and stock size on recruitment of arctic grayling (*Thymallus arcticus*) in the Chena River, Alaska. Canadian Journal of Fisheries and Aquatic Sciences 49(5):102–1034.

Kaya, C. M. 1992a. Review of the decline and status of fluvial arctic grayling (*Thymallus arcticus*), in Montana. Proceedings of Montana Academy of Sciences 52:43–70.

Kaya, C. M. 1992b. Restoration of fluvial arctic grayling to Montana streams: assessment of reintroduction potential of streams in the native range, the upper Missouri River drainage above Great Falls. Prepared for Montana Chapter of the American Fisheries Society and Montana Department of Fish, Wildlife & Parks, Bozeman, MT.

Leary, R. F. 1991. Establishment, maintenance, and use of a genetic reserve of Big Hole River arctic grayling. Wild Trout and Salmon Genetics Laboratory Report 91/5. University of Montana, Missoula, MT.

Lohr, S. C., P. A. Byorth, C. M. Kaya, and W. P. Dwyer.1996. High temperature tolerances of fluvial arctic grayling and comparisons with summer water temperatures of the Big Hole River, Montana. Transactions of the American Fisheries Society 125:933–939.

Magee, J. P., and P. A. Byorth. 1995. Competitive interactions of fluvial arctic grayling and sympatric species in the Big Hole River drainage, Montana. Submitted to Montana Fluvial Arctic Grayling Workgroup. Montana Fish, Wildlife & Parks, Bozeman, MT.

Magee, J. P. and P. A. Byorth. 1994. Competitive interactions of fluvial arctic grayling (*Thymallus arcticus*) and brook trout (*Salvelinus fontinalis*) in the upper Big Hole River, Montana. Submitted to Montana Fluvial Arctic Grayling Workgroup. Montana Department, of Fish, Wildlife & Parks, Bozeman, MT.

Shepard, B. B., and R. A. Oswald. 1989. Timing, location, and population characteristics of spawning Montana arctic grayling (*Thymallus arcticus*

montanus [Milner]) in the Big Hole River drainage, 1988. Montana Department of Fish, Wildlife & Parks, Bozeman, MT.

Skaar, D. 1989. Distribution, relative abundance, and habitat utilization of arctic grayling (*Thymallus arcticus*) in the upper Big Hole River drainage, Montana, July 5 to September 8, 1988. Report to Montana Natural Heritage Program, Beaverhead National Forest, and Montana Department. of Fish, Wildlife & Parks, Bozeman, MT.

Vincent, R. E. 1962. Biogeographical and biologic factors contributing to the decline of arctic grayling (*Thymallus arcticus* [Pallus]) in Michigan and Montana. Ph.D. dissertation, University of Michigan, Ann Arbor, MI.

Sturgeon Chub (*Hybopsis gelida*)

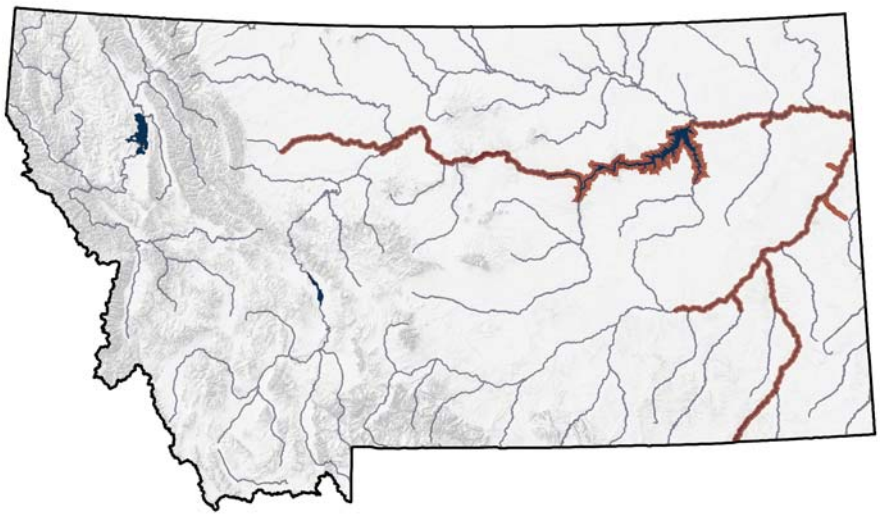


Figure 54. Distribution of the Sturgeon Chub

Range

The sturgeon chub is indigenous to the Missouri-Mississippi river basins from Montana to Louisiana (Lee et al. 1980; Werdon 1993). Historically, sturgeon chub have been collected in small numbers from only a few locations in Montana, so the Montana Department of Fish, Wildlife & Parks designated it a state species of special concern more than two decades ago (Holton 1980). Werdon (1993) reported the sturgeon chub was in possible danger of extinction over much of its former range, including all relevant Montana waters except the Powder River. However, recent collections of this species show it is more widespread and abundant than previously understood. Prior to 1975 only four collections of sturgeon chub from Montana were known. The first collection was taken from an unknown site on the Milk River (Girard 1856), and three collections were reported more than 100 years later from the Yellowstone River drainage (Bailey and Allum 1962; Brown 1971). Collections from 1975–1982 determined that chubs were also present throughout the Powder River (Rehwinkle 1978), in the lower Tongue River (1980), and in the lower Teton and the middle Missouri rivers (Gardner and Berg 1982).

Between 1990 and 1995, collections verified the persistence of sturgeon chub in much of their previously known range and established major range extensions. Sturgeon chub are still present in the Powder River (Werdon 1993; Gould 1994), Lower Yellowstone River (Werdon 1993; 1994 MSU collections by Bramblett et al.), and middle Missouri River (1994 MSU collections by Gardner and Grisak). Furthermore, collections from 1993 to 1995 have yielded significant up- and downstream range extensions in the lower Yellowstone (MSU collections by Bramblett et al.; Ruggles 1997; Stewart 1994), middle Missouri (MSU collections by

Gardner and Grisak), and the lower Missouri rivers (Tews 1993; Ruggles 1997). In total, sturgeon chub recently have been found over some 650 kilometers in three Montana rivers (Gould 1994). However, sampling has not been able to establish their continued existence in the lower Teton and Milk rivers (Gould 1994).

Habitat

Sturgeon chub are highly adapted to life in turbid waters. They have small eyes and many external papillae on their bodies and fins, probably to aid in locating food (Cross 1967; Pflieger 1975). Chub are most closely associated with sites having moderate currents and depths and sand or rock substrates (Baxter and Simon 1970; Brown 1971; Lee et al. 1980). In the Powder River, sturgeon chub were taken most frequently at sites with depths less than 51 cm and depth velocities of less than 90 cm/s at 0.6 depth (Stewart 1981; Werdon 1992; Gould unpublished data).

Management

No management plan for this species exists in Montana. Recommendations for operating reservoir and irrigation projects should be developed for improving and maintaining sturgeon chub populations and habitats in Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat alteration by dam operations, reducing turbidities and/or altering temperature and flow regimes	Conservation practices on large rivers in eastern Montana
Channelization of the Missouri River due to irrigation operations and development	Support sustainable irrigation projects
Decreased range and abundance of prey aquatic insect larvae due to dam construction and snag removal	Increased monitoring and survey efforts in eastern Montana designed to monitor population trends and range expansion or loss and collect additional information on life history and ecology
Removal of wild individuals used for bait fish	Educate the public on the necessity of native species
Predation by non-native fish	Consider preparing a management plan for the sturgeon chub or include it into other comprehensive taxonomic plans
Low stream flows probably have eliminated some peripheral sturgeon chub populations in smaller streams	Repopulate smaller tributaries such as Teton, Milk, and Tongue rivers to establish periphery populations

Management Plan

None

Citations

Bailey, R., and M. Allum. 1962. Fishes of South Dakota. Museum of Zoology, University of Michigan. Ann Arbor, MI.

Baxter, G., and J. Simon. 1970. Wyoming fishers. Bulletin Number 4, Wyoming Game and Fish Department. Cheyenne, WY.

Bicknell, William. 2001. USFWS Federal Registry. Notice of 12-month petition finding to list the sicklefin chub (*Macrhybopsis meeki*) and the sturgeon chub (*Macrhybopsis gelida*) as endangered. 3425 Miriam Avenue, Bismarck, ND 58501. 10 pp.

Brown, C. 1976. Fishes of Montana. Big Sky Books, Montana State University. Bozeman, MT.

Cross, F. 1967. Handbook of fishes of Kansas. Museum of Natural History, University of Kansas, Lawrence, KS.

Gardner, W. M., and R. Berg. 1982. An analysis of the instream flow requirements for selected fishes in the Wild and Scenic portion of the Missouri River. Montana Fish, Wildlife & Parks. Helena, MT. 111 pp.

Girard, C. 1856. Researches upon the cyprinoid fishes inhabiting the fresh waters of the United States, west of the Mississippi Valley, from specimens in the museum of the Smithsonian Institution. Proceedings of the Academy of Natural Science of Philadelphia. 8:165–213.

Gould, W. 1994. The recent distribution of sturgeon chub (*Macrhybopsis gelida*) in Montana. Report to the Montana Department of Fish, Wildlife & Parks. Helena, MT.

Hiebert, S. D., R. Wydoski, and T.J. Parks. 1999. Fish entrainment at the lower Yellowstone Diversion Dam, Intake Canal, Montana: 1996–1998. Technical Service Center Data Report. Bureau of Reclamation. In press. 52 pp.

Holton, G. 1980. The riddle of existence: fishes of special concern. Montana Outdoors 11:2–6.

Lee, S., et al. 1980. Atlas of North American freshwater fishes. North Carolina State Museum of Natural History. Raleigh, NC.

Pflieger, W. 1975. The fishes of Missouri. Missouri Department of Conservation. Jefferson City, Missouri, MO.

Rehwinkle, B. 1978. Powder River aquatic ecology project. Report to Utah International, Inc., Salt Lake City, UT.

Ruggles, M. P. 1997. Sections 2 and 3: Upper Inter-Reservoir I and Lower Yellowstone River, Montana. In D. J. Dieterman, M. P. Ruggles, M. L. Wildhaber, and D. L. Galat, eds. Population structure and habitat use of benthic fishes along the Missouri and Lower Yellowstone Rivers. 1997 Annual Report of Missouri River Benthic Fish Study PD-95-5832 to U.S. Army Corps of Engineers and U.S. Bureau of Reclamation.

Stewart, D. 1981. The biology of the sturgeon chub (*Hybopsis gelida Girard*) in Wyoming. Master's thesis, University of Wyoming, Laramie, WY.

Tews A. 1993. Pallid sturgeon and shovelnose sturgeon in the Missouri River from Fort Peck Dam to Lake Sacagawea and in the Yellowstone from Intake to its mouth. Report submitted to the U.S. Army Corps of Engineers. Planning Branch. Omaha, NE.

Welker, T. L., and D. L. Scarnecchia. Habitat use and population structure of four native minnows (family Cyprinidae) in the upper Missouri and Lower Yellowstone rivers, North Dakota. Ecology of Freshwater Fish 2004:13:8–22.

Werdon, S. 1992. Population status and characteristics of *Macrhybopsis gelida*, *Platygobio gracilis* and *Rhinichthyes cataractae* in the Missouri River Basin. Master's thesis, South Dakota State University, Brookings, SD.

Werdon, S. 1993. Status report on sturgeon chub (*Macrhybopsis gelida*), a candidate endangered species. U.S. Fish and Wildlife Service, Ecological Services, North Dakota State Office. Bismarck, ND.

Sicklefin Chub (*Hybopsis meeki*)

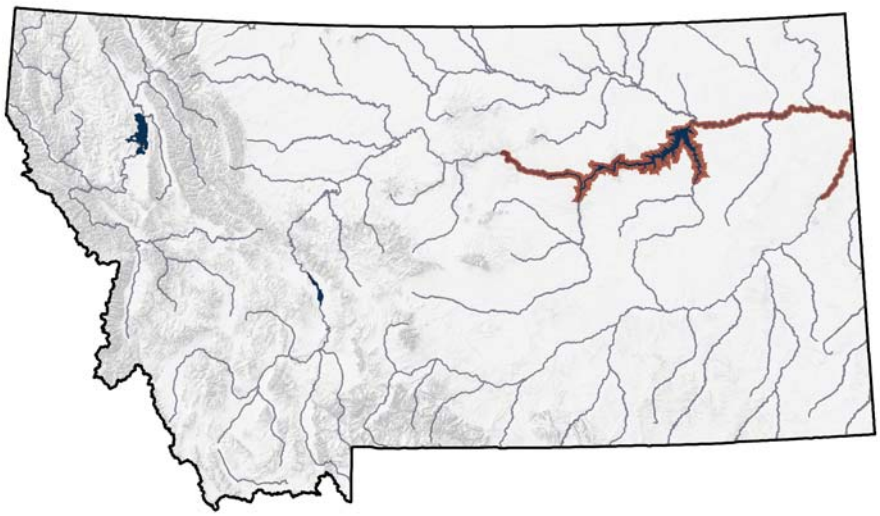


Figure 55. Distribution of the Sicklefin Chub

Range

The first observation of sicklefin chub in Montana was in 1979 in the middle Missouri River upstream of Fort Peck Reservoir (Gould 1981; Gardner and Berg 1982). Until this time they were unknown to exist in the state most likely because of the lack of sampling efforts in eastern Montana. At present, the distribution of sicklefin chub in Montana includes the middle Missouri River from Cow Island downstream to the headwaters of Fort Peck Reservoir (Grisak 1996), the lower Missouri River from the mouth of the Redwater River to the Yellowstone River confluence (Liebelt 1996), and the lower Yellowstone River, from the Intake Diversion Dam to the confluence with the Missouri (Ruggles 1997). As of 1997, the known range of sicklefin chub encompasses nearly 280 kilometers of river in the Missouri and Yellowstone drainages.

Habitat

Spawning occurs in primary channel areas of the large turbid rivers that sicklefin chub inhabit. The spawning period is during the summer months and probably occurs over a wide time span, similar to other big river species. Young-of-the-year sicklefin chub have never been collected, and their early life history remains a mystery. Although the species has been sampled from shallow water and a rocky substrate, there seems to be a general preference for deeper water and a sandy substrate. Unlike the sturgeon chub, all of the Montana captures have been from only the Missouri and Yellowstone rivers, indicating a strong preference for large, turbid rivers.

Management

No management plan for this species exists in Montana. The lack of proper monitoring of these populations could lead to their demise by virtue of not recognizing if and when they are in jeopardy of becoming extirpated by any artificial or natural entity. Recommendations for operating reservoir and irrigation projects should be developed for improving and maintaining sicklefin chub populations and habitats in Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat alteration by dam operations, reducing turbidities and/or altering temperature and flow regimes	Conservation practices on large rivers in eastern Montana
Channelization of the Missouri River due to irrigation operations and development	Support sustainable irrigation practices
Decreased range and abundance of prey aquatic insect larvae due to dam construction and snag removal	Increased monitoring and survey efforts in eastern Montana designed to monitor population trends and range expansion or loss and collect additional information on life history and ecology
Removal of wild individuals used for bait fish	Educate the public on the necessity of native species
Predation by non-native fish	Consider preparing a management plan for the sicklefin chub or include it into other comprehensive taxonomic plans

Management Plan

None

Citations

Bicknell, William. 2001. USFWS Federal Registry. Notice of 12-month petition finding to list the sicklefin chub (*Macrhybopsis meeki*) and the sturgeon chub (*Macrhybopsis gelida*) as endangered. 3425 Miriam Avenue, Bismarck, ND 58501. 10 pp.

Dieterman, Douglas J., and David L. Galat. 2004. Large-scale factors associated with sicklefin chub distribution in the Missouri and Lower Yellowstone rivers. Transactions of the American Fisheries Society 133:577–587.

Gardner, W. M., and R. Berg. 1982. An analysis of the instream flow requirements for selected fishes in the Wild and Scenic portion of the Missouri River. Montana Fish, Wildlife & Parks. Helena, MT. 111 pp.

Grisak, G. G. 1996. The status and distribution of the sicklefin chub in the middle Missouri River, Montana. Master's thesis, Montana State University, Bozeman, MT.

Gould, W. R. 1981. First records of the rainbow smelt (*Osmeridae*), sicklefin chub (*Cyprinidae*) and white bass (*Percichthyidae*) from Montana. Proceedings of the Montana Academy of Sciences 40:9–10.

Liebelt, J. E. 1996. Lower Missouri River and Yellowstone River pallid sturgeon study, 1994–1995. Montana Department of Fish, Wildlife & Parks. Helena, MT.

Ruggles, M. P. 1997. Sections 2 and 3: Upper Inter-Reservoir I and Lower Yellowstone River, Montana. In D. J. Dieterman, M. P. Ruggles, M. L. Wildhaber, and D. L. Galat, eds. Population structure and habitat use of benthic fishes along the Missouri and Lower Yellowstone rivers. 1997 Annual Report of Missouri River Benthic Fish Study PD-95-5832 to U.S. Army Corps of Engineers and U.S. Bureau of Reclamation.

Welker, T. L., and D. L. Scarnecchia. Habitat use and population structure of four native minnows (family Cyprinidae) in the upper Missouri and Lower Yellowstone rivers, North Dakota. Ecology of Freshwater Fish 2004:13:8–22.

Pearl Dace (*Margariscus margarita*)

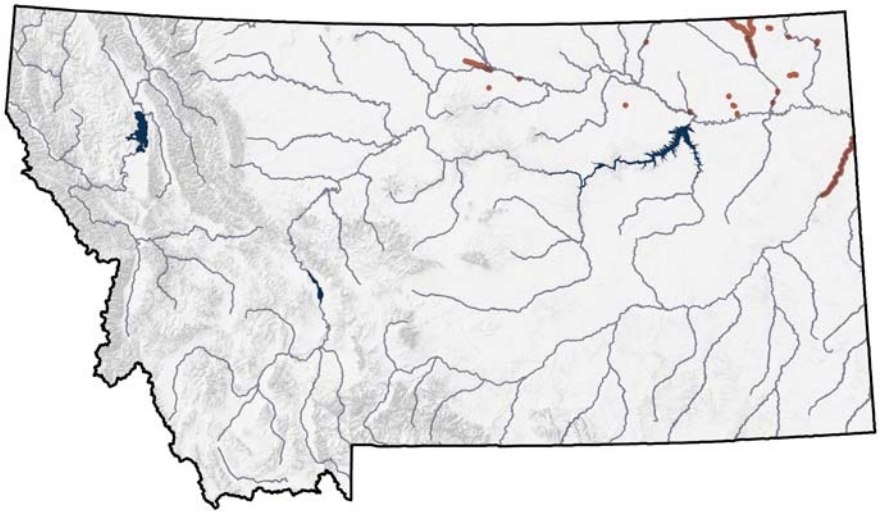


Figure 56. Distribution of the Pearl Dace

Range

Montana contains the southwestern periphery of the continental range of the pearl dace. In Montana, pearl dace occur only in the Missouri River and Saskatchewan River basins. Most known pearl dace localities are in south-flowing tributaries to the Missouri River downstream of its confluence with the Milk River, in the Milk River drainage, or on the Blackfeet Indian Reservation in Glacier County and in Glacier National Park (Schultz 1941; Gould and Brown 1968; Brown 1971; Holton and Johnson 2003; Stash 2001; Bramblett, unpublished data; Robbin Wagner, U.S. Fish and Wildlife Service, personal communication, January 2004).

Two previously reported localities for pearl dace in the lower Yellowstone River (Gould and Brown 1968; Brown 1971; Holton and Johnson 2003) were probably attributable to misidentified creek chubs. The Gould and Brown (1968) collection was reexamined, and the putative pearl dace was found to be a creek chub (William R. Gould, Montana State University, personal communication, January 2004). Other surveys have failed to find pearl dace in the Yellowstone River basin in Montana (Elser et al. 1980; Bramblett, unpublished data). Pearl dace appear to be a glacial relict in Montana, as they are most commonly found in formerly glaciated portions of the plains regions.

Habitat

Pearl dace occur in lakes, cool bog ponds, creeks, and cool springs (Scott and Crossman 1973). Little habitat-related information exists for this species in Montana. At four stream locations where pearl dace were captured in

northeastern Montana, average stream widths ranged from 5.4 to 11.8 meters, average thalweg depths ranged from 0.4 to 1.4 meters, substrates ranged from 53 to 100 percent fine substrate (less than 0.06 mm), and aquatic macrophytes were sparse to very heavy (less than10 to more than 75 percent coverage; Bramblett, unpublished data). Eleven fish species were associated with pearl dace in seven collections from four sites on four Montana streams.

Pearl dace appear to prefer cool to cold water temperatures. In Canada, pearl dace were more often found to co-occur with brook trout (*Salvelinus fontinalis*) and mottled sculpin (*Cottus bairdi*) at water temperatures of 15.8 to 16.6 degrees C than with smallmouth bass (*Micropterus dolomieu*) and rock bass (*Ambloplites rupestris*) at 20.8 to 21.5 degrees C (Becker 1983). The upper lethal temperature for pearl dace was found to be 31.1 degrees C (Becker 1983). In the southernmost part of their range in Maryland and Virginia, pearl dace were found in streams that were cool in summer and warm in winter, with substantial spring-water input (Tsai and Fava 1982). In Montana, pearl dace were captured in streams with daytime water temperatures from July through September ranging from 9.6 to 23.1 degrees C (Bramblett, unpublished data).

Management

Montana Fish, Wildlife & Parks classifies the pearl dace as a species of special concern. The primary management task is to monitor the status of the species in Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Limited distribution in Montana renders it vulnerable to extirpation from the state	Consider preparing a management plan for the pearl dace or include it into other comprehensive taxonomic plans
	Fish surveys supported by voucher specimens should be conducted in streams across the range (including areas of historical records) of the species to better determine its geographic range
Populations vulnerable to predation and competition	Reduce stocking of non-native fish (especially pike) that may compete or prey on this species
Collected by anglers seeking bait minnows	Educate anglers of importance of native fish

Anthropogenic stressors that increase water temperatures	Conservation of prairie streams to include less livestock use, increase riparian quality, and decrease fertilizers and nutrients used

Management Plan

None

Citations

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press, Madison, WI.

Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books. Montana State University, Bozeman, MT.

Elser, A. A., M. W. Gorges, and L. M. Morris. 1980. Distribution of fishes in southeastern Montana. Montana Department of Fish, Wildlife & Parks, Helena, MT.

Findlay, C. S., D. G. Bert, and L. Zheng. 2000. Effect of introduced piscivores on native minnow communities in Adirondack lakes. Canadian Journal of Fisheries and Aquatic Sciences 57:570–580.

Gould, W. R., and C. J. D. Brown. 1968. Fishes of the genus *Semotilus* (Cyprinidae) from Montana. Copeia 1968: 628-629.

Holton, G. D., and H. E. Johnson. 2003. A field guide to Montana fishes, 3rd ed. Montana Fish, Wildlife & Parks, Helena, MT.

MacRae, P. S. D., and D. A. Jackson. 2000. The influence of smallmouth bass (*Micropterus dolomieui*) predation and habitat complexity on the structure of littoral zone fish assemblages. Canadian Journal of Fisheries and Aquatic Sciences 58:342–351.

Schultz, L. P. 1941. Fishes of Glacier National Park, Montana. U.S. Department of the Interior Conservation Bulletin, Number 22, Washington, DC.

Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Bulletin 184, Fisheries Research Board of Canada, Ottawa.

Stash, S. W. 2001. Distribution, relative abundance, and habitat association of Milk River fishes related to irrigation diversion dams. Master's thesis, Montana State University, Bozeman, MT.

Tsai, C., and J. A. Fava. 1982. Habitats and distribution of the pearl dace (*Semotilus margarita* [Cope]), in the Potomac River drainage. Virginia Journal of Science 33:201–205.

Whittier, T. R., D. B. Halliwell, and S. G. Paulsen. 1997. Cyprinid distributions in northeastern U.S.A. lakes: evidence of regional-scale minnow biodiversity losses. Canadian Journal of Fisheries and Aquatic Sciences 54:1593–1607.

Blue Sucker (*Cycleptus elongates*)

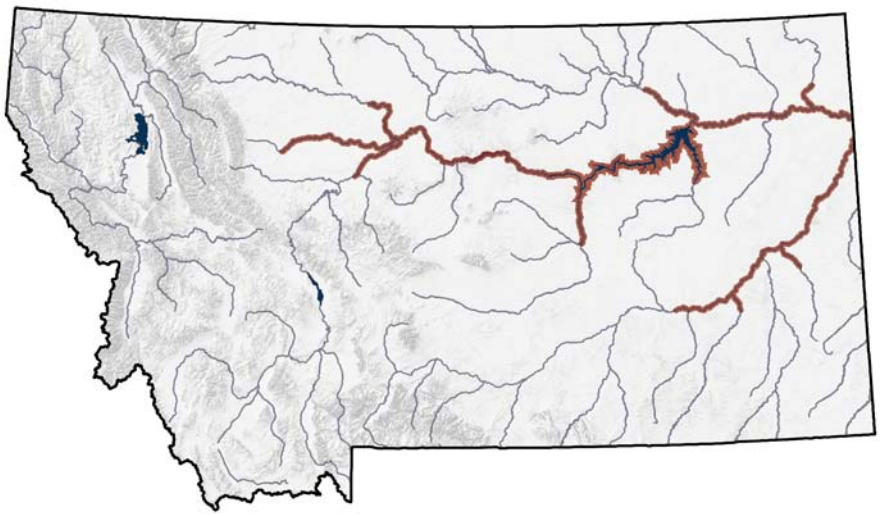


Figure 57. Distribution of the Blue Sucker

Range

In Montana, blue suckers are found in the Missouri River as far upriver as Morony Dam near Great Falls and in the Yellowstone River upriver of Forsyth. During their spawning season, blue suckers have been found in many of the major tributary streams. There have been very few blue suckers sampled in Fort Peck Reservoir, indicating their avoidance of lake environments (AFS website 2003).

Habitat

The blue sucker is adapted for life in swift currents with high turbidity. This fish prefers swift current areas of large rivers, feeding on insects in cobble areas (Moss et al. 1983). In the spring blue suckers migrate upriver and congregate in fast rocky areas to spawn. Large numbers have been observed migrating up tributary streams to spawn. The Tongue, Marias, Milk, and Teton rivers are the tributary streams most heavily used.

Management

Management of the blue sucker consists primarily of routine monitoring of population status and habitat protection. Currently, there is no management plan for blue suckers in Montana. The blue sucker is considered an indicator species for ecotype health because of its habitat-specific requirements. Current monitoring information indicates the populations are in stable condition.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat changes and fragmentation caused by large dams that block passage to spawning grounds, alter stream flow, and eliminate peak flows that initiate spawning runs. Dams also discharge cold, clear water as opposed to the warm, turbid waters in which these species evolved	Consider preparing a management plan for the blue sucker or include it into other comprehensive taxonomic plans
	Regulate water regimes to be more closely tied to natural water regimes
Channelization of large lotic systems	Protect natural minimum instream flow reservations
Changes in riparian habitat and less regeneration of woody trees and understory	Continue conservation of habitats by managing grazing in riparian areas

Management Plan

None

Citations

American Fisheries Society Montana website. http://www.fisheries.org/AFSmontana/SSCpages/Bluesuckstatus.htm.

Moss, R. E., J. W. Scanlan, and C. S. Anderson. 1983. Observations on the natural history of the blue sucker (*Cycleptus elongatus* LeSueur) in the Neosho River. The American Midland Naturalist 109(1):15–22.

Trout-perch (*Percopsis omiscomaycus*)

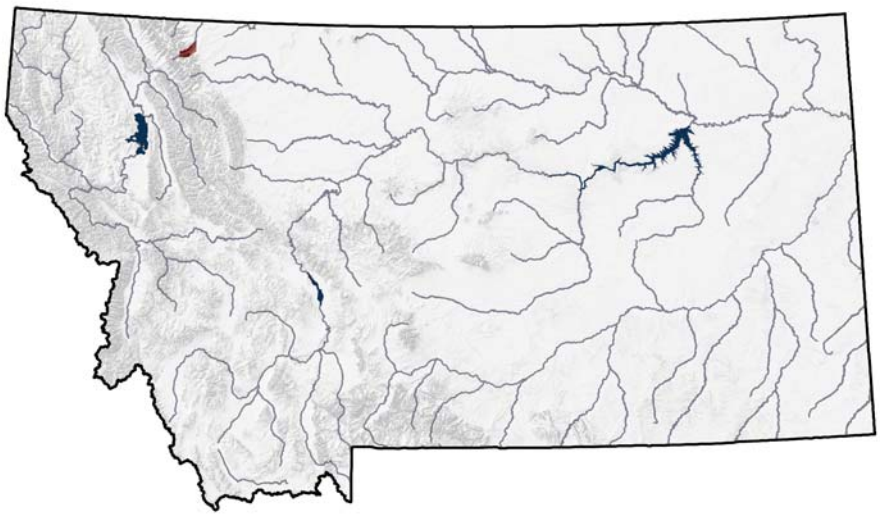


Figure 58. Distribution of the Trout-perch

Range

In Montana, the trout-perch occurs in the South Saskatchewan River basin, which drains northeastern Glacier National Park and the northwestern portion of the Blackfeet Indian Reservation. Trout-perch were not reported in Montana until 1968 (Gould 1969), and the only Montana collection records are from Lower St. Mary Lake (Gould 1969; Brown 1971) and the associated St. Mary canal (Holton and Johnson 1996). Trout-perch have not been reported in other areas of the South Saskatchewan River basin in Montana, such as the Belly River and Waterton Lake, but they may occur there, as this basin has not been surveyed extensively (Brown 1971; L. Marnell, National Park Service, personal communication, 2000). Moreover, trout-perch are commonly collected in the Belly River and Waterton Lake systems in Alberta (T. Clayton, Alberta Environment, unpublished data, 2001). Trout-perch have also been captured in the Milk River in Alberta (T. Clayton, Alberta Environment, unpublished data, 2001). The Milk River basin is outside of the trout-perch's native range. Trout-perch apparently gained access to the Milk River basin via the St. Mary canal, which connects the St. Mary River system with the North Fork Milk River.

Habitat

In Montana, trout-perch are regularly captured in Lower St. Mary Lake and the St. Mary canal using backpack and boat electrofishing (R. Wagner, U.S. Fish and Wildlife Service, personal communication, 2000). In the lake they are associated with large rocky cover and are not captured over sandy or silty substrates. During daylight periods they appear to use rocks as hiding cover, while at night they are out of, but in close proximity, to rocky cover. In the St. Mary canal, trout-

perch have been captured in winter after the canal headgate is closed. In the canal, trout-perch are found in residual pools associated with large rocky cover or concrete riprap (R. Wagner, U.S. Fish and Wildlife Service, personal communication, 2000). Scott and Crossman (1973) report that trout-perch are typically a lake species in eastern Canada, but that they also occur in streams, including somewhat turbid streams, in western Canada. Trout-perch are reported to undergo diel migrations into shallower inshore waters of lakes at night (Brown 1971; Eddy and Underhill 1974; Becker 1983; Nelson and Paetz 1992).

Management

Montana Fish, Wildlife & Parks classify trout-perch as a nongame wildlife species. They are too small to be sought by anglers. The entire known range of trout-perch in Montana is within Glacier National Park and the Blackfeet Indian Reservation. Neither entity has a specific management program for trout-perch.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Sensitive to pollution and sedimentation associated with row crop agriculture, as well as channelization	Consider preparing a management plan for the trout-perch or include it into other comprehensive taxonomic plans
	Conservation of riparian areas, including increased restrictions on fertilizers and nutrients seeping into waters
Sensitive to warm water temperatures	Surveys in the Belly River and Waterton Lake in Montana are needed to establish the presence of trout-perch in these waters
Impoundments restricting proper movement of populations	Manage irrigation and development to improve connectivity of habitat

Management Plan

None

Citations

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press, Madison, WI.

Brown, C. J. D. 1971. Fishes of Montana. Big Sky Books. Montana State University, Bozeman, MT.

Eddy, S., and J. C. Underhill. 1974. Northern fishes. University of Minnesota Press, Minneapolis, MN.

Gould, W. R. 1969. First record of the trout-perch (*Percopsis omiscomaycus*) from Montana. Proceedings of the Montana Academy of Sciences 29:51.

Holton, G. D., and H. E. Johnson. 1996. A field guide to Montana fishes. Montana Fish, Wildlife & Parks, Helena, MT.

Nelson, J. S., and M. J. Paetz. 1992. The fishes of Alberta, 2nd ed. The University of Alberta Press, Edmonton, and the University of Calgary Press.

Pflieger, W. L. 1997. The fishes of Missouri. Missouri Department of Conservation, Jefferson City, MO.

Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Bulletin 184, Fisheries Research Board of Canada, Ottawa.

Burbot (*Lota lota*)

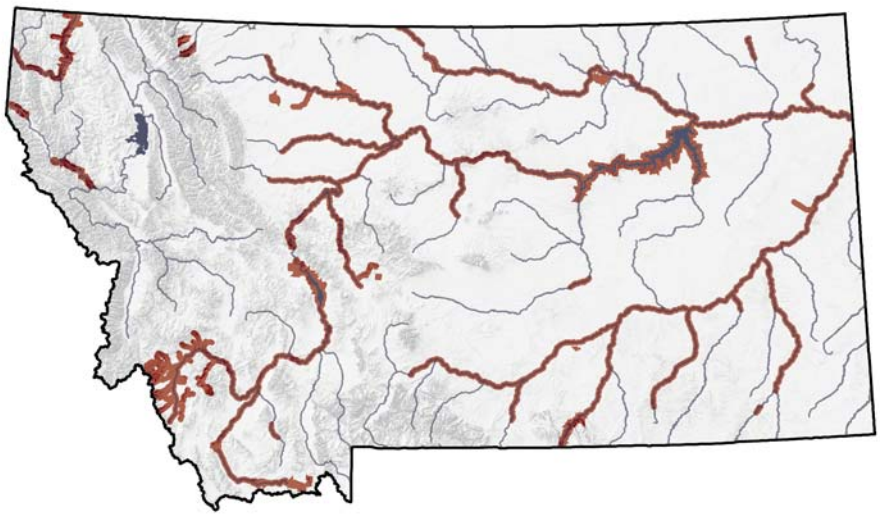


Figure 59. Distribution of the Burbot

Range

Burbot are found in all three major river drainages in Montana (Clark Fork, Missouri, and Yellowstone). Burbot, also known as ling, are usually found in larger streams and cold, deep lakes and reservoirs.

Habitat

Burbot habitat includes large rivers and cold, deep lakes and reservoirs. In lakes, they are mostly associated with bedrock and rubble substrates (Edsall et al. 1993). If soft substrates are present, burbot may construct burrows (Boyer et al. 1989). River requirements are less understood, but some believe they were originally restricted to backwater areas of cooler high-altitude systems (McPhail and Paragamian 2000).Their long cylindrical shape and poor swimming ability prevents them from inhabiting high current areas (Jones et al. 1974). Most spawning is believed to occur in lakes (Scott and Crossman 1973; McPhail and Paragamian 2000); however, reproduction may also occur in rivers and streams (Cahn 1936; Arndt and Hutchinson 2000; Paragamian 2000). They spawn in shallow water, usually in rocky areas.

Management

Burbot management was once poorly understood or nonexistent (McPhail and Paragamian 2000). However, with the completion of a new status paper (Jones-Wuellner and Guy 2004) and routine surveys in the Missouri River by Fish, Wildlife & Parks, we are beginning to have a better grasp on biological information for burbot. The burbot population in the Kootenai River below

Kootenai Falls is declining, and because of this, the burbot has been petitioned for listing as a federally endangered species. The decline in this population has been attributed to the operation of Libby Dam for hydroelectric power flood control. Similar declines in burbot populations have been seen in other states following dam construction.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Overharvest	Evaluate angler exploitation rates and determine sustainability of wild populations
Poorly understood life history traits and habitat requirements	Increased surveys to gain basic population characteristics (e.g., population sizes, age structure, and condition)
Reduced numbers in river systems due to impoundments	Work with managing authorities to encourage reservoir management to mimic a natural hydrograph

Management Plan

Jones-Wuellner, Melissa R. and Christopher S. Guy. 2004. Status of burbot in Montana. Prepared for Montana Fish, Wildlife & Parks. Montana Cooperative Fisheries Research Unit, Montana State University, Bozeman, MT.

Citations

Arndt, S. K. A., and J. Hutchinson. 2000. Characteristics of a tributary-spawning population of burbot from Columbia Lake, British Columbia. Pp. 48–60 in V. L. Paragamian and D. W. Willis, eds. Burbot: biology, ecology and management. American Fisheries Society, Fisheries Management Section, publication Number 1, Bethesda, MD.

Boyer, L. F., R. A. Cooper, D. T. Long, and T. M. Askew. 1989. Burbot (*Lota lota*) biogenic sedimentary structure in Lake Superior. Journal of Great Lakes Research 15:174–185.

Cahn, A. R. 1936. Observations on the breeding of the lawyer (*Lota lota maculosa*). Copeia 1936:163–165.

Edsall, T. A., G. W. Kennedy, and W. H. Horns. 1993. Distribution, abundance and resting microhabitat of burbot on Julian's Reef, southwestern Lake Michigan. Transactions of the American Fisheries Society 122:560–574.

McPhail, J. D., and V. L. Paragamian. 2000. Burbot biology and life history. Pp. 11–23 in V. L. Paragamian and D. W. Willis, eds. Burbot: biology, ecology and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda, MD.

Paragamian, V. L. 2000. The effects of varying flows on burbot spawning migrations in the Kootenai River, Idaho and British Columbia, Canada, after construction of the Libby Dam. Pp. 111–123 in V. L. Paragamian and D. W. Willis, eds. Burbot: biology, ecology and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda, MD.

Scott, W. B., and E. J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada Bulletin 184.

Sauger (*Sander canadensis*)

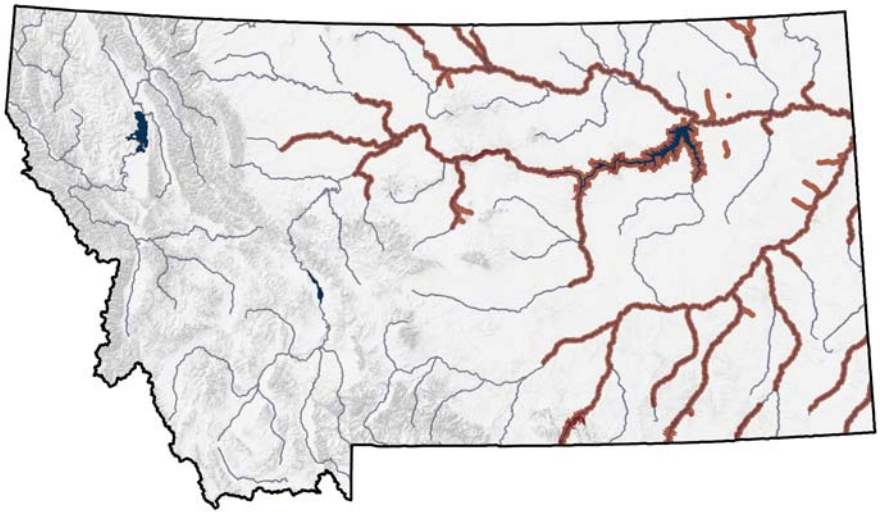


Figure 60. Distribution of the Sauger

Range

The sauger is one of the most widely distributed North American fishes, with a historical range extending across most of central and eastern North America from the St. Lawrence-Champlain system south, west of the Appalachian Mountains, to the Tennessee River in Alabama, and northwestward to central Montana and Alberta (Scott and Crossman 1973).

In Montana, historical distribution included the Missouri River and its major tributaries downstream of Great Falls and the Yellowstone River and its major tributaries downstream of the Clark Fork (McMahon and Gardner 2001). Current distribution in Montana has declined by 53 percent from historical levels with the largest losses occurring in tributaries (McMahon and Gardner 2001). Current distribution in the Missouri River drainage is confined to the primary stem of the Missouri and small parts of the previously widely occupied Marias, Musselshell, and Milk rivers (McMahon and Gardner 2001). Sauger are considered rare or absent in other major tributaries such as the Teton, Judith, and Poplar rivers (McMahon and Gardner 2001). In the primary stem of the Yellowstone River, distribution is now considered limited to downstream of Rosebud Creek; sauger are considered rare or absent in major tributaries such as the Big Horn and Tongue rivers, although a small, partially isolated population may persist in the upper Powder River (McMahon and Gardner 2001; B. Stewart, Wyoming Department of Game and Fish, Sheridan, WY, personal communication).

Habitat

Sauger typically occur in large turbid rivers and shallow turbid lakes (Becker 1983). Turbidity is an important delineator of suitable habitat for sauger. Physiological adaptations, such as a highly advanced light-gathering retina, allow sauger to thrive in low-light environments (Ali and Anctil 1977; Crance 1987). At cool water mesotherms, sauger have a fairly wide range of thermal tolerance with occupied temperatures ranging from 1 to 30 degrees C and a physiological optimum of 18 to 24 degrees C (Crance 1987; Carlander 1997).

Sauger are heavily dependent throughout their life histories on unimpeded access to the wide diversity of physical habitats that are present in large river systems. They are considered to be the most migratory percid (Collette 1977). Their migratory behavior, which is primarily related to spawning, is well documented throughout their range with annual movements of up to 600 kilometers between spawning and rearing habitats (Nelson 1968; Collette et al. 1977; Penkal 1992; Pegg et al. 1997; M. E. Jaeger, Montana State University, unpublished data). Sauger are highly selective for spawning sites and commonly travel long distances to aggregate in a relatively few discrete areas to spawn (Nelson 1968; Nelson 1969; Gardner and Stewart 1987; Penkal 1992). Although primary stem spawning does occur (Jeager 2004), it has been suggested that sauger populations are strongly reliant on access to large tributaries for spawning (Nelson 1968; Gardner and Stewart 1987; Penkal 1992; Hesse 1994; McMahon 1999). Spawning locations are associated with unique geomorphic features, such as bluff pools and bedrock reefs, and rocky substrates over which sauger broadcast their eggs (Nelson 1968; Gardner and Stewart 1987; Hesse 1994; Jeager 2004). During a 10- to 12-day period following emergence, it is thought that larval sauger drift long distances downstream—up to 300 kilometers—prior to gaining the ability to maneuver horizontally and begin feeding (Nelson 1968; Penkal 1992; McMahon 1999). Juveniles rear in side channels, backwaters, oxbows, and other off-channel habitats during spring and summer before shifting to primary channel habitats in autumn (Gardner and Berg 1980; Gardner and Stewart 1987; Hesse 1994). Adult sauger also use off-channel and channel-margin habitats during the spring and early summer periods of high flow and turbidity, and then move to deeper primary channel habitats in late summer and autumn as decreasing flows and turbidities cause suitable off-channel habitats to become unavailable (Hesse 1994; M. E. Jaeger 2004).

Management

Montana boasts some of the most pristine large-river habitat in the United States. To promote the conservation and recovery of sauger to acceptable levels, an interagency agreement is being completed at this time by Fish, Wildlife & Parks to sustain and advance suager populations.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Water withdrawals resulting in low river flows	Minimize the diversion of water from river channels and limit processes such as channelization and streambank armoring that result in loss of important off-channel habitats
Reservoir operation that alters the natural hydrograph	Flow releases from dams can be regulated throughout the year to maximize spawning success and year-class strength of sauger (Nelson 1968; Walburg 1972)
	Preservation of natural hydrographs, natural processes of channel formation, and high degrees of connectivity where sauger currently exist
Barriers that negatively influence spawning movement patterns and larval drift	Removal of primary stem and tributary impoundments
	Improved passage at several irrigation-related migratory barriers
Channelization and loss of side channel habitat for larval and juvenile sauger	Install fish screens and return structures to minimize entrapment of fish in irrigation canals
Hybridization with walleye	Continue surveying and monitoring of species
Negative interactions with other species such as walleye and smallmouth bass	Research to better understand interaction between sauger and exotic species
Overexploitation	Increase angler harvest limits in certain areas

Management Plan

Montana Department of Fish, Wildlife & Parks. 2004. Memorandum of Understanding and Conservation Agreement for Sauger (*Sander canadensis*) in Montana. 23 pp. Draft (in progress).

Citations

Ali, M. A., and M. Anctil. 1977. Retinal structure and function in the walleye (*Stizostedion vitreum vitreum*) and sauger (*S. canadense*). Journal of the Fisheries Research Board of Canada 34:1467–1474.

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press, Madison, WI.

Carlander, K. D. 1997. Handbook of freshwater fishery biology, vol. 3: life history data on ichthyopercid and percid fishes of the United States and Canada. Iowa State University Press, Ames, IA.

Collette, B. B., and 7 co-authors. 1977. Biology of the percids. Journal of the Fisheries Research Board of Canada 34:1890–1899.

Crance, J. H. 1987. Preliminary habitat suitability curves for sauger. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 41:159–167.

Gardner, W. M., and P. A. Stewart. 1997. The fishery of the lower Missouri River, Montana. Montana Department of Fish, Wildlife & Parks report, FW-2-R.

Gardner, W. M., and R. K. Berg. 1980. An analysis of the instream flow requirements for selected fishes in the Wild and Scenic portion of the Missouri River. Montana Fish, Wildlife & Parks report, Great Falls, MT.

Hesse, L. W. 1994. The status of Nebraska fishes in the Missouri River. 6. Sauger (Percidae: *Stizostedion canadense*). Transactions of the Nebraska Academy of Sciences 21:109–121.

Jaeger, M. E. 2004. An empirical assessment of factors precluding recovery of sauger in the Lower Yellowstone River: movement, habitat use, exploitation and entrainment. Master's thesis, Montana State University, Bozeman, MT.

Leach, J. H., and 5 co-authors. 1977. Responses of percids and their habitats to eutophication. Journal of the Fisheries Research Board of Canada 34:1964–1971.

McMahon, T. E., and W. M. Gardner. 2001. Status of sauger in Montana. Intermountain Journal of Sciences 7:1–21

McMahon, T. E. 1999. Status of sauger in Montana. Montana Fish, Wildlife & Parks report, Helena, MT.

Nelson, W. R., and C. H. Walburg. 1977. Population dynamics of yellow perch (*Perca flavescens*), sauger (*Stizostedion candense*), and walleye (*S. vitreum vitreum*) in four Missouri River reservoirs. Journal of the Fisheries Research Board of Canada 34:1748–1763.

Nelson, W. R. 1968. Reproduction and early life history of sauger (*Stizostedion canadense*) in Lewis and Clark Lake. Transactions of the American Fisheries Society 97:159–166.

Pegg, M. A., P. W. Bettoli, and J. B. Layzer. 1997. Movement of sauger in the lower Tennessee River determined by radio telemetry, and implications for management. North American Journal of Fisheries Management 17:763–768.

Penkal, R. F. 1992. Assessment and requirements of sauger and walleye populations in the Lower Yellowstone River and its tributaries. Montana Department of Fish, Wildlife & Parks report, Helena, MT.

Rawson, M. R., and R. L. Scholl. 1978. Reestablishment of sauger in western Lake Erie. Pp. 261–265 in R. L. Kendall, ed. Selected cool water fishes of North America. American Fisheries Society Special Publication 11. Bethesda, MD.

Scott W. B., and E. J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada Bulletin 184.

Walburg C. H. 1972. Some factors associated with fluctuation in year-class strength of sauger, Lewis and Clark Lake, South Dakota. Transactions of the American Fisheries Society 101:311–316.

Amphibians

Coeur d' Alene Salamander (*Plethodon idahoensis*)

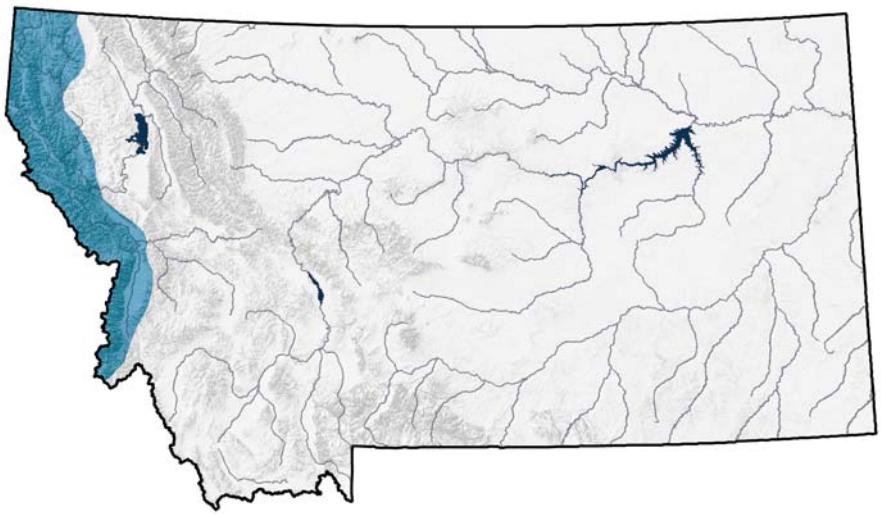


Figure 61. Distribution of the Coeur d' Alene Salamander

Range

The Coeur d' Alene salamander is a regional endemic for which Montana is the eastern limit in distribution. In Montana, the Coeur d' Alene salamander is known from about 45 locations in five northwestern counties: Lincoln, Sanders, Mineral, Missoula, and Ravalli. The southern limit of known distribution is Lake Como Falls in the Bitterroot River drainage (Maxell 2002), and the northernmost population is along the South Fork of the Yaak River (Wilson and Simon 1987; Maxell et al. 2003). Maximum known elevation is 5,200 feet (1,585 meters).

The Coeur d' Alene salamander has been the subject of taxonomic controversy nearly since its initial discovery. First classified as a new species (Slater and Slipp 1940), it was later reclassified (Lowe 1950) as a subspecies of the Van Dyke salamander (*Plethodon vandykei idahoensis*) found in western Washington. Whether considered a species or a subspecies, the Coeur d' Alene salamander represents a unique genetic resource in Idaho, Montana, and British Columbia and should be managed as such (Howard 1993). The Coeur d' Alene salamander has a small range in northern Idaho, western Montana, and southeastern British Columbia. It is found in close association with water in springs or seeps, spray zones of waterfalls, and edges of streams and feeds on aquatic and terrestrial insects. Coeur d' Alene salamanders tend to have small home ranges, are strongly philopatric, and show no tendency to disperse away from home ranges when disturbed (Petranka et al. 1993).

The Coeur d' Alene salamander is rare and local, distributed in suitable habitat (Werner and Reichel 1994), and in Montana is reported in Lincoln, Sanders, Mineral, Missoula, and Ravalli counties. The core of distribution and area of greatest density of known locations is in the northern Idaho drainages of the St. Joe, North Fork Clearwater, and Coeur d' Alene rivers in Idaho (Groves 1989), but the distribution of the species does extend northward along the Moyie River drainage into British Columbia, Canada (Wilson et al. 1989).

Habitat

The habitat for Coeur d' Alene salamanders includes the three major habitat categories: springs and seeps, waterfall spray zones, and stream edges (Wilson and Larsen 1988; Werner and Reichel 1994; Boundy 2001; Maxell 2002). Specific primary habitats are seeps and streamside talus, but they also inhabit talus far from free water (deep talus mixed with moist soil on well-shaded north-facing slopes). Coeur d' Alene salamander occurrences are generally located in coniferous forests, but are not restricted to a particular overstory species or aspect. In wet weather, they also occur in leaf litter and under bark and logs in coniferous forests.

All plethodontid salamanders respire through their skin; terrestrial species lose water to the environment through evaporation and are therefore restricted to cool, damp environments. Coeur d' Alene salamanders are closely tied to water and are considered among the most aquatic plethodontids (Brodie and Storm 1970). Because they may live in the harshest climate of any northwestern plethodontid (Nussbaum et al. 1983), they are highly dependent on the thermal and hydrologic stability provided by wet habitats in otherwise inhospitable surroundings.

Sites occupied by Coeur d' Alene salamanders in Montana have fractured rock formations present, and nearby habitats are typically forested (Reichel and Flath 1995). Foraging areas include seepage areas and splash zones with high humidity, high substrate moisture, and relatively high temperatures (Wilson and Larsen 1988). Shelter is provided by deep bedrock fractures or in talus habitat (Wilson and Larsen 1988). Montana populations are found primarily in talus areas along splash zones of creeks, or with seeps running through (Teberg 1963, 1965; Wilson and Larsen 1988). Idaho and Montana populations breed in both spring and fall, although most eggs usually are laid in the spring. Eggs are laid in moist, concealed places on land (Stebbins 1985) far down in the rocks (Werner and Reichel 1994).

Management

Potential threats for the species across its global range also apply to Montana populations, but population declines or extinctions have not yet been documented here. Some populations continue to be vulnerable to highway

construction activity, and most populations occur at elevations and in forest types where timber harvest is a common activity. Routine monitoring (Groves et al. 1996) of known populations should be conducted to identify threats to each, as well as to determine their continued viability.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Disturbances, such as timber harvest, fire, road and trail construction, and water diversion projects	Fence known salamander sites to exclude livestock
Pollution	Regulate chemical application (herbicides, pesticides, fertilizers, etc.) within 300 feet of water bodies or wetlands
Introduction of exotic species	Avoid road construction within 300 feet of known salamander sites and avoid stocking non-native fish in nearby waters
Restricted mobility coupled with increasing habitat fragmentation make the Coeur d' Alene salamander susceptible to local extirpation	Habitat protection and conservation through regulation of development, logging, and chemical applications
	Surveys of potential habitats for the Coeur d' Alene salamander
Disease and parasites	To prevent spread of chytrid fungus, personnel working in either lentic or lotic systems should thoroughly rinse and decontaminate all equipment as described in Maxell et al. (2004)
Global climate change	Conduct monitoring program to establish long-term trends of abundance and distribution of populations

Management Plan

Maxell, Bryce A. 2000. Management of Montana's amphibians: a review of factors that may present a risk to population viability and accounts on the identification, distribution, taxonomy, habitat use, natural history, and the status and conservation of individual species. Contract No. 43-0343-0-0224. September 20, 2000.

Citations

Brodie, E. D., Jr., and R. M. Storm. 1970. *Plethodon vandykei*. Cat. Am. Amph. Rep. 91.1–91.2.

Cassirer, E. F., C. R. Groves, and D. L. Genter. 1993. Sensitive species management guide for the Coeur d' Alene salamander. Idaho Department of Fish and Game, Boise, ID, and the Montana Natural Heritage Program, Helena, MT.
Cassirer, E. F., C. R. Groves, and D. L. Genter. 1994. Coeur d' Alene salamander conservation assessment. U.S.D.A. Forest Service, Region 1, Missoula, MT. 55 pp.

Groves, C. R., E. F. Cassirer, D. L. Genter, and J. D. Reichel. 1996. Coeur d' Alene Salamander (*plethodon idahoensis*). Natural Areas Journal 16(3):238–247.

Groves, C. R., and C. Peterson. 1992. Distribution and population trends of Idaho amphibians as determined by mail questionnaire. Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Groves, C. 1988, 1989. Status and distribution of the Coeur d' Alene salamander *(Plethodon vandykei idahoensis)* in Idaho–part II. Unpublished report. Idaho Department of Fish and Game, Boise, ID.

Howard, J. 1993. Genetic variation and population divergence in the *Plethodon vandykei* species group. Herpetologica 49:238–247.

Lowe, C. H., Jr. 1950. The systematic status of the salamander *Plethodon hardii* with a discussion of problems in Aneides. Copeia 1950:92–99.

Maxell, B. A., G. Hokit, J. Miller, and K. Werner. 2004 (unpublished). Detection of *Batrachochytrium dendrobatidis*, the chytrid fungus associated with global amphibian declines, in Montana amphibians. Unpublished mimeo. University of Montana, Missoula, MT.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Maxell, B. A. 2002. (Database file of herpetological observations from 2001.)

Maxell, B. A. 2002. Geographic Distribution. *Plethodon idahoensis*. Herpetological Review 33(2):144.

Montana Natural Heritage Program. 1987. Status report on the Coeur d' Alene salamander (*Plethodon idahoensis*) in Montana. Unpublished mimeo. U.S.D.A. Forest Service, Kootenai National Forest and Lolo National Forest, Libby, MT.

Montana Natural Heritage Program. http://MNHP.nris.state.mt.us/animalguide (accessed April 26, 2004).

NatureServe. 2004. NatureServe explorer. An online encyclopedia of life. Version 3.0. NatureServe, Arlington, VA. http://www.natureserve.org/explorer (accessed April 22, 2004).
Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University Press of Idaho. 332 pp.

Partners in Amphibian and Reptile Conservation. 1999. Conference, Conserving Amphibians and Reptiles in the New Millennium, June 2–4, 1999; Atlanta, GA. http://www.parcplace.org (accessed May 20, 2004).

Petranka, J. W., Eldridge, M. E., and K. E. Haley. 1993. Effects of timber harvesting on southern Appalachian salamanders. Conservation Biology 7:363–370.

Reichel, J. D., and D. Flath. 1995. Identification of Montana's amphibians and reptiles. Montana Outdoors 26:15–34.

Slater, J. R., and J. W. Slipp. 1940. A new species of *Plethodon* from northern Idaho. Occasional Papers of Biology. College of the Puget Sound 8:38–43.

Stebbins, R. C. 1985. Peterson Field Guides: Western Reptiles and Amphibians. Houghton Mifflin Company, Boston, MA.

Teberg, E. K. 1965. Range extensions of the salamander *Plethedon vandykei idahoensis*. Copeia 1965:244.

Teberg, E. K. 1963. An extension into Montana of the known range of the salamander *Plethodon vandykei idahoensis*. Herpetologica 19:287.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Werner, J. K., and J. D. Reichel. 1996. Amphibian and reptile monitoring/survey of the Kootenai National Forest: 1995. Montana Natural Heritage Program, Helena, MT.

Werner, J. K., and J. D. Reichel. 1994. Amphibian and reptile survey of the Kootenai National Forest: 1994. Montana Natural Heritage Program, Helena, MT. 105 pp.

Wilson, A. G., E. Simon, and J. H. Larsen, Jr. 1989. Range extension for the Coeur d' Alene salamander (*Plethodon vandykei idahoensis*) to the Canada-U.S. border. Canadian Field-Naturalist 103:93–94.

Western Toad (*Bufo boreas*)

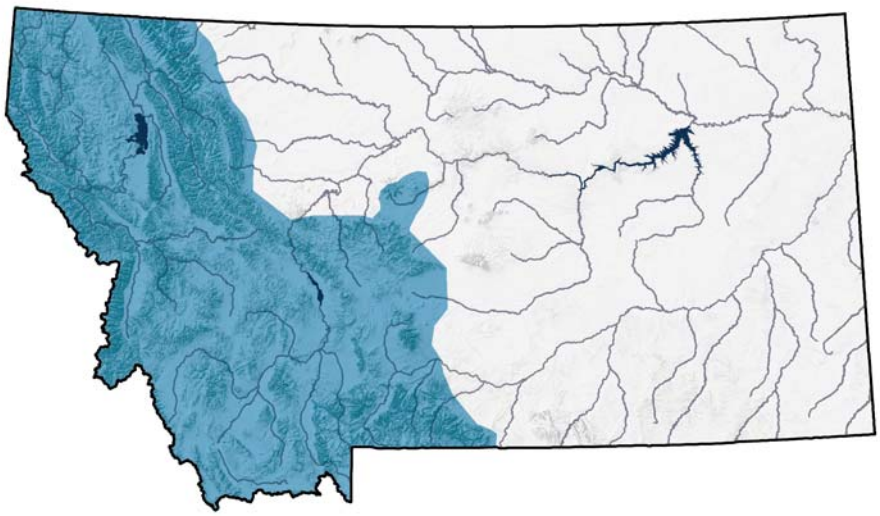


Figure 62. Distribution of the Western Toad

Range

The western toad is found throughout the mountains and intermountain valleys of the western third of the state on both sides of the Continental Divide (Maxell et al. 2003). Specimens have been collected in 22 western counties and sighted in 5 more, at elevations up to 9,220 feet (2,810 meters).

Habitat

Habitats used by western toads in Montana are similar to those reported for other regions and range from low-elevation beaver ponds, reservoirs, streams, marshes, lake shores, potholes, wet meadows, and marshes to high-elevation ponds, fens, and tarns at or near tree line (Rodgers and Jellison 1942; Brunson and Demaree 1951; Miller 1978; Marnell 1997; Werner et al. 1998; Boundy 2001). Forest cover in or near encounter sites is often unreported, but toads have been noted in open-canopy ponderosa pine woodlands and closed-canopy dry conifer forests in Sanders County (Boundy 2001), willow wetland thickets and aspen stands bordering Engelmann spruce stands in Beaverhead County (Jean et al. 2002), and mixed ponderosa pine/cottonwood/willow sites or Douglas-fir/ponderosa pine forests in Ravalli and Missoula counties (P. Hendricks, personal observation).

Elsewhere the western toad is known to utilize a wide variety of habitats, including desert springs and streams, meadows and woodlands, mountain wetlands, beaver ponds, marshes, ditches, and backwater channels of rivers where they prefer shallow areas with mud bottoms (Nussbaum et al. 1983; Baxter and Stone 1985; Russell and Bauer 1993; Koch and Peterson 1995;

Hammerson 1999). Forest cover around occupied montane wetlands may include aspen, Douglas-fir, lodgepole pine, Engelmann spruce, and subalpine fir; in local situations western toads may also be found in ponderosa pine forest. They also occur in urban settings, sometimes congregating under streetlights at night to feed on insects (Hammerson 1999; P. Hendricks, personal observation). Normally they remain fairly close to ponds, lakes, reservoirs, and slow-moving rivers and streams during the day, but may range widely at night. Eggs and larvae develop in still, shallow areas of ponds, lakes, or reservoirs or in pools of slow-moving streams, often where there is sparse emergent vegetation. Adult and juvenile western toads dig burrows in loose soil, use burrows of small mammals, or occupy shallow shelters under logs or rocks. At least some toads overwinter in terrestrial burrows or cavities, apparently where conditions prevent freezing (Nussbaum et al. 1983; Koch and Peterson 1995; Hammerson 1999).

Management

In previous decades the western toad was considered the most abundant amphibian of the western third of the state (Rodgers and Jellison 1942; Brunson 1952; Maxell 2003), and although still encountered widely and frequently though by no means commonly, it is no longer ranked as the most abundant amphibian. Numerous surveys since the early 1990s indicate that this species has experienced regional population declines in the state. Western toads were documented to breed at only 2 to 5 percent of more than 2,000 standing water bodies surveyed since 1997, and where breeding was documented, fewer than ten breeding females contributed in a given year (Maxell 2000; Maxell et al. 2003). Range-wide declines in this species have been indicated in Montana as well as in other western states.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Breeding site destruction	Reduce access by livestock to known breeding sites within grazing allotments, which will prevent undue trampling mortality (Bartelt 1998)
	Protect certain wetlands occupied by western toads from introduced species and human disturbance
	Survey road ditches for tadpoles before any blading of ditches in June/July
	Survey wetlands suitable for western toads

Diseases such as red-leg disease and chytrid fungus	To prevent spread of chytrid fungus, personnel working in either lentic or lotic systems should thoroughly rinse and decontaminate all equipment as described in Maxell et al. (2004)
Use of chemicals and fertilizers	Avoid use of pesticides, fertilizers, and herbicides near known breeding areas
Increased predation by species attracted to human disturbance	Avoid stocking of predatory game fish at sites lacking them

Management Plan

Maxell, Bryce A. 2000. Management of Montana's amphibians: a review of factors that may present a risk to population viability and accounts on the identification, distribution, taxonomy, habitat use, natural history and the status and conservation of individual species. Contract No. 43-0343-0-0224. September 20, 2000.

Citations

Bartelt, P. E. 1998. Western toad (*Bufo boreas*). Mortality. Herpetological Review 29:96.

Baxter, G. T., and M. D. Stone. 1985. Amphibians and reptiles of Wyoming. 2nd ed. Wyoming Game and Fish Department, Cheyenne, WY.

Boundy, J. 2001. Herpetofaunal surveys in the Clark Fork Valley region, Montana. Herpetological Natural History 8:15–26.

Brunson, R. B. 1952. Recent collections of *Bufo boreas* from western Montana. Proceedings of the Montana Academy of Sciences 11:17–19.

Brunson, R. B., and H. A. Demaree. 1951. The herpetology of the Mission Mountains, Montana. Copeia 1951:306–308.

Hammerson, G. A. 1999. Amphibians and reptiles in Colorado. 2nd ed. University Press of Colorado, Boulder, CO. 484 pp + xxvi.

Jean, C., P. Hendricks, M. Jones, S. Cooper, and J. Carlson. 2002. Ecological communities on the Red Rock Lakes National Wildlife Refuge: inventory and review of aspen and wetland systems. Report to the Red Rock Lakes National Wildlife Refuge, MT

Jones, M. S., J. P. Goettl, and L. J. Livo. 1999. Western toad (*Bufo boreas*). Predation. Herpetological Review 30:91

Koch, E. D., and C. R. Peterson. 1995. Amphibians and reptiles of Yellowstone and Grand Teton national parks. University of Utah Press, Salt Lake City, UT. 188 pp + xviii.

Marnell, L. F. 1997. Herpetofauna of Glacier National Park. Northwest Naturalist, 78:17–33.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Maxell, B. A., K. J. Nelson, and S. Browder. 2002. Record clutch size and observations on breeding and development of the western toad (*Bufo boreas*) in Montana. Northwestern Naturalist 83:27–30.

Miller, J. D. 1978. Observations on the diet of *Rana pretiosa, Rana pipiens,* and *Bufo boreas* from western Montana. Northwestern Science 52:243–249.

Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and Reptiles of the Pacific Northwest. University Press of Idaho. 332 pp.

Rodgers, T. L., and W. L. Jellison. 1942. A collection of amphibians and reptiles from western Montana. Copeia 1942:10–13.

Russell, A. P., and A. M. Bauer. 1993. The amphibians and reptiles of Alberta. University of Calgary Press, Calgary, Alberta, and University of Alberta Press, Edmonton, Alberta. 264 pp.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Werner, J. K., T. Plummer, and J. Weaselhead. 1998. Amphibians and reptiles of the Flathead Indian Reservation. Intermountain Journal of Science 4:33–49.

Northern Leopard Frog (*Rana pipiens*)

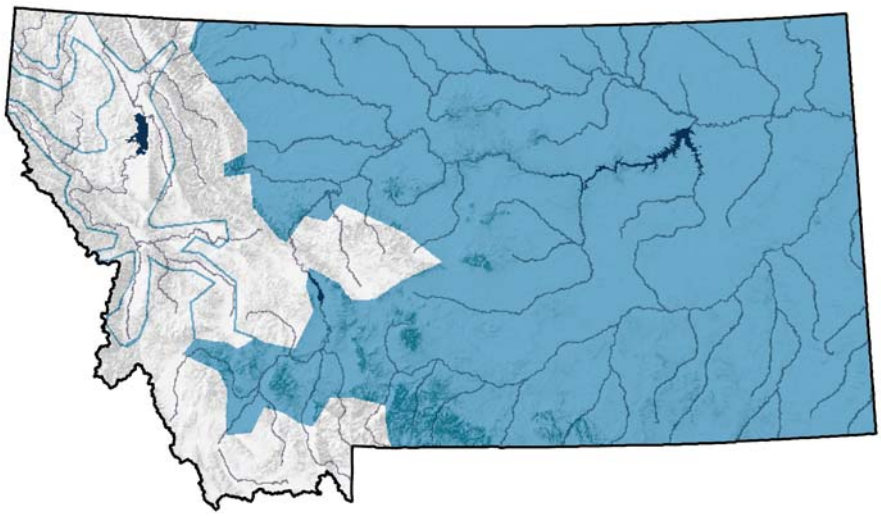


Figure 63. Distribution of the Northern Leopard Frog

Range

The northern leopard frog is found across the prairie regions of the eastern two-thirds of Montana east of the Continental Divide (Maxell et al. 2004; Werner et al. 2004). It was historically dispersed throughout intermountain valleys west of the Continental Divide, especially in the Flathead and lower Clark Fork river drainages, but in recent years has been documented as isolated populations in only two western sites (Werner 2003; Johnson 2005): near Kalispell (Flathead County) and Eureka (Lincoln County).This frog has been documented in all but seven Montana counties (six of which are west of the Continental Divide), at elevations up to 6,700 feet (2,042 meters).

The northern leopard frog's historical distribution is irregular but includes western Montana except in the Big Hole area, as well as the tip of the Idaho Panhandle and southeast and parts of southwest Idaho (Stebbins 1985). Recent extirpations are reported in all of western Montana and across much of the neighboring states (Werner and Reichel 1994; Reichel and Flath 1995).

Habitat

Habitats used by northern leopard frogs in Montana include low-elevation and valley bottom ponds, spillway ponds, beaver ponds, stock reservoirs, lakes, creeks, pools in intermittent streams, warmwater springs, potholes, and marshes (Brunson and Demaree 1951; Mosimann and Rabb 1952; Black 1969; Miller 1978; Dood 1980; Reichel 1995; Hendricks and Reichel 1996; Hendricks 1999). Northern leopard frogs require a mosaic of habitats to meet annual requirements of all life stages. They occupy a variety of wetland habitats of relatively fresh

water with moderate salinity, including springs, slow streams, marshes, bogs, ponds, canals, floodplains, beaver ponds, reservoirs, and lakes, usually in permanent water with rooted aquatic vegetation. Adults and juveniles commonly feed in open or semi-open wet meadows and fields with shorter vegetation, usually near the margins of water bodies where there is permanent water and growth of cattails or other aquatic vegetation, yet they may forage far from water in damp meadows (Stebbins 1985). They seek cover underwater and seem to avoid denser vegetation.

Northern leopard frogs have a large range throughout much of the United States and southern Canada (NatureServe 2004) and are still common in many areas and in a wide array of pristine and disturbed habitats (NatureServe 2004). NatureServe (2004) lists the northern leopard frog in 35 states in the United States and 12 Canadian provinces. In Montana the northern leopard frog is found primarily in riparian habitat but is not as restricted to water as other *Rana* species (Black 1969; Miller 1978). This species is abundant on plains near permanent water (Black 1969; Mosimann and Rabb 1952), tends to avoid tall, dense grass areas (Miller 1978), and prefers densely vegetated areas such as wet sedge meadows or cattail marshes (Reichel and Flath 1995; Werner and Reichel 1994).

Management

No special management needs are currently recognized for populations in eastern Montana; however, in western Montana, monitoring and reintroduction programs are occurring. Any populations discovered in the western region should be reported to the native species biologist of the Montana Department of Fish, Wildlife & Parks or the program zoologist of the Montana Natural Heritage Program.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Northern Leopard Frog range has nearly vanished on western side of Continental Divide in Montana	Protect the two remaining breeding populations west of the Continental Divide in Montana
	Survey western Montana to locate additional populations
	Monitor historical breeding sites and populations
Loss of wetlands and hydrological regimes	Habitat conservation and improvement projects
	Protect breeding sites from livestock impacts

Introduction of game fish, mosquitofish, and bullfrogs	Allow no introduction of game fish or bullfrogs into waters with known breeding sites
Contamination by pesticides and herbicides	Protect breeding sites from organic and chemical (pesticide and herbicide) contamination
Pathogens, including chytrid fugus (Batrachochytrium dendrobatidis)	To prevent spread of chytrid fungus, personnel working in either lentic or lotic systems should thoroughly rinse and decontaminate all equipment as described in Maxell et al. 2004 (unpublished)
Global change (climatic and atmospheric changes such as increased UV-B radiation, pollution, acid rain, and disease)	Conduct monitoring program to establish long-term trends of abundance and distribution of populations
Unsustainable use and illegal collecting	Increase education and information on amphibian biology and awareness of the importance of breeding sites

Management Plan

Maxell, Bryce A., 2000, Management of Montana's amphibians: a review of factors that may present a risk to population viability and accounts on the identification, distribution, taxonomy, habitat use, natural history and the status and conservation of individual species. Contract No. 43-0343-0-0224. September 20, 2000.

Citations

Black, J. H. 1969. The frog genus *Rana* in Montana. Northwest Science. 43:191–195.

Brunson, R. B., and H. A. Demaree. 1951. The herpetology of the Mission Mountains, Montana. Copeia 1951:306–308.

Dood, A. R. 1980. Terry badlands nongame survey and inventory: final report. BLM Contract #YA-512-CT8-217. Montana Deptartment of Fish, Wildlife & Parks. 70 pp.

Hendricks, Paul. 1999. Amphibian and reptile surveys on Montana refuges: 1998–1999. December 1999.

Johnson, Wayne. 2005. Observations of northern leopard frog in Kootenai National Forest. Personal communication.

Maxell, B.A., G. Hokit, J. Miller, and K. Werner. 2004 (unpublished). Detection of *Batrachochytrium dendrobatidis*, the chytrid fungus associated with global amphibian declines, in Montana amphibians. Unpublished memo. University of Montana, Missoula, MT.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Miller, J. D. 1978. Observations on the diet of *Rana pretiosa, Rana pipiens,* and *Bufo boreas* from western Montana. Northwestern Science 52:243–249.

Montana Natural Heritage Program. Montana field guide. Northern leopard frog. Online database. http://fwp.state.mt.us/fieldguide (accessed November 19, 2003).

Mosimann, J. E., and G. B. Rabb. 1952. The herpetology of Tiber Reservoir Area, Montana. Copeia 1952:23–27.

NatureServe. 2004. NatureServe explorer. An online encyclopedia of life. Version 3.0. NatureServe, Arlington, VA. http://www.natureserve.org/explorer (accessed April 22, 2004).

Partners in Amphibian and Reptile Conservation. 1999. Conference, Conserving Amphibians and Reptiles in the New Millennium, June 2–4, 1999, Atlanta, GA. http//www.parcplace.org (accessed May 20, 2004).

Reichel, James D. 1995. Preliminary amphibian and reptile survey of the Lewis and Clark National Forest: 1994. March 1995.

Stebbins, R. C. 1985. Peterson Field Guides: Western Reptiles and Amphibians. Houghton Mifflin, Boston, MA.

Werner, J. K., B. A. Maxell, D. Flath, and D.P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Werner, J. K. 2003. Status of the northern leopard frog (*Rana pipiens*) in western Montana. Northwestern Naturalist 84:24–30.

Werner, J. K., and J. D. Reichel. 1994. Amphibian and reptile monitoring/survey of the Kootenai National Forest: 1995. Montana Natural Heritage Program, Helena, MT.

Reptiles

Snapping Turtle (*Chelydra serpentina*)

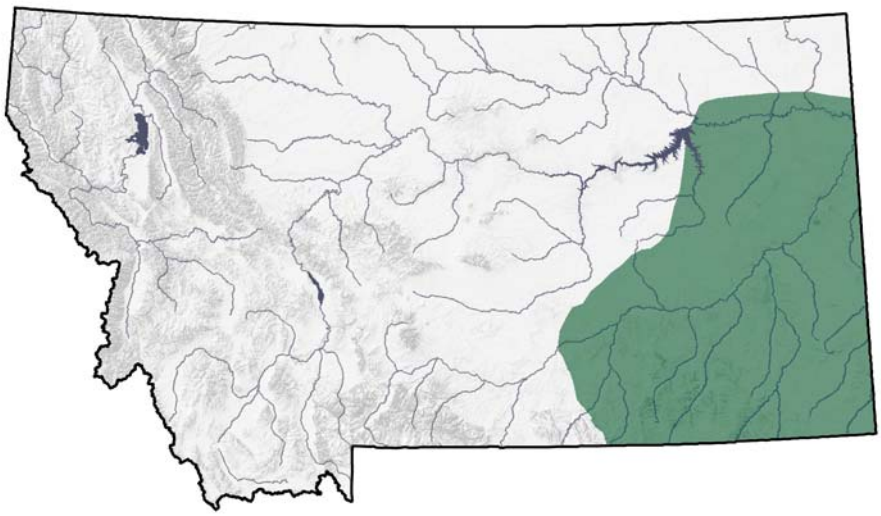


Figure 64. Distribution of the Snapping Turtle

Range

Voucher specimens of snapping turtles have been collected in three eastern counties (Carter, Powder River, and Rosebud), with visual observations in seven additional counties (Big Horn, Custer, Dawson, Wibaux, Richland, Roosevelt, and Yellowstone), at elevations up to 3,800 feet (1,158 meters). Although there are no records of breeding populations on the Missouri River, several reliable sightings, including one on the Redwater River, may indicate existing populations (Werner et al. 2004). Snapping turtles have probably been introduced in several localities (there are unconfirmed reports from Gallatin, Ravalli, and Sanders counties); confirmed records from Flathead and Lake counties represent introductions.

Habitat

Habitat use by snapping turtles in Montana is probably similar to elsewhere in the range, but studies are lacking and there is little qualitative information available. They have been captured or observed in backwaters along major rivers, at smaller reservoirs, and in smaller streams and creeks with permanent flowing water and sandy or muddy bottoms (Reichel 1995; Hendricks and Reichel 1996; P. Hendricks, personal observation). Nesting habitat and nest sites have not been described.

Elsewhere, snapping turtles occur in all types of shallow freshwater habitats, such as streams, rivers, reservoirs, and ponds, especially those with a soft mud

bottom and abundant aquatic vegetation or submerged brush and logs (Hammerson 1999), and in brackish water in some areas. Although found most often in shallower water, they have been reported on the bottom of lakes in water up to 10 meters deep. Temporary ponds also may be occupied. Hatchlings and juveniles tend to occupy shallower sites than mature individuals in the same water bodies. Snapping turtles are mostly bottom dwellers, which is where they spend much of their time. Although highly aquatic, they may make long movements overland if their pond or marsh dries (Baxter and Stone 1985; Ernest et al. 1994; Hammerson 1999). They hibernate singly or in groups in streams, lakes, ponds, or marshes; in bottom mud, in or under submerged logs or debris, under an overhanging bank, or in muskrat tunnels; often in shallow water; sometimes in anoxic sites (Brown and Brooks 1994). Sometimes snapping turtles bask out of water, especially younger individuals and in the northern extremes of the global range.

Nests are built in soft sand, loam, vegetation debris, or even sawdust piles, most often in open areas and often 100 meters or more from water (Congdon et al. 1987; Ernst et al. 1994; Hammerson 1999). They also nest in beaver and muskrat lodges.

Management

Montana populations of the snapping turtle are poorly understood, making management more difficult. It is possible that even moderate harvest of adults by anglers in most localities will result in population declines, similar to Colorado (Hammerson 1999), because the life history of this species indicates recruitment of juveniles into breeding populations is low, and population densities in western states is probably low.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Biological information lacking in Montana	Consider preparing a management plan for the snapping turtle or include it into other comprehensive taxonomic plans
	Meticulous tracking of observations and biological information
	Conduct surveys of suitable habitat that are designed to detect the species
Habitat loss and degradation, including barriers that hamper movement of snapping turtles	Conservation of major river systems in Montana
Nest destruction and predation	Conservation of nest areas
Human harvest of long-lived adults	Review harvests limits

Management Plan

None

Citations

Baxter, G. T., and M. D. Stone. 1985. Amphibians and reptiles of Wyoming. 2nd ed. Wyoming Game and Fish Department, Cheyenne, WY.

Brown, G. P., and R. J. Brooks. 1994. Characteristics of and fidelity to hibernacula in a northern population of snapping turtles (*Chelydra serpentine*). Copeia 1994:222–226.

Congdon, J. D., et al. 1987. Reproduction and nesting ecology of snapping turtles (*Chelydra serpentina*) in southeastern Michigan. Herpetologica 43:39–54.

Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, DC. 578 pp.

Hammerson, G. A. 1999. Amphibians and reptiles in Colorado. 2nd ed. University Press of Colorado, Boulder, CO. 484 pp + xxvi.

Hendricks, P., and J. D. Reichel. 1996. Preliminary amphibian and reptile survey of the Ashland District, Custer National Forest: 1995. Montana Natural Heritage Program. Helena, MT. 79 pp.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Reichel, J. D. 1995. Montana Species of Special Concern. Montana Natural Heritage Program, Helena, MT. 10 pp.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Spiny Softshell (*Apalone spinifera*)

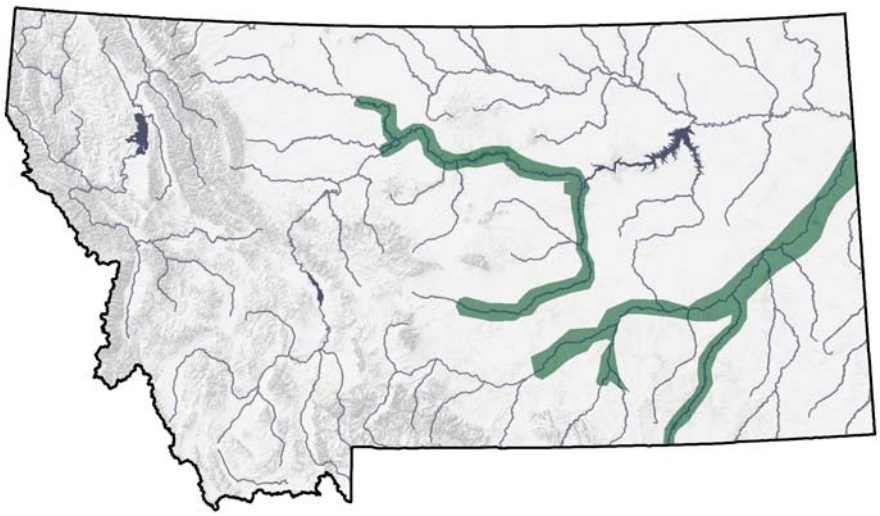


Figure 65. Distribution of the Spiny Softshell Turtle

Range

In Montana, native populations of the spiny softshell are present east of the Continental Divide in the Missouri River and Yellowstone River drainages, and some principle tributaries (Maxell et al. 2003). Large gaps remain in the species' range within Montana, especially in the Missouri River below the mouth of the Musselshell River. Spiny softshells in Montana are thought to be isolated from the remainder of the global population, and it appears the population in the Missouri River is isolated from the population in the Yellowstone River. Voucher specimens have been collected in five counties (Big Horn, Chouteau, Prairie, Rosebud, and Wheatland), with visual observations in eight additional counties, at elevations up to 3,600 feet (1,097 meters); a questionable voucher record exists from Roosevelt County.

Habitat

Habitat use by spiny softshells in Montana is probably similar to elsewhere in the range, but studies are lacking and there is little qualitative information available. They occupy larger rivers and tributaries. Both sexes have been observed basking together on partially submerged logs in backwater sites of slow-moving water and on sandy or muddy riverbanks (P. Hendricks, personal observation).

Generally, the spiny softshell is primarily a riverine species, occupying large rivers and river impoundments, but also occurs in lakes, ponds along rivers, pools along intermittent streams, bayous, irrigation canals, and oxbows. Spiny softshells usually are found in areas with open sandy or muddy banks, a soft bottom, and submerged brush and other debris. They bask on shores or on

partially submerged logs and burrow into the bottoms of permanent water bodies, either shallow or relatively deep (0.5 to 7 meters), where they spend the winter. Eggs are laid in nests dug in open areas in sand, gravel, or soft soil near water (Baxter and Stone 1985; Ernst et al. 1994; Hammerson 1999; Stebbins 2003).

Management

Montana populations of the spiny softshell are poorly understood, making management more difficult. No management plan is in place at this time.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Little biological information for Montana populations	Consider preparing a management plan for the spiny softshell or include it into other comprehensive taxonomic plans
Habitat loss and degradation, including barriers that hamper movement of spiny softshells	Conservation of major rivers in Montana
Nest disturbance	Protect nest sites from human disturbance
Incidental take from anglers	Thorough documentation of observations and incidental take

Management Plan

None

Citations

Baxter, G. T., and M. D. Stone. 1985. Amphibians and reptiles of Wyoming. 2nd ed. Wyoming Game and Fish Department, Cheyenne, WY.

Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, DC. 578 pp.

Hammerson, G. A. 1999. Amphibians and reptiles in Colorado. 2nd ed. University Press of Colorado, Boulder, CO. 484 pp + xxvi.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Stebbins, R. C. 2003. A field guide to western reptiles and amphibians. 3rd ed. Houghton Mifflin Company, Boston, MA. 533 pp.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Western Hog-nosed Snake (*Heterodon nasicus*)

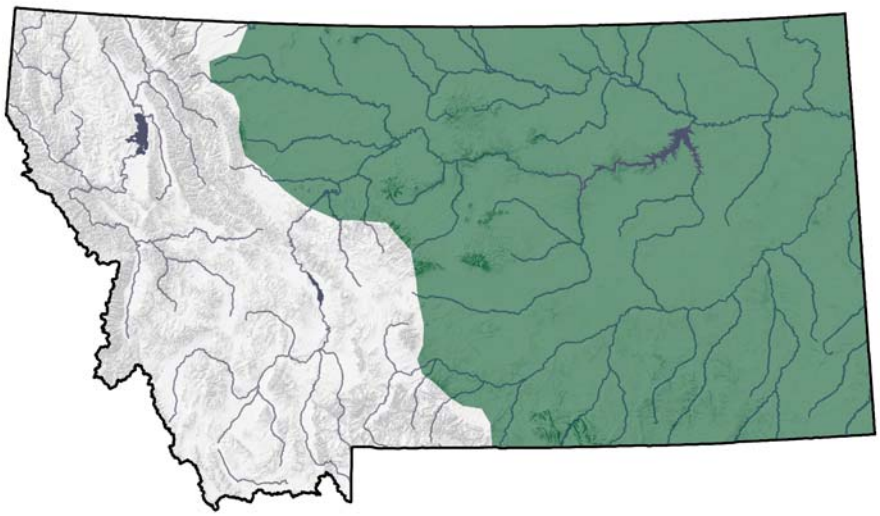


Figure 66. Distribution of the Western Hog-nosed Snake

Range

In Montana, the western hog-nosed snake is found east of the Continental Divide throughout the prairies, although significant gaps in its known distribution remain in the central region between the “island” mountain ranges, and there have been few reports statewide in the last ten years (Maxell et al. 2003). Voucher specimens exist for 17 eastern counties, and there are observation records from 7 additional counties, at elevations up to 4,060 feet (1,237 meters).

Habitat

Little specific information for the state is available. Western hog-nosed snakes have been reported in areas of sagebrush grassland habitat (Dood 1980) and near pine savannah in grassland underlain by sandy soil (Reichel 1995; Hendricks 1999). Distribution of soil and vegetation and proximity to water could be limiting factors for distribution.

In other locations, their apparent preference for arid areas, farmlands, and floodplains, particularly those with gravelly or sandy soil, has been noted. They occupy burrows or dig into soil and can be found under rocks or debris during periods of inactivity (Baxter and Stone 1985; Hammerson 1999; Stebbins 2003).

Management

Apparently the western hog-nosed snake was relatively abundant in Montana during the late 19th century. In 1876 it was the third most common reptile (after the western rattlesnake and short-horned lizard) along the Missouri River

between Fort Benton and the mouth of the Judith River (Cope 1879). This is no longer the case (Maxell et al. 2003); the few recent records suggest that the species is uncommon throughout Montana, although its status is largely unknown.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Distribution, status, and habitat uses are poorly understood	Develop a comprehensive taxanomic management plan (e.g., for reptiles) that includes the western hog-nosed snake and addresses the concerns listed
	Record all observations of this species to continue establishing its range in Montana
Some evidence for declines are potentially associated with habitat loss	Conservation of prairie land and prey habitat (wetlands)
Pet trade industry	Increase education and information on reptile biology and awareness of the importance of den and nest sites
Declines in prey (amphibians)	Targeted surveys (specific to both hog-nosed snakes and prey base) in suitable habitat to continue determining their abundance and range in Montana
Dependent on natural flood regimes that provide gravel and sandy beaches in which they and their amphibian prey can burrow	Mainenance of natural flood regime

Management Plan

None

Citations

Baxter, G. T., and M. D. Stone. 1985. Amphibians and reptiles of Wyoming. 2nd ed. Wyoming Game and Fish Department, Cheyenne, WY.

Cope, E. D. 1879. A contribution to and zoology of Montana. American Naturalist 13(7):432–441.

Dood, A. R. 1980. Terry badlands nongame survey and inventory: final report. (BLM Contract #YA-512-CT8-217.) Montana Department of Fish, Wildlife & Parks. 70 pp.

Hammerson, G. A. 1999. Amphibians and reptiles in Colorado. 2nd ed. University Press of Colorado, Boulder, CO. 484 pp + xxvi.

Hendricks, P. 1999. Amphibian and reptile survey of the Bureau of Land Management, Miles City District, Montana. Montana Natural Heritage Program, Helena, MT. 80 pp.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Reichel, J. D. 1995. Preliminary amphibian and reptile survey of the Sioux District of the Custer National Forest: 1994. Montana Natural Heritage Program. Helena, MT. 75 pp.

Stebbins, R. C. 2003. A field guide to western reptiles and amphibians. 3rd ed. Houghton Mifflin Company, Boston, MA. 533 pp.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Milksnake (*Lampropeltis triangulum)*

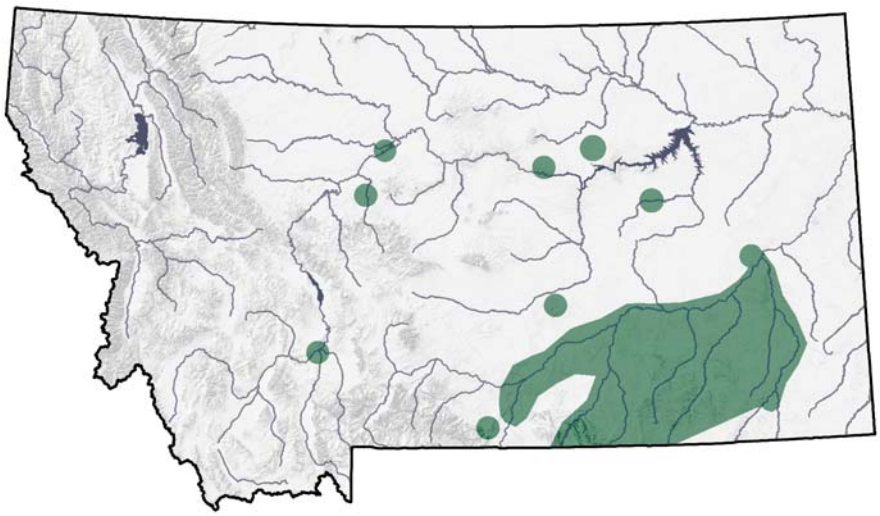


Figure 67. Distribution of the Milksnake

Range

In Montana, the milksnake is found east of the Continental Divide throughout much of the prairie regions, although mostly south of the Missouri River (Maxell et al. 2003); significant gaps are present in its known distribution, probably due in part to a combination of restricted habitat preferences, extensive use of cover (e.g., rocks), and nocturnal habits. Voucher specimens exist for seven counties (Carbon, Chouteau, Custer, Garfield, Phillips, Powder River, and Yellowstone), and there are observation records for four additional counties (Big Horn, Musselshell, Prairie, and Rosebud), at elevations up to 3,960 feet (1,207 meters). Questionable records exist for Cascade County near Belt and the boundary of Broadwater, Gallatin, and Jefferson counties near Three Forks.

Habitat

Little specific information is available. Milksnakes have been reported in areas of open sagebrush grassland habitat (Dood 1980) and ponderosa pine savannah with sandy soils (Hendricks 1999; B. Maxell, personal communication; L. Vitt, personal communication), most often in or near areas of rocky outcrops and hillsides or badland scarps, sometimes within city limits.

Management

So few recent milksnake records exist for Montana (Maxell et al. 2003) that it is difficult to determine if management activity is needed. Nevertheless, the widely scattered recent records indicate that milksnakes continue to occupy a large part of the known range in the state, and some sites near a large urban center have

remained occupied for the last 40 to 45 years (L. Vitt, personal communication). Management for this species is hampered by a lack of basic information on abundance, food habits, and habitat associations.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Distribution, status, and biology are poorly understood	Develop a comprehensive taxanomic management plan (e.g., for reptiles) that includes the milksnake and addresses the conservation concerns listed
	Record all observations of this species to continue establishing its range in Montana
	Targeted surveys (specific to the milksnake) in suitable habitat to continue determining its range in Montana
Pet trade industry	Increase education and information on reptile biology and awareness of the importance of den and nest sites

Management Plan

None

Citations

Dood, A. R. 1980. Terry badlands nongame survey and inventory: final report. (BLM Contract #YA-512-CT8-217.) Montana Department of Fish, Wildlife & Parks. 70 pp.

Hendricks, P. 1999. Amphibian and reptile survey of the Bureau of Land Management, Miles City District, Montana. Montana Natural Heritage Program, Helena, MT. 80 pp.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Smooth Greensnake (*Opheodrys vernalis*)

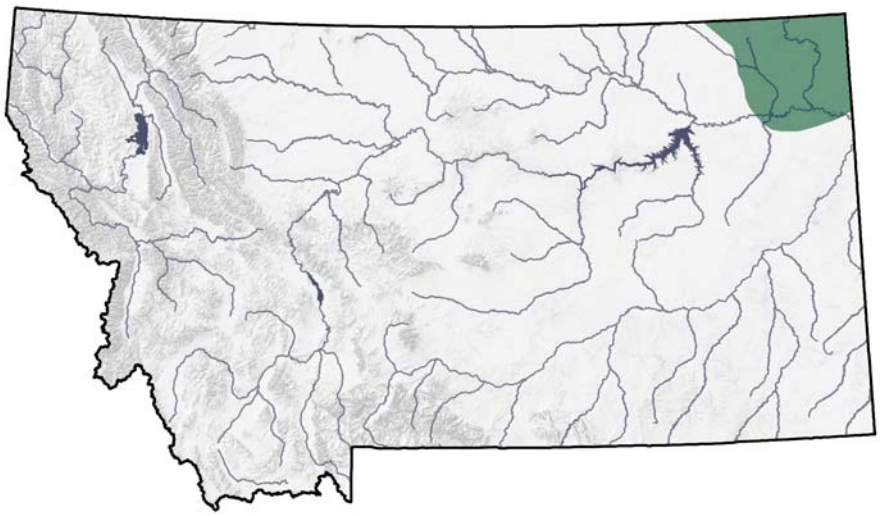


Figure 68. Distribution of the Smooth Greensnake

Range

Montana is at the edge of the smooth greensnake's global range. The species is restricted to extreme northeastern Montana north of the Missouri River, at elevations below 2,780 feet (847 meters). There are reliable records from Sheridan County (Maxell et al. 2003); smooth greensnakes recently have been found in Valley County, and they undoubtedly occur in Roosevelt County. This snake may eventually be documented south of the Missouri River near the boundry with North Dakota.

Habitat

Little information is available for the species in Montana, though it has been reported on residential lawns, in city parks, along ditches in the prairie pothole region, and around wetland complexes. Based upon observations outside Montana, the smooth greensnake is known to occupy meadows, grassy marshes, moist grassy fields at forest edges, mountain shrublands, stream borders, bogs, open moist woodlands, abandoned farmlands, and vacant lots. Periods of inactivity are spent underground, beneath woody debris and rocks or in rotting wood. Smooth greensnakes have been found hibernating in abandoned ant mounds. Most activity is restricted to the ground, but they may climb into low vegetation and sometimes enter water (Hammerson 1999).

Management

No special management activity is defined at this time.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Distribution, status, and biology in Montana are poorly understood	Develop a comprehensive taxanomic management plan (e.g., for reptiles) that includes the smooth greensnake and addresses the conservation concerns listed above
	Targeted surveys (specific to the smooth greensnake) in suitable habitat to continue determining its range in Montana
	Record all observations of this species to continue establishing its range in Montana
	Habitat where smooth greensnakes occur should be conserved
	Increase education and information on reptile biology

Management Plan

None

Citations

Hammerson, G. A. 1999. Amphibians and reptiles in Colorado. 2nd ed. University Press of Colorado, Boulder, CO. 484 pp + xxvi.

Maxell, B., K. J. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Birds

Common Loon (*Gavia immer*)

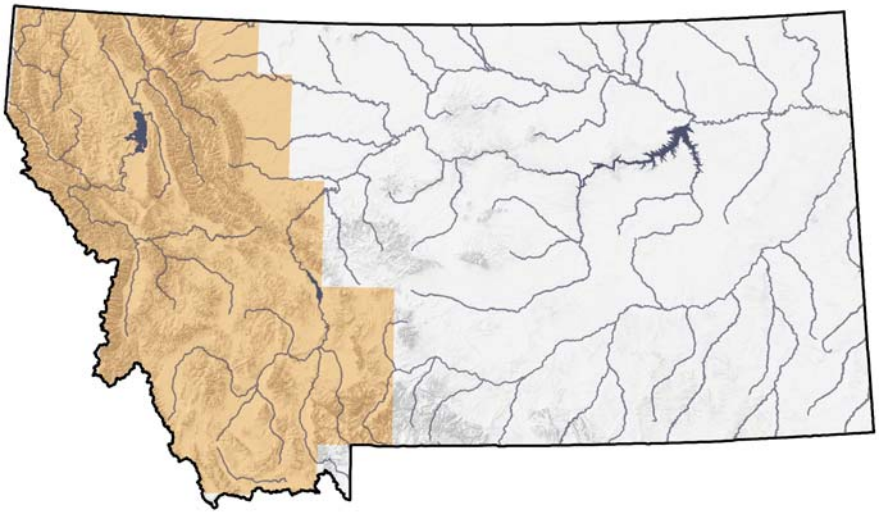


Figure 69. Distribution of the Common Loon
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The global population of the common loon is considered “secure” (IUCN G5 Ranking); however, many local populations are small and isolated, and are vulnerable to extinction primarily due to habitat loss and human encroachment into key habitat (Kelly 1992; Evers 2004). Loons are considered imperiled (MT ranking S2) by the Montana Natural Heritage Program and are already listed as a “sensitive species” by the U.S. Forest Service (R-1) and a Species of Management Concern by the USFWS Region 6 (U.S. Fish and Wildlife Service 1995).

In Montana, the current breeding range for common loons is primarily restricted to lower elevation forested glacial lakes in the northwest corner of the state. Historically, common loons were believed to have nested throughout the western half of the state where suitable habitat was found. The primary nesting habitat currently used is restricted to lakes in the Blackfoot, Flathead, and Kootenai river drainages, with some breeding occurring on the east side of Glacier National Park and on the Blackfeet Indian Reservation. Loons also currently nest in Yellowstone National Park; historical records include lakes in southwest Montana. Common loons breeding in Canada migrate through the entire state during spring and fall. Rafts of more than 60 birds frequently have been observed on major lakes and reservoirs throughout the state. Nonbreeding common loons are occasionally observed during the summer in Montana, also on larger lakes or reservoirs. A pair of common loons once nested in central Montana at Nelson

Reservoir near Malta (F. Prellwitz, personal communication in Dolan 1994). Common loons have been recorded as breeding in 11 Montana counties: Lincoln, Flathead, Glacier, Sanders, Lake, Missoula, Powell, Lewis and Clark, Teton, Beaverhead, and Madison (Montana Bird Distribution 2003, MNHP 2002) (Montana Animal Field Guide 2004). The northwestern portion of Montana supports the highest density of nesting common loons in the lower 48 states west of the Mississippi River. Based on coordinated total counts of common loons in mid-July over the last six years, Montana supports an average of 62 (+/- 5) breeding pairs that successfully raise an average of 43 (+/- 8) chicks each year. In addition, surveyors counted an average of 48 single or nonbreeding adult loons. Total midsummer loon counts since 1999 have averaged 217 (range 201–230). Based on these data, the population appears to be stable (Bissell 2005).

Based on recoveries or reobservations of adult and juvenile banded common loons first captured on nesting lakes in northwestern Montana, these loons appear to winter along the west coast from Washington to the mid-California coast (Bissell 2005). Occasional overwintering also occurs in Montana. Common loons have been observed overwintering (December 15 through February 15) in Lincoln, Flathead, and Lake counties (Montana Bird Distribution 2003).

Habitat

In Montana, common loons will generally not nest on lakes less than about 13 acres in size or over 5,000 feet in elevation (Skaar 1990). If nesting on a small lake, they may use an adjacent lake for supplementary foraging (Montana Animal Field Guide 2004). Successful nesting requires both nesting sites and nursery areas sheltered from winds and disturbances. Small islands, coves, and bays are preferred general areas for nesting. Loons must nest adjacent to water, and they frequently nest on herbaceous shoreline areas but also logs, stumps, muskrat houses, floating vegetative mats, and gravel shorelines if that is all that is available. Nests usually consist of aquatic vegetation shaped into a shallow bowl located within a few inches of the water’s edge. Nursery areas are very often sheltered, shallow coves with abundant small fish and insects (Skaar 1990). Most Montana lakes inhabited by common loons are relatively oligotrophic and have not experienced significant siltation or other hydrological changes.

The quantity and quality of nesting habitat may limit the loon population of northwestern Montana. Skaar (1990) estimated the state’s “carrying capacity” at 185 potential nesting territories, based on the size and number of lakes within the species’ breeding distribution. He assumed 100 hectares of surface area per pair. Kelly (1992) documented a density of 72.2 hectares of surface water per adult loon for the Tobacco, Stillwater, Clearwater, and Swan river drainages.

Loons are a long-lived, slowly reproducing species that raise a maximum of only one to two young per year. It takes three years for loons to acquire adult plumage and an average of seven years before adults successfully occupy a territory and

raise young (Evers 2004). Adults may live to 20 years or more. Juvenile birds spend three winters in coastal waters before returning inland in adult plumage. Scientists studying common loons in other parts of their range estimate juvenile recruitment rates to the adult state (three years) to be about 40 percent (Evers 2004). Loons are also poor colonizers, with the young returning to within 5 to 20 kilometers of their natal area.This slow reproductive rate combined with limited dispersal distance and extreme territoriality presents some unique challenges to wildlife managers. Common loon habitat is relatively restricted in nature. Given their fierce territorial behavior to maintain successful occupation of a lake or portion of a lake, the occupation of all available habitats will inevitably lead to greater territorial conflicts. Repeated nest failures at Upper Thompson Lake in both 2004 and 2005 appear to be related to fighting, territorial switching, and general competition between two adjoining nesting pairs of loons and other territorial pairs in the drainage.

Management

Since 1999, management of common loons and their habitat in Montana is coordinated through the Common Loon Working Group (CLWG), an ad hoc advisory group consisting of representatives from state and federal agencies, tribes, nonprofit organizations such as the Montana Loon Society, and industry. This group coordinates surveys, research, and management programs and meets at least twice a year. The CLWG has helped solicit and fund the Loon Ranger Program as well as the recently started Loon Ecology Project using a State Wildlife Grant.

The current management program entails many activities focused on loon conservation including two coordinated annual population surveys: one in mid-May on accessible breeding lakes to determine territorial pair presence and possibly nesting, and a second survey in mid-July to count both adults and chicks of the year. The data are collected by the CLWG and housed in a centralized database maintained by the Montana Natural Heritage Program.

The management program also consists of implementing an annual outreach and education program using “Loon Rangers” at most breeding lakes that have high levels of recreational use. Through FWP’s summer internship program, three to four college students are hired each year to help with educational signs, floating buoys, surveys, and education programs at the busiest nesting lakes. The Loon Ranger Program was initiated in 2000. Funding is provided both by agencies and private donations. For many lakes, management includes the setting out of floating buoys around nest sites where conflicts with boaters has occurred, and the use of artificial loon platforms or nesting islands on lakes where nesting habitat has been reduced or lakes levels affected. Until recently, Glacier National Park participated only in annual surveys. This year, Glacier is initiating a citizen science program to more closely monitor nesting loons within the park. FWP has summarized the various CLWG activities over the last five years through periodic

annual reports available through the Wildlife Division or Region One headquarters. Preliminary evaluation of the education program indicates nesting success has been maintained or increased in the areas served by the program.

Other management options that have been occasionally implemented by lakeshore landowners such as FWP, DNRC, and the U.S. Forest Service include managing access to lakes through seasonal closures of trails or campsites, rerouting of roads or trails, strategic placement of educational signs, changing the design or upgrades of boat ramps, implementing no-wake rules, and providing input on proposed development projects. The members of the CLWG also work with homeowner associations to identify areas in need of conservation.

The new research efforts are focused on determining habitat factors associated with nesting success at various habitat scales; monitoring levels of methyl mercury and other contaminants in loon eggs and blood; estimating Montana's potential habitat capacity and the relationship between Montana's breeding population and adjoining populations to the west (Washington), north (Canada), or south (Wyoming); determining adult and juvenile survival and recruitment rates; and estimating overall population trends. The results will be used to update Montana's Common Loon Conservation Plan in 2008.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Disturbances to loon nesting and foraging lakes and shorelines caused by human activities such as boating, angling, camping, or other activities during the nesting season	Need to implement a territorial ranking system to help identify priority nesting lakes or areas
Loss of nesting habitat including alternative nesting areas and nursery areas due to development, water level alterations, and recreation	Need to estimate total amount of available habitat and percent occupancy of that habitat based on historical and current habitat conditions
	Need to maintain the suitability of currently used nesting territories and create site-specific management plans that use a variety of tools to maintain loon nesting sites and nursery areas
Loss of connectivity within Montana's populations as well as between Montana's population and other western populations	Need for population demographic and trend information for Montana as well as increased knowledge of migratory routes and other factors affecting overwinter survival

	Need to identify areas of population sinks and sources
	Need to identify risks and potential threats outside Montana to Montana's breeding population and the consequences of those risks
Accumulation of contaminants over the life of individual birds, including lead (from fish sinkers) poisoning and methyl mercury (Evers 2004)	Need to continue to investigate known causes of mortality including the effect of human sources including methyl mercury and lead on breeding loons
Research opportunities	Need to keep current database up to date and available for interagency use
	Complete ongoing research efforts to revise loon conservation plan
	Provide for continued cooperative funding for education and other aspects of ongoing loon management plan

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Evers, David C. 2004. Status Assessment and Conservation Plan for the Common Loon (*Gavia immer*) in North America. David C. Evers, BioDiversity Research Institute, April 12, 2004, available at http://alaska.fws.gov/mbsp/mbm/loons/pdf/Common_Loon_Status_Assessment.pdf

Kushlan, James A., Melanie J. Steinkamp, Katherine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, DC. 78 pp.

Skaar, D. 1990. Montana common loon management plan. Unpublished report prepared for U.S.D.A. Forest Service, Region 1. 61 pp.

Skaar, D. 1988. Creation of a management plan for the common loon in Montana. Pp. 101–102 in North American Loon Fund conference report.

Citations

Bissell, Gael N. 2005. Third Annual Common Loon Report (draft). Unpublished report. March 2005. Region One, Montana Fish, Wildlife & Parks, 490 North Meridian Road, Kalispell, MT 59901.

Bissell, Gael N. 2005. Personal communication.

Digital Atlas of Idaho. http://imnh.isu.edu/digitalatlas (accessed June 5, 2004).

Dolan, P. M. 1994. The common loon (*Gavia immer*) in the northern region: biology and management recommendations. Unpublished report. U.S.D.A. Forest Service, Region One. 76 pp.

Kelly, L. M. 1992. The effects of human disturbance on common loon productivity in northwestern Montana. M.S. thesis, University of Montana, Missoula, MT. 65 pp.

McIntyre, J. W., and J. F. Barr. 1997. Common loon (*Gavia immer*). In The Birds of North America, No. 313, A. Poole and F. Gills, eds. The Academy of Natural Sciences, Philadelphia, PA, and the American Ornithologists' Union, Washington, DC.

Montana Bird Distribution: An Online Database (web application). 2002. Helena, MT: Montana Audubon Society. Available at http://MNHP.nris.state.mt.us/mbd/ (accessed October 7, 2002).

Montana Natural Heritage Program (MNHP): Biological and Conservation Database. 2002. Helena, MT (accessed: October 7, 2002).

NatureServe Explorer. http://www.natureserve.org/explorer/ (accessed June 5, 2004). Montana Animal Field Guide. http://MNHP.nris.state.mt.us/animalguide/ (accessed June 5, 2004).

U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Government Printing Office:1996-404-911/44014. 22 pp.

Trumpeter Swan (*Cygnus buccinator*)

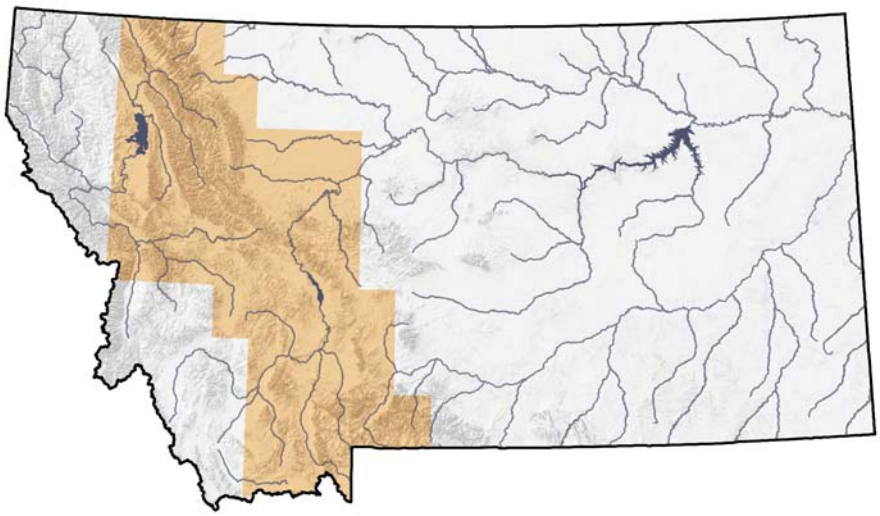


Figure 70. Distribution of the Trumpeter Swan
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

Trumpeter swans breeding in Montana are all part of the Rocky Mountain population, which occurs all along the Rocky Mountain range. The breeding range of these trumpeter swans in Montana is restricted to the extreme southwestern corner of the state (Beaverhead County) and along the Rocky Mountain Front (Lewis and Clark County) (Montana Natural Heritage Program 2003). In Beaverhead County, trumpeter swans breed in the Red Rock Lakes National Wildlife Refuge in the Centennial Valley, specifically the Lima Reservoir and the Upper and Lower Red Rock Lakes. In Lewis and Clark County they inhabit several small pothole lakes along the front range of the Rocky Mountains, most of which are west and southwest of Augusta. This is a very small subpopulation of the larger population breeding in the Centennial Valley (MNHP 2003). Reintroductions are currently ongoing on the Flathead Indian Reservation in northwestern Montana as well.

The nonbreeding range of trumpeter swans is also limited to several areas in the southwestern part of the state (Beaverhead, Gallatin, and Madison counties). Virtually all of the birds breeding in southwestern Montana also winter there. Birds summering in Canada migrate to the area in winter to join them. In Beaverhead County, the Red Rock Lakes area in the Centennial Valley is a major wintering ground for the species. In Madison County, trumpeter swans winter at Ennis Lake and the Madison River up to approximately 15 miles upstream. In Gallatin County, they winter on the south fork arms of Hebgen

Reservoir, as well as the river below Hebgen Dam and several other smaller lakes in the area (MNHP 2003).

Trumpeter swans breeding in Montana are nonmigrants. They spend both the breeding season and the winter in southern Montana's lakes, ponds, and streams of the Red Rock Lakes National Wildlife Refuge. The Canadian subpopulation breeding in parts of British Columbia, Alberta, the Yukon, and the Northwest Territories move south in late October to early November (Mitchell 1994).

Fall migration dates for the Bozeman area are from November 15 to December 15 and spring from February 25 to April 15 (Skaar 1969). They usually follow the Rocky Mountain Front, moving fsrther south as water freezes or food diminishes. They eventually arrive in southern Montana and winter along with the resident population. Canadian swans leave their wintering grounds in early March to early April, moving up the Rocky Mountain Front toward their breeding habitat farther north (Mitchell 1994).

Habitat

The breeding habitat for trumpeter swans in the Red Rock Lakes/Centennial Valley of Montana includes lakes and ponds and adjacent marshes containing sufficient vegetation and nesting locations. Along the Rocky Mountain Front the breeding habitat is small pothole lakes, generally with sufficient water to maintain emergent vegetation through the breeding season (MNHP 2003). However, due to recent drought conditions, this small breeding population has been severely impacted. In 2003 there was an attempt by swans to nest in the Upper Blackfoot drainage, and this area is targeted for future population augmentation or reintroduction of trumpeter swans. Habitat requirements for breeding include room to take off (about 100 meters), shallow, unpolluted water with sufficient emergent vegetation and invertebrates, appropriate nest sites (e.g., muskrat lodges), and areas with little human disturbance (Mitchell 1994).

Nonbreeding habitat for trumpter swans in Montana consists of many large and small lakes and ponds in extreme southern Montana, including the breeding area of the Red Rock Lakes/Centennial Valley. Swans also winter in the Ennis Lake and Madison River complex, as well as Hebgen Lake and the surrounding area. During winter appropriate habitat is areas where water does not freeze and food is plentiful and accessible. Swans will move out of one lake or pond to another if conditions become too severe.

Management

Management for trumpeter swans began in Montana in the early 1930s with the designation of the Red Rock Lakes National Wildlife Refuge (NWR). This refuge was specifically created for continued trumpeter swan presence and for active

management practices. These early management practices consisted of protection from shooting, winter-feeding stations, and relocation to other breeding locations (Mitchell 1994). Some of these management activities are still in practice today, along with others including habitat restoration, human recreation management, breeding, wintering habitat management, and winter translocation work (Mitchell 1994). Since 1988 trumpeter swans have been relocated from the Red Rock Lakes NWR in southern Montana to locations in Idaho, Oregon, Wyoming, and Utah to promote exploration of new wintering habitats and to remedy the increasing problem of overpopulation in the refuge during winter. The goal is to have less than 10 percent winter at any one site and no swans wintering at the Red Rock Lakes NWR (Baskin 1993). In 1993 winter feeding stations were terminated in the Red Rock Lakes NWR. It was believed these stations were reducing the winter range expansion work, as birds would not actively explore new wintering locations if food were made readily available in the refuge. Since then, trumpeter swans have indeed dispersed to new areas in the west, and the remaining population in the Red Rock Lakes NWR has stabilized. Other management techniques are described and supported by the North American Management Plan for Trumpeter Swans (1984). As noted in the distribution comments, the Confederated Salish and Kootenai Tribes in northwestern Montana are also reintroducing trumpeter swans on the Flathead Indian Reservation. Recently, a cooperative effort has developed between USFWS and FWP to reintroduce breeding trumpeter swans to the Blackfoot River. Trumpeter swans are a Species of Management Concern in Region 6 (U.S. Fish and Wildlife Service 1995).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Isolation of breeding populations	Protect known nesting habitat and manage nesting habitat in a manner compatible with increasing swan production and connectivity between populations
Wetland degradation and destruction	Wetland restoration programs
Lack of information of breeding success	Continue surveys and monitoring of populations
Vulnerable to power line collisions	Relocate power lines underground in areas adjacent to nesting and brood rearing locations

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

North American Waterfowl Management Plan. 1998. Expanding the Vision (update). 32 pp.

Pacific Flyway Council and USFWS. 2003. Pacific Flyway Implementation Plan for the Rocky Mountain Population of Trumpeter Swans 2003 Annual Report. 29 pp.

Subcommittee on the Interior Population of Trumpeter Swans. 1997. Mississippi and central flyway management plan for the Interior population of trumpeter swans. Mississippi and Central Flyway Councils, c/o USFWS, Migratory Bird Coordinator, Twin Cities, MN.

The North American Management Plan for Trumpeter Swans. 1984.

Citations

Baskins, Y. 1993. Trumpeter swans relearn migration. BioSci. 43(2):76–79.

Mitchell, C. D. 1994. Trumpeter swan (*Cygnus buccinator*). In The Birds of North America, No. 105, A. Poole and F. Gill, eds. Philadelphia, PA: The Academy of Natural Sciences and Washington, DC: The American Ornithologists' Union.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Skaar, P. D. 1969. Birds of the Bozeman lat-long. P. D. Skaar, Pub., Bozeman, MT. 132 pp.

U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Government Printing Office:1996-404-911/44014. 22 pp.

Harlequin Duck (*Histrionicus histrionicus*)

Figure 71. Distribution of the Harlequin Duck
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The harlequin duck's range is small and fragmented and is found primarily in northwestern Montana and parts of the Greater Yellowstone ecotype.

Harlequin ducks breed in Alaska and western Canada, south to eastern Oregon and east-central California, Idaho, and Wyoming; they also breed in eastern Canada. They winter in the Aleutian and Pribilof Islands, south to central California and also in the Maritime Provinces south to Maryland (Karl 2000). In North America harlequin ducks winter along the north Pacific coast, then migrate inland to nest along swiftly flowing mountain streams (Bellrose 1980). Although still globally widespread, the Atlantic population may be reaching critically low levels, and the Pacific population has experienced substantial declines (NatureServe 2004).

Habitat

In Montana, most harlequin ducks inhabit fast-moving, low-gradient, clear mountain streams. Overstory in Montana does not appear to affect habitat use: In Glacier National Park, birds used primarily old-growth or mature forest (90 percent), and most birds in streams on the Rocky Mountain Front were seen in pole-sized timber (Diamond and Finnegan 1993). Banks are most often covered with a mosaic of trees and shrubs, but the only significant positive correlation is with overhanging vegetation (Diamond and Finnegan 1993; Ashley 1994).

Four habitat characteristics were noted at more than 50 percent of harlequin duck observations in the Tetons (Wallen 1987): 1) streamside perennial shrub vegetation, 2) meandering (braided) channel types, 3) more than three loafing sites per 10 meters, and 4) areas unused by humans. Wallen (1987) postulated that human activities might have a greater influence on breeding success than available habitat. Harlequins feed primarily on crustaceans, mollusks, insects, and a few small fishes (Karl 2000).

The strongest stream section factor in Montana appears to be for stream reaches with 2-plus loafing sites per 10 meters (Kuchel 1977; Diamond and Finnegan 1993; Ashley 1994). Broods may preferentially use backwater areas, especially shortly after hatching (Kuchel 1977), though this is not apparent in data from other studies (Ashley 1994). Stream width ranges from 3 to 35 meters in Montana. On stream gradients of 7 percent, occupied stream reaches ranged from 1.8 to 2.8 percent (Fairman and Miller 1990), while velocity at 42 harlequin observation points ranged from 0.8 to 4.1 meters per second (Diamond and Finnegan 1993). Harlequins in Glacier National Park used straight, curved, meandering, and braided stream reaches in proportion to their availability, as was the case for bottom types (Ashley 1994).

Harlequin ducks breed locally on mountain streams in the western part of the state (Reichel and Genter 1995), including the Kootenai, Flathead, Clark Fork, and Blackfoot river drainages. Scattered breeding also occurs along the Rocky Mountain Front and the northern edge of Yellowstone National Park (Montana Partners in Flight 2004). Harlequin ducks are known to occur in Bonner, Boundary, Clearwater, and Shoshone counties in Idaho. Harlequin ducks in Glacier National Park confine almost all activities to swiftly running waters (90 percent of area used), but also used cut-off side channels and other backwaters during periods of high water and as brood rearing habitat (Kuckel 1977). Females with broods avoided all areas frequented by humans. Occupied streams in northern Idaho were usually in mature/old-growth western red cedar/western hemlock or Engelmann spruce/subalpine fir stands. Cassirer and Groves (1991) suggested that the presence of mature/old-growth forest in northern Idaho might indicate streams with high-quality, low-sediment loads, intact riparian areas, and relative inaccessibility to humans. Stream sections most suitable for harlequin breeding had gradients less than 10 degrees and banks lined with dense perennial shrubs; breeding and brood rearing occurred on streams with a mean gradient less than 30 degrees. In Idaho hens nest in cliff cavities, tree cavities, and on the ground.

Management

There is no specific management for harlequins in Montana; however, continued survey and monitoring efforts by MNHP have identified migration areas used by harlequin ducks.

In 1990 the harlequin duck was identified as potentially imperiled in western Montana. By 1991 it was considered as a candidate for listing on the federal threatened or endangered species list. Considered a sensitive or indicator species, it is among the first species to reflect damage to the type of pristine environments where it remains (Street 1999). The Harlequin Duck Working Group (1993) has identified inventory needs for both the Atlantic and Pacific populations for wintering and breeding habitats.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Range and forest management practices	Manage grazing to maintain riparian vegetation and streambank stability in excellent condition
	Continue survey efforts to find occupied streams throughout its range in the state, and to develop and track a statewide population estimate
Human disturbance by paddlers (especially in breeding season)	Decrease human disturbance such as boating, hiking, and camping during breeding season
Water pollution on headwater streams utilized for nesting, brood rearing, and prey base	Work with agencies, organizations and public to identify and reduce point source pollution in headwater streams
Destruction of watershed stability and stream flow regimes. High water during nesting and brood rearing can reduce or eliminate productivity. Low water will render feeding and brood rearing habitats unavailable	Avoid increasing peak flows during nesting season
	Avoid increasing sedimentation
Impoundments and diversions on breeding streams	Reduce streambank or channel alteration along breeding habitat

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Cassirer, E. F., J. D. Reichel, R. L. Wallen, and E. C. Atkinson. 1996. Harlequin Duck (*Histrionicus histrionicus*) conservation assessment and strategy for the U.S. Rocky Mountains. Unpublished technical report, Idaho Department of Fish and Game, Lewiston, ID.

North American Waterfowl Management Plan. 1998. Expanding the Vision (update). 32 pp.

Will, G. C. January 1986. Waterfowl, Sandhill Crane and Snipe Management Plan.

Citations

Ashley, J. 1994. Progress report: harlequin duck inventory and monitoring in Glacier National Park, Montana. Unpublished report. Division of Research Management, Glacier National Park, MT. 14 pp.

Bent, A. C. 1925. Life histories of North American wildfowl. Order: Anseres (Part II). U.S. National Museum Bulletin 130. Washington, DC. 316 pp.

Campbell, R. W., N. K. Dawe, I. McTaggart-Cowan, J. M. Cooper, G. W. Kaiser, and M. C. McNall. 1990. The birds of British Columbia, Vols. 1 and 2: non-passerines. Royal British Columbia Museum, Victoria, B.C. 518 and 636 pp.

Cassirer, E. F., G. Schirato, F. Sharpe, C. R. Groves, and R. N. Anderson. 1993. Cavity nesting by harlequin ducks in the Pacific Northwest. Wilson Bulletin 105:691–694.

Cassirer, E. F, A. Breault, P. Clarkson, D. L. Genter, R. I. Goudie, B. Hunt, S. C. Latta, G. H. Mittelhauser, M. M. Schirato, and R. L. Wallen. 1993. Status of harlequin ducks in North America. Report on Harlequin Duck Working Group.

Cassirer, E. F., and C. R. Groves. 1991. Harlequin duck ecology in Idaho. 1987–1990. Idaho Fish and Game and U.S. Fish and Wildlife Service.

Diamond, S., and P. Finnegan. 1993. Harlequin duck ecology on Montana's Rocky Mountain Front. Unpublished report. Rocky Mountain District, Lewis and Clark National Forest, Choteau, MT. 45 pp.

Fairman, L. M., and V. E. Miller. 1990. Results of 1990 surveys for harlequin ducks on the Kootenai and Lolo national forests, Montana. Unpublished report. Montana Natural Heritage Program, Helena, MT.

Genter, D. L. 1993. Harlequin duck status report 1992: Montana. Pp. 31–34 in E. F. Cassirer, A. Breault, P. Clarkson, D. L. Genter, R. I. Goudie, B. Hunt, S. C. Latta, G. H. Mittelhauser, M. M. Schirato, and R. L. Wallen, eds. Harlequin ducks in North America. Harlequin Duck Working Group.

Harlequin Duck Working Group. 1993. Status of harlequin ducks (*Histrionicus histrionicus*) in North America. Report of the Harlequin Duck Working Group.

Jewett, S. G. 1931. Nesting of the Pacific harlequin duck in Oregon. Condor 33:255.

Kuchel, C. R. 1977. Some aspects of the behavior and ecology of harlequin ducks breeding in Glacier National Park, Montana. M.S. thesis, University of Montana, Missoula, MT. 160 pp.

Montana Natural Heritage Program Online Database. http://MNHP.nris.state.mt.us/animalguide (accessed April 26, 2004).

Montana Partners in Flight Online Database. http://biology.dbs.umt.edu/landbird/mbcp/mtpif (accessed April 26, 2004).

NatureServe. 2004. NatureServe explorer. An online encyclopedia of life. Version 3.0. NatureServe, Arlington, VA. http://www.natureserve.org/explorer (accessed April 22, 2004).

Reichel, J. D., and D. L. Genter. 1995. Harlequin duck surveys in western Montana: 1994. Montana Natural Heritage Program, Helena, MT.

Spahr, R., L. Armstrong, D. Atwood, and M. Rath. 1991. Threatened, endangered, and sensitive species of the Intermountain Region. U.S.D.A. Forest Service, Ogden, UT.

Street, R. 1999. *Histrionicus histrionicus*. Animal Diversity Web. http://animaldiversity.ummz.umich.edu/accounts/information/Histrionicus histrionicus.html (accessed May 13, 2004).

Thompson, L. 1985. A harlequin romance. Montana Outdoors 16:21–25.

Wallen, R. L. 1987. Habitat utilization by harlequin ducks in Grand Teton National Park. Unpublished MS thesis, Montana State University, Bozeman, MT.

Wallen, R. L., and C. R. Groves. 1989. Distribution, breeding biology and nesting habitat of harlequin ducks (*Histrionicus histrionicus*) in northern Idaho. Natural Heritage Section. Nongame Wildlife/Endangered Species Program, Bureau of Wildlife.

Bald Eagle (*Haliaeetus leucocephalus*)

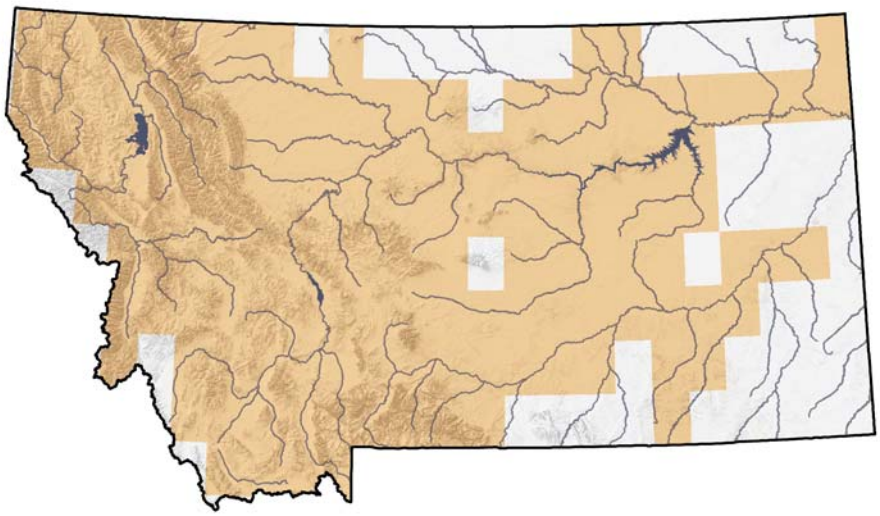


Figure 72. Distribution of the Bald Eagle
(Distribution reflects entire range and does not discriminate betweem breeding and nonbreeding areas)

Range

The majority of birds nesting in Montana are found in the western third of the state, although breeding pairs may be found along many of the major rivers and lakes in the central portion of the state and along the Yellowstone and Missouri rivers to the eastern prairie lands (Montana Bald Eagle Working Group 1994; MBD 2003). East of the Continental Divide, the presence of bald eagles may be somewhat more seasonally dependent than in the western part of the state because migrants from more northerly climes travel through Montana to reach their wintering grounds farther south.

In recent years, one of the largest fall (mid-October to mid-December) migration concentrations (200 to 300 birds at any one time, close to 1,000 individuals throughout the season) to take advantage of spawning salmon occurred at Canyon Ferry Reservoir on the Missouri River, near Helena. Formerly, migrating bald eagles were known to gather in large numbers in Glacier National Park where spawning kokanee salmon were abundant. No evidence exists, however, that the eagles on the Missouri River were those that formerly congregated in Glacier National Park (Montana Bald Eagle Working Group 1994). Subsequent shifting of fall congregations is expected as salmon populations peak and wane throughout the eagle's migration corridor. See the Montana Bald Eagle Management Plan for further details and descriptions of recovery zones (Montana Bald Eagle Working Group 1994).

Habitat

In Montana, as elsewhere, the bald eagle is primarily a species of riparian and lacustrine habitats (forested areas along rivers and lakes), especially during the breeding season. Important year-round habitat includes wetlands, major water bodies, spring spawning streams, ungulate winter ranges, and open water areas (Bureau of Land Management 1986). Wintering habitat may include upland sites. Nesting sites are generally located within larger forested areas near large lakes and rivers where nests are usually built in the tallest, oldest, largest diameter trees. Nesting site selection is dependent upon maximum local food availability and minimum disturbance from human activity (Montana Bald Eagle Working Group 1994). See the Montana Bald Eagle Management Plan (1994) for further details including home range sizes and habitat requirements of fledgling birds.

Management

General objectives of habitat management for bald eagles in Montana include maintaining prey bases; maintaining forest stands currently used or suitable for nesting, roosting, and foraging; planning for future potential nesting, roosting, and foraging habitat; and minimizing disturbances from human activities in nest territories, at communal roosts, and at important feeding sites, including water (MBEWG 1991). The Montana Bald Eagle Management Plan (MBEWG 1994) directs management of this species in the state. Specific objectives identified in the plan include a minimum of 800 nesting pairs in the seven-state recovery area, 99 of these in Montana; nesting success rate of 65 percent in occupied sites over a five-year period with annual average production of 1.0 fledged young per pair; population goals realized in at least 80 percent of management zones with nesting potential; and continued population increases for five consecutive years. See the Habitat Management Guide for Bald Eagles in Northwestern Montana (MBEWG 1991) and the Montana Bald Eagle Management Plan (MBEWG 1994) for further details on management guidelines and recovery objectives. The bald eagle is a good example of a success story—a species that has increased significanltly in population since its addition to the Endangered Species Act.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Maintaining forest stands currently used or suitable for nesting, roosting, and foraging	Continue periodic monitoring and surveying for breeding pairs and locations of nests
Sensitive to human disturbance particularly if activity occurs after nest initiation and prior to fledging	Minimize disturbance within and near nesting territories during the nesting season
	Development of and updated brochure on living with bald eagles

Water turbidity caused by human activity, rendering water unsuitable for foraging	Follow MBEWG guidelines of no more than 10 percent of shoreline be developed on lakes within occupied nesting territories
Contaminants (lead, residual pesticides)	Enforcement of regulations that address the dumping of pollutants into waterways

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Escano, R., D. Flath, R. Hazelwood and B. Klaver, eds. for Bureau of Land Management. 1986. Montana eagle management plan. Montana Bald Eagle Working Group. BLM, Montana State Office. 61 pp.

Montana Bald Eagle Working Group. 1994. Montana Bald Eagle Management Plan. 2nd ed. Bureau of Reclamation. 104 pp.

Rich, T. D., C.J . Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Zubik, R. J. 1988. A site-specific management plan for the lower Stillwater bald eagle territory. Unpublished report. Montana Department of Fish, Wildlife & Parks, Kalispell, MT. 43 pp.

Citations

Hawk Watch International. 2003. An online search for migration watch results, 1999–2002 data. http://www.hawkwatch.org (accessed September 11, 2003).

Montana Bald Eagle Working Group. 1991. Habitat management guide for bald eagles in northwestern Montana. 29 pp.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/

Skaar, P. D. 1969. Birds of the Bozeman lat-long. P. D. Skaar, Pub., Bozeman, MT. 132 pp.

Greater Sage-Grouse (*Centrocercus urophasianus*)

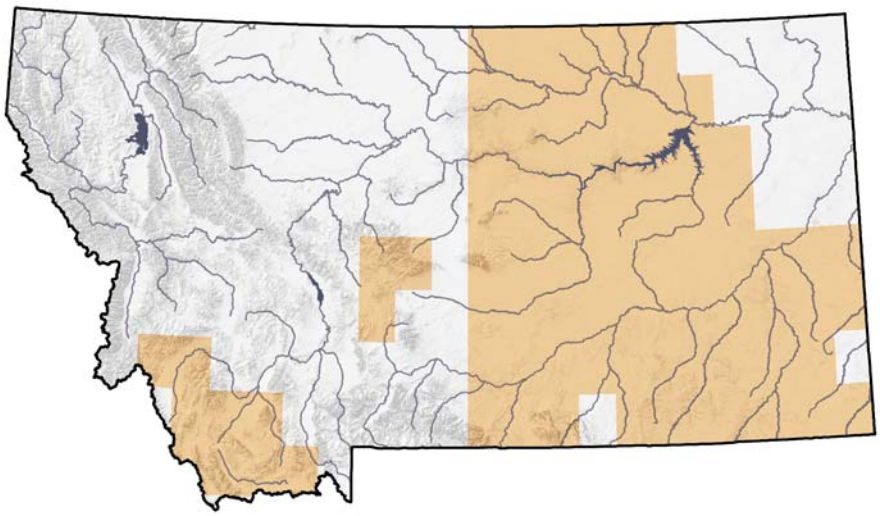


Figure 73. Distribution of the Greater Sage-Grouse
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

Greater sage-grouse are native to the sagebrush steppe of western North America, and their distribution closely follows that of sagebrush, primarily big sagebrush (*Artemisia tridentata*). Distribution of greater sage-grouse in Montana includes the eastern half and southwest corner of the state—roughly 27 million acres (11 million hectares) of sagebrush grassland in 39 counties. In eastern Montana, where close interspersion of wintering, nesting, and brood rearing habitat rarely require large seasonal movements, greater sage-grouse are essentially nonmigratory. Some greater sage-grouse in southwestern Montana are migratory, moving between separate summer and winter areas.

Historically, greater sage-grouse occupied the Bitterroot Valley in western Montana, southwestern Montana, most of eastern Montana, and far western North Dakota and South Dakota (Schroeder et al. 2004). One specimen was collected near Missoula, Montana, as late as 1900. Today, greater sage-grouse distribution is more restricted in Montana, South Dakota, and North Dakota and is found on two national forests—Custer and Beaverhead-Deerlodge.

Habitat

Healthy, properly functioning sagebrush communities support greater sage-grouse and a variety of other native wildlife. Sagebrush communities in each of the sagebrush ecotypes are influenced by a variety of environmental variables. Among these variables are soil texture, moisture regime, past fire activity, past

herbicide spraying, topography, grazing history, grazing accessibility, and recent weather pattern. The characteristics of vegetation at any particular site are the result of superimposed environmental variables. Close examination of a functional sagebrush community reveals these factors at work in the form of a patchwork of shrubs, grasses, and forbs of varying heights, canopy coverage, and species. Individual patches within the landscape can be measured at a microsite level, such as a nest site, or can be extended to include a broader scale, which might be used to describe greater sage-grouse wintering areas. Greater sage-grouse have adapted to and require this naturally occurring patchwork to meet yearlong survival and reproduction needs (Connelly et al. 2000b).

Greater sage-grouse select specific habitat characteristics in response to season and life stage. During the spring breeding season, males congregate on display areas to attract females. Leks, which usually consist of clearings surrounded by sagebrush, are revisited annually. About two-thirds of greater sage-grouse nests are located within 2 miles of a lek. Hens generally nest under stands of sagebrush 12 to 20 inches or more in height, seeking taller shrubs in a stand for nesting. Grasses and forbs provide additional nest concealment from predators. After eggs hatch, hens seek relatively open sagebrush stands with more than 15 percent grass and forb canopy cover. Insects and succulent forbs provide critical food for young broods. As summer progresses and upland forbs desiccate, hens will move broods to moist sites along drainages, ditches, or irrigated meadows/hay crops. In general, moist areas with standing herbaceous cover, for concealing broods from predators, interspersed with sagebrush grasslands provide high-quality brood habitat. Improvements in native grass and forb height and density generally translate into better nest success and brood survival. During late fall and winter, greater sage-grouse feed almost exclusively on sagebrush. Deep snow conditions force greater sage-grouse to move to areas of exposed sagebrush both for food and cover. Wintering greater sage-grouse prefer extensive stands of sagebrush with at least 20 percent canopy cover.

Contiguous large blocks of healthy sagebrush grassland are best suited for meeting yearlong needs of greater sage-grouse. Limited seasonal habitats (e.g., nesting cover, brood rearing habitat, winter habitat, etc.) may restrict the abundance, productivity, or occurrence of greater sage-grouse in a particular area.

Management

Greater sage-grouse are managed under state authority, including the statutory authority to regulate harvest. Legislative mandate designates the greater sage-grouse as an upland game bird (87-2-101, MCA).

FWP, in conjunction with federal land management agencies and conservation groups, monitors greater sage-grouse populations during spring through a

census of displaying males on leks. The post-harvest telephone survey provides an estimate of harvest for all upland bird species, trends in hunter numbers, and number of birds by species taken by hunters. FWP uses wings from harvested greater sage-grouse to estimate composition of the harvest by sex and age.

State-funded cooperative habitat projects have the potential to benefit greater sage-grouse. In 1987 the Montana legislature created a process and funding source for FWP to purchase conservation interests in important wildlife habitats through conservation easements and fee title acquisitions. The program generates funding from an earmarked portion of license revenue and provides an innovative tool to protect habitat at the state level. The Upland Game Bird Habitat Enhancement Program was developed through a series of Montana legislative sessions from 1987 to 2001. This program funds habitat enhancements on private and public lands such as vegetation plantings, grazing management systems, and leases. The program has recently helped fund (in combination with the USFWS Landowner Incentive Program) the Montana Sagebrush Initiative, which is a 30-year private land lease program designed to conserve high-priority sagebrush grasslands from prescribed fire, herbicide applications, plowing, and other practices intended to reduce or eliminate sagebrush and forbs.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Conversion of native sagebrush grassland to cropland or non-native pasture	Promote conservation of intact sagebrush grassland landscapes through incentives and easements
	Guided by the Montana Greater Sage-Grouse Conservation Plan, utilize local working groups, organizations, and agency partnerships to promote and expand greater sage-grouse conservation
Rangeland treatments (e.g., prescribed fire and spraying)	Avoid use of rangeland herbicides and prescribed fire
Fragmentation of sagebrush grasslands (e.g., structural developments, roads, urban sprawl)	Develop and implement a habitat monitoring system to determine landscape-level trends in sagebrush grasslands
Range management practices	Support livestock grazing management that maintains or improves native rangeland integrity and provides standing herbaceous cover, important for nesting and brood rearing

Human disturbance	Quantify impacts of energy development and determine ways to reduce, eliminate, or mitigate negative effects
Noxious weeds	On a smaller scale, monitor trends in habitat condition (e.g., native rangeland integrity, habitat function, invasive weeds)
Vulnerability to West Nile virus	Continue funding and research on associations between West Nile virus and Greater Sage-grouse populations
Lek use and availability in association with other habitat uses	As needed, determine local greater sage-grouse habitat use and movements
	Develop and implement a lek monitoring strategy that will accurately measure trends in greater sage-grouse abundance and distribution across their range
	Continue to inventory greater sage-grouse leks and wintering areas

Management Plans

Braun, C. E. 1999b. Conservation plans. Presentation given to the Western Greater Sage-Grouse Status Conference, January 14–15, 1999, Boise, ID. Online. Available at http://www.rangenet.org/projects/grouse.html.

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Montana Greater Sage-Grouse Work Group. 2004. Management plan and conservation strategies for greater sage-grouse in Montana.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Citations

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000b. Guidelines to manage greater sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967–985.

Connelly, J. 2001. Field Assessment. Greater Sage-Grouse Habitats and Populations—Big Sheep Creek Basin, Montana. Unpublished report on file. Beaverhead-Deerlodge National Forest, Dillon, MT.

Schroeder, Michael A., Cameron L. Aldridge, Anthony D. Apa, Joseph R. Bohne, Clait E. Braun, S. Dwight Bunnell, John W. Connelly, Pat A. Deibert, Scott C. Gardner, Mark A. Hilliard, Gerald D. Kobriger, Susan M. McAdam, Clinton W. McCarthy, John J. McCarthy, Dean L. Mitchell, Eric V. Rickerson, and San J. Stiver. 2004. Distribution of greater sage-grouse in North America. Condor 106:363–376.

Columbian Sharp-tailed Grouse (*Tympanuchus phasianellus columbianus*)

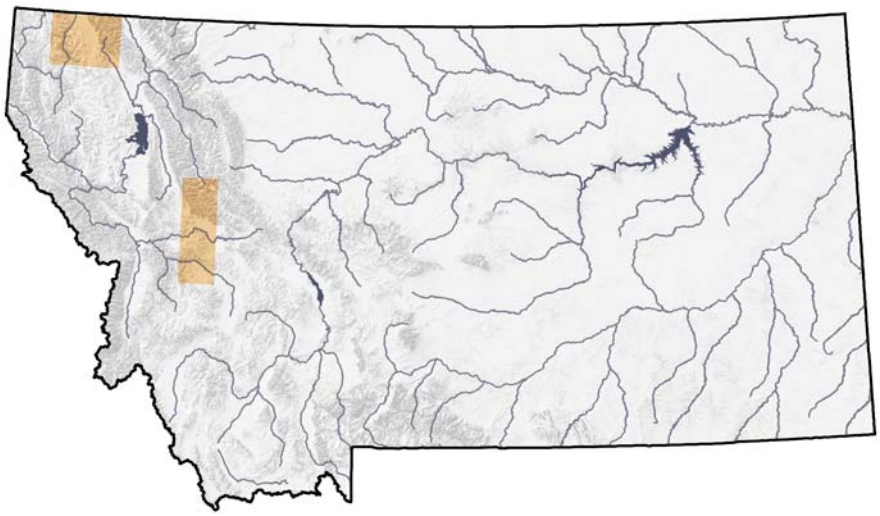


Figure 74. Distribution of the Columbian Sharp-tailed Grouse
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The Columbian sharp-tailed grouse is one of six recognized subspecies of sharp-tailed grouse that occur in North America (AOU 1957). Historically, the Columbian subspecies 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 (Ulliman et al. 1998). There have been significant regional and local declines and extirpations; its geographic distribution has contracted by an estimated 90 percent (Aldrich 1963: Miller and Graul 1980). Currently, there are three meta-populations of Columbian sharp-tailed grouse: one in Colorado/Wyoming, one in Idaho/Utah, and one in central British Columbia. Smaller population centers are found in south-central Idaho/northeast Nevada, north-central Washington, and northeast Oregon (USFWS 1999).

Montana recently supported a very small population of Columbian sharp-tailed grouse in the Tobacco Valley near Eureka. Only one lek is known to exist in this area, which is located on land held by The Nature Conservancy. There has been no known use of the lek during the past three years (T. Their, personal communication). Counts of males on the lek varied from a high of 33 in 1971 to the recent low. This population was supplemented with birds from British Columbia on two occasions.

Flocks of sharp-tailed grouse also occur in the Helmville area of Powell County. These have traditionally been considered the Columbian subspecies. Given their

geographic nearness to the plains subspecies, however, there may be genetic interchange with plains birds. Although a genetics study has shown similarities between a very small sample of Helmville birds and sharp-tailed grouse from Washington (Warheit and Schroeder 2001), there does not appear to be conclusive evidence identifying the Helmville birds as the Columbian subspecies.

Habitat

Columbian sharp-tailed grouse are associated with intermountain shrub grassland habitats including sagebrush grasslands and deciduous riparian and foothill shrub habitats. Brood sites are similar to nest sites, but they are usually close to broad-leaved brush patches or shrubby riparian zones. Sharp-tailed grouse need habitat with moderate vegetative cover, high plant diversity, and high structural diversity (Montana Partners in Flight 2004). Tall broad-leaved mountain shrub and riparian cover types are critical components of winter habitat for sharp-tailed grouse (Saab and Marks 1992). They often move to higher elevations to get into moister sites that support greater amounts of these types of shrubs (Ulliman et al. 1998). Suitable winter sites need to be no more than 4 miles from leks to be useful to sharp-tails (Ulliman et al. 1998).

In Montana, Columbian sharp-tailed grouse persist only on native bunchgrass-shrub stands (Mussehl et al. 1971; Montana Natural Heritage Program 2004). In some areas, conversion of native habitats to cropland, range management, and/or herbicide use has resulted in loss of native grasses, forbs, and woody vegetation, which are habitat components necessary for providing shelter from winter weather, protection from predators, nesting cover, and food (Mussehl et al. 1971; Montana Natural Heritage Program 2004). Over the past 15 years, much of the historical Columbian sharp-tailed grouse habitat in western Montana has been subject to considerable urban development, resulting in further habitat fragmentation, likely increases in nest-predator abundance, and reduced habitat function. Self-sustaining populations of sharp-tailed grouse require thousands of acres of intact habitat; large blocks of cropland or urban developed habitat are not conducive for supporting sustainable populations (Ulliman et al. 1998). Sharp-tailed grouse habitats associated with the Helmville and Eureka areas are not considered sufficient to support viable populations over time (Montana Partners in Flight 2004).

Management

As there is only one, possibly two, small populations of Columbian sharp-tailed grouse in Montana, critical efforts must be maintained to encourage individuals to seek and use lek areas. Careful population counts must be made, as well as counts of nesting sites and breeding success. Counting individuals at leks is the easiest way to monitor population trends. Wildlife agencies monitor leks because their size and density provide an index to populations and indirectly reflect changes in habitat quality (Cannon and Knopf 1981; Giesen and Connelly 1993).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Isolated and extremely small population	Increase abundance and distribution of Columbian sharp-tailed grouse with reintroduction program into northwest Montana that includes the development of a captive rearing facility
	Monitor existing populations to determine if management actions are adequate
	Identify validity of Blackfoot population as Columbian subspecies
Human disturbance to leks	Protect known lek areas and surrounding habitats within 2 kilometers, and search for new leks in areas with appropriate physiographic and vegetative characteristics
	Prohibit physical, mechanical, and audible disturbances within the breeding complex during the breeding season (March to June), if they might impact courtship activities and breeding during the daily display period (within three hours of sunrise and sunset)
	Avoid pesticide use on Columbian sharp-tailed grouse habitats
Conversion of native grassland and shrub/grass communities to agriculture and other unsuitable land uses	Solicit cooperation and communication between land managers and landowners in managing habitat
	Coordinate with British Columbia to manage suitable habitat in the Tobacco Plains area
Encroachment of conifers onto grassland habitat	Use prescribed fire to stimulate growth and vigor of deciduous shrubs in wintering areas, as long as a minimum of 10 percent of habitat will provide shrub cover during the recovery period of the burned area
Range management practices	Develop livestock management plans, which favor maintenance or enhancement of bunchgrass communities, forbs species diversity, and upland shrubs
	Develop appropriate grazing regimes in areas of known populations
	Fence areas of deciduous trees and shrubs (especially in riparian areas) to manage livestock

Invasion of non-native annual vegetation	Avoid manipulation or alteration of vegetation within the breeding complex (lek and nesting areas) during the nesting period (mid-April to June)
Predation on nests by ravens and other predators	Protect, maintain, and enhance winter, breeding, and nesting habitats near known populations

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Wood, M. 1991. Management plan for Columbian sharp-tailed grouse in western Montana.

Citations

AOU. 1957. American Ornithological Union Check-list of North American Birds, pp. 137–139. The Lord Baltimore Press, Inc., Baltimore, MD.

Aldrich, J. W. 1963. Geographic orientation of American Tetraonidae. Journal of Wildlife Management 27:529–545.

Baydack, R. K., and D. A. Hein. 1987. Tolerance of sharp-tailed grouse to lek disturbance. Wildlife Society Bulletin 15:535–539.

Cannon, R. W., and F. L. Knopf. 1981. Lek numbers as a trend index to prairie grouse populations. Journal of Wildlife Management 45:776–778.

Deeble, B. D. 1996. Conservation of Columbian sharp-tailed grouse, with special emphasis on the upper Blackfoot Valley, Montana. Unpublished M.S. thesis, University of Montana, Missoula, MT.

Dickerman, R. W., and J. P. Hubbard. 1994. An extinct subspecies of sharp-tailed grouse from New Mexico. Western Birds 25:128–136.

Giesen, K. M., and J. W. Connelly. 1993. Guidelines for management of sharp-tailed grouse habitats. Wildlife Society Bulletin 21:325–333.

Karl, J. 2000. Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*). Digital atlas of Idaho. http://imnh.isu.edu/digitalatlas (accessed May 25, 2004).

Kessler, W. B., and R. P. Bosch. 1982. Sharp-tailed grouse and range management practices in western rangelands. 1982. Pp. 133–136 in proceedings

of wildlife-livestock relationships symposium. J. M. Peek and P. Dallce, eds. University of Idaho, Moscow, ID.

Montana Natural Heritage Program Online Database. http://MNHP.nris.state.mt.us/animalguide (accessed April 26, 2004).

Montana Partners in Flight. http://biology.dbs.umt.edu/landbird/mbpc (accessed April 26, 2004).

Mussehl, T., P. Schladweiler, and R. Weckwerth. 1971. Forest grouse. Pp. 143–151 in T. W. Mussehl and F. W. Howell, eds. Game management in Montana. Montana Fish and Game Department, Game Management Division, Helena, MT.

NatureServe. 2004. NatureServe explorer. An online encyclopedia of life. Version 3.0. NatureServe, Arlington, VA. http://www.natureserve.org/explorer (accessed April 22, 2004).

Saab, V. A., and J. S. Marks. 1992. Summer habitat use by Columbian sharp-tailed grouse in western Idaho. Great Basin Naturalist 52:166–173.

Ulliman, M. J., A. Sands, and T. Hemker. 1998. Conservation Plan for Columbian Sharp-tailed Grouse and its Habitat in Idaho (draft). Draft document on file at the Forest Supervisor's Office, Idaho Falls, ID.

U.S. Fish and Wildlife Service (USFWS). 1999. Endangered and threatened wildlife and plants: 90-day finding on a petition to list the Columbian sharp-tailed grouse as threatened. Federal Register: October 26, 1999. V. 64, No. 206, pp. 57620–57623.

Young, Lewis. 1995 (unpublished). Range Permit Re-issuance: Columbian Sharp-tailed Grouse. Kootenai National Forest, Eureka, MT.

Yellow Rail (*Coturnicops noveboracensis*)

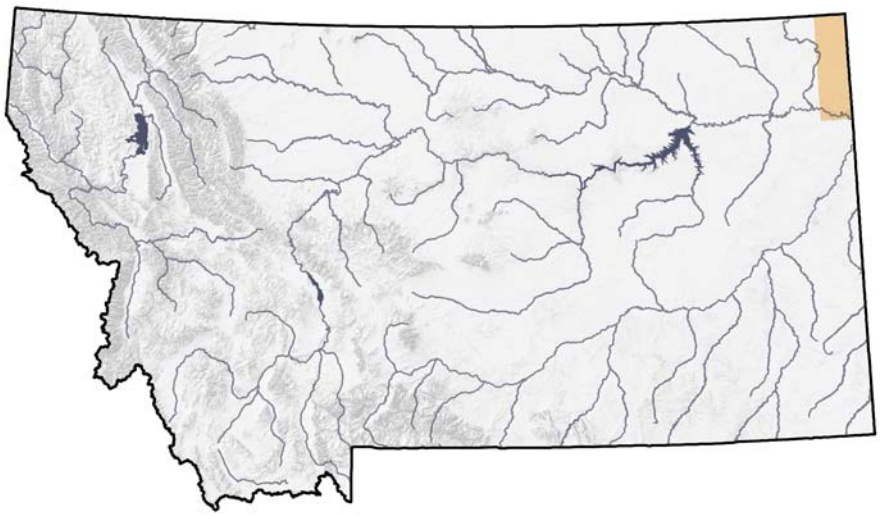


Figure 75. Distribution of the Yellow Rail
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

With fewer than 20 known observations in the state, this species is considered rare. Wright (1997) indicates that the yellow rail is known to occur regularly in the northeastern corner of the state and is rare elsewhere. The first recorded observation in the state was reported in Medicine Lake in 1943. Other sightings of the species have occurred across the state, with reports from the East Bay of Flathead Lake (the farthest west the species has been reported in the state), Red Rock Lakes, Huntley (Yellowstone County), the Bowdoin National Wildlife Refuge, and Westby (Montana Bird Distribution 2003).

Habitat

Breeding habitat selection is similar to that of other locations and consists of wet sedge (*Carex* spp.) meadows and other wetlands containing grasses, rushes (*Juncus* spp.), and bulrushes (*Scirpus* spp.) (Northern Prairie Wildlife Research Center 2003). Presence of the yellow rail is most commonly dictated by water depth, specifically one that fluctuates throughout the breeding season, i.e., wet in the early part of the breeding season and relatively dry (no standing water) by July or September (Northern Prairie Wildlife Research Center 2003).

Management

Outside of the national wildlife refuges, no management activities are known that specifically address conservation of yellow rails in Montana. Yellow rails are a

Species of Management Concern in USFWS Region 6 (U.S. Fish and Wildlife Service 1995).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Little known information in Montana	Increased survey and monitoring projects
Human disturbance of wetland habitats	Conservation practices of wetlands
Water level manipulation at nesting locations	Manage reservoirs and dammed rivers in a manner that mimics more natural seasonal fluctuations

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Kushlan, James A., Melanie J. Steinkamp, Katherine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, DC. 78 pp.

Citations

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Northern Prairie Wildlife Research Center: Biological Resources—Eastern Bluebird. United States Geological Survey: http://www.npwrc.usgs.gov (last updated February 21, 2003).

U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Government Printing Office: 1996-404-911/44014. 22 pp.

Wright, P. L. 1997. Status of Rare Birds in Montana, With Comments on Known Hybrids. Northwestern Naturalist 77:57–85.

Whooping Crane (*Grus americana*)

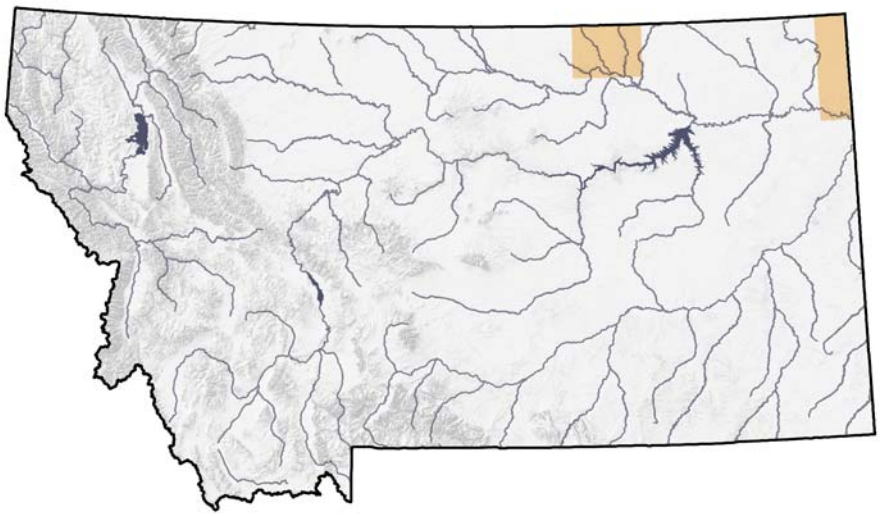


Figure 76. Distribution of the Whooping Crane
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The earliest report of a whooping crane in the state is credited to Maximilian, Prince of Wied, for his observation of a flock of a few individuals above the mouth of the Musselshell River in September 1833 (Skaar, unpublished notes). Skaar (unpublished notes) also indicates that reports of this species for the next 90 years were scarce: singular reports exist for Big Sandy (1903), Terry (1904), and Billings (1918).

Individual, transient whooping cranes have been reported throughout the eastern portions of the state, with most of those records for Sheridan (Medicine Lake National Wildlife Refuge) and Roosevelt counties (MBD 2003). Historical observations of the species in the west-central portion of the state are also recorded; those reported the farthest west include observations in Gallatin County (west of Bozeman) in 1967 and Broadwater County (northwest of Townsend) in 1979 (Skaar, unpublished notes). For the past 20 years, observations have been restricted to the northeastern corner of the state, with limited sightings of individuals at Red Rock Lakes National Wildlife Refuge. Reports of the birds from Red Rock Lakes are the result of the reintroduction effort to establish a population at Grays Lake, Idaho, which was a nonreproducing flock. The last bird observed at Red Rocks was seen in 2002, and it is presumed that since the Grays Lake flock is no longer extant, whooping cranes will most likely not be seen at Red Rock Lakes until another regional population is established. The birds observed in the eastern corner of Montana

are occasional migrants traveling through from the Aransas population on their journey to breeding grounds in Alberta and the Northwest Territories.

Habitat

The whooping crane has been observed and breed at or within the marsh habitat present at Medicine Lake National Wildlife Refuge and Red Rock Lakes National Wildlife Refuge. Observations of individual birds in other areas of the state include grain and stubble fields as well as wet meadows, wet prairie habitat, and freshwater marshes that are usually shallow and broad with safe roosting sites and nearby foraging opportunities (MBD 2003).

Management

Efforts continue to protect and restore wetlands in the northeastern corner of Montana, in the area where whooping cranes have migrated in the past. There are also continued efforts to educate crane and waterfowl hunters on the identification of whooping cranes in an effort to avoid accidental harvest.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat degradation and fragmentation of native prairies	Habitat conservation in northeast Montana (outside Medicine Lake NWR)
Human disturbance to nesting locations	Prohibition of public access to breeding locations, including aircraft
	Periodic census to evaluate productivity
Potential petroleum spills in the wintering areas of Port Aransas	Work with other states to continue conservation efforts for Whooping crane
Human misidentification as sandhill cranes during hunting season	Hunter education

Management Plans

Kushlan, James A., Melanie J. Steinkamp, Katherine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, DC. 78 pp.

Olsen, David L. 1980. Whooping Crane Recovery Plan. Whooping Crane Recovery Team (USFWS, Nebraska Game and Parks Commission, Texas Parks & Wildlife Department, National Audubon Society). 206 pp.

Citations

Johnsgard, P. A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the northern Rocky Mountain region. Colorado Associated University Press, Boulder, CO. 504 pp +xi.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Piping Plover (*Charadrius melodus*)

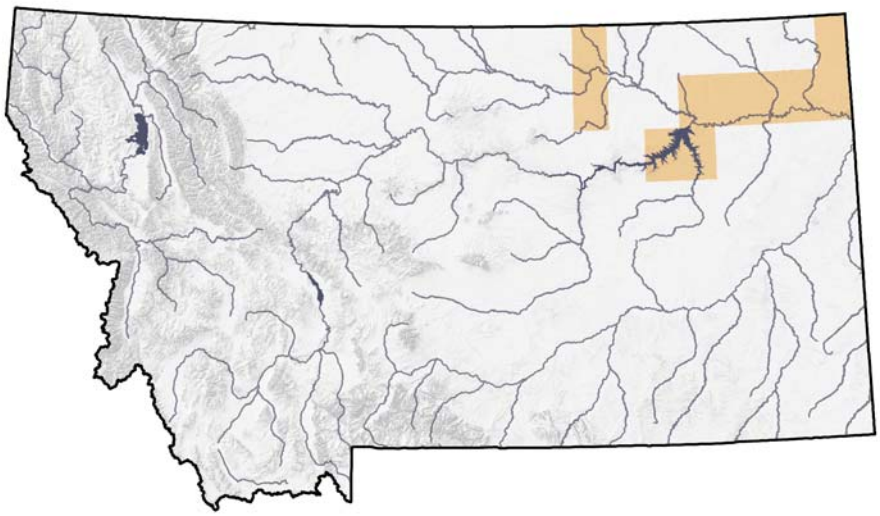


Figure 77. Distribution of the Piping Plover
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

Piping plovers are limited to the open shorelines of freshwater or alkaline lakes, reservoirs, rivers, or wetlands. The piping plover is generally a species of northern and northeastern Montana. This species is known to breed in Medicine Lake National Wildlife Refuge, Sheridan County, the Missouri River below Fort Peck Dam, Fort Peck Reservoir, Nelson Reservoir, Bowdoin National Wildlife Refuge (occasionally), and Alkali Lake (Montana Piping Plover Recovery Committee (MPPRC) 1994; Montana Bird Distribution 2003).

Observations of nonbreeding individuals have been recorded at Freezeout Lake Wildlife Management Area, the south end of Canyon Ferry Reservoir, and Park County (MPPRC 1994; Montana Bird Distribution 2003), though it is presumed the species uses other appropriate habitat in the state during migration.

The piping plover usually arrives in Montana in early May and leaves the state by late August. The earliest reported observation dates for the species are April 28, Fort Peck Reservoir (MPPRC 1994) and April 28, Upper Goose Lake, Sheridan County (Montana Bird Distribution 2003). Most of the observations reported in the state are for breeding individuals or for activity that suggests breeding.

Reports of piping plovers during migration are not common, but do occur just east of the Rocky Mountains (Montana Bird Distribution Committee 1996). Although they were known to breed at Bowdoin National Wildlife Refuge and Fort Peck Reservoir, little attention was paid to the species prior to its listing in 1985.

As a result, few observations are recorded prior to 1985 (Montana Bird Distribution 2003).

Habitat

Piping plovers primarily select unvegetated sand or pebble beaches on shorelines or islands in freshwater and saline wetlands. Vegetation, if present at all, consists of sparse, scattered clumps (Casey 2000). Open shorelines and sandbars of rivers and large reservoirs in the eastern and north-central portions of the state provide prime breeding habitat (MFWP 2003). In Montana and throughout the species' range, nesting may occur on a variety of habitat types. If conditions are right, alkali wetlands, lakes, reservoirs, and rivers can all provide the essential features required for nesting. The alkali wetlands and lakes found in the northeastern corner of the state generally contain wide, unvegetated, gravelly, salt-encrusted beaches. Rivers that flood adequately can supply open sandbars or gravelly beaches, as can large reservoirs, with their shoreline beaches, peninsulas, and islands of gravel or sand (USFWS 2003).

Sites with gravel substrate provide the most suitable sites for nesting (MPPRC 1994). One of the most limiting factors to nesting site selection is vegetation encroachment; piping plovers avoid areas where vegetation provides cover for potential predators. Fine-textured soils are easier to treat mechanically than rocky or gravelly soils when vegetation is determined as a limiting factor in an area's ability to provide suitable nesting habitat, but fine soils are not typically a preferred nesting substrate (MPPRC 1994). Another, and more important, limiting factor in nest site selection is the location of nesting sites in relation to surrounding water levels. Nests are often inundated because water levels are kept unnaturally high throughout the breeding season (and high winds can cause nests to be flooded), or nesting sites are not available, either because of encroaching vegetation or because water levels are so high that beaches are underwater during the early part of, and possibly throughout, the nesting season (MPPRC 1994). Nests are simple scrapes dug into the nest substrate, which may or may not be lined with pebbles (MPPRC 1994, 1995; Haig 1992).

Management

Four specific geographic areas recognized as providing critically important habitat and identified as essential for the conservation of the species have been designated as "Critical Habitat Units" in Montana by USFWS. The designation of critical habitat may require federal agencies to develop special management actions affecting these sites. The four units include prairie alkali wetlands and surrounding shoreline; river channels and associated sandbars and islands; and reservoirs and inland lakes with associated shorelines, peninsulas, and islands (USFWS 2003). Piping plovers rely on these places for courtship, nesting, foraging, and brood rearing. The first, Unit 1, contains alkali lake and wetland habitat found in Sheridan County. Unit 2 is identified as riverine habitat and

includes the Missouri River just south of Wolf Point to the state line, encompassing habitat provided by the sparsely vegetated sandbars and sandy or gravelly beaches along this stretch of the river. Reservoirs, which include similar sandbars and sandy or gravelly beach habitat, define both Units 3 and 4. Unit 3 includes Fort Peck Reservoir, from south of the dam to and including approximately 26 miles (north to south distance) of the length of Dry Arm. Portions of the Bowdoin National Wildlife Refuge, the majority of Lake Bowdoin, and the western portion of Dry Lake, were designated as Unit 4. Piping plovers nest at Nelson Reservoir north of the Bowdoin National Wildlife Refuge, but are not contained within any of the Critical Habitat Units in the state. This reservoir was excluded from the critical habitat designation because of a memorandum of understanding between the Bureau of Reclamation, the U.S. Fish and Wildlife Service, and the local irrigation districts. The memorandum, in combination with a biological opinion from the USFWS, guides management actions at this location (USFWS 2003).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Destruction and degradation of summer and winter habitat	Protection of as much existing native prairie as feasible, primarily by conservation easements
	Conservation practices, including education, for nest locations which includes nest movement to safer areas
Shoreline erosion	Restoration of drained wetlands
Loss of nesting sites by high water levels	Timing spring flow releases from Fort Peck Dam to more closely mimic the natural seasonal flows of the river
Human disturbances of nesting and foraging birds	Avoid oil and gas development near wetlands
Predation	Direct predator management

Management Plans

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.
Haig, S., et al. 1994. Revised recovery plan for piping plovers (*Charadrius melodus*) breeding on the Great Lakes and northern Great Plains.

Technical/agency review draft. Great Lakes/Northern Great Plains Piping Plover Recovery Team. 121 pp.

Haig, S., et al. 1988. Recovery plan for piping plovers (*Charadrius melodus*) of the Great Lakes and northern Great Plains. U.S. Fish and Wildlife Service, 160 pp.

Montana Piping Plover Working Group. 2003. Montana Piping Plover Management Plan. Unpublished report. 35 pp.

Citations

Erickson, K., and D. M. Prellwitz. 1999. Piping plover surveys for Nelson Reservoir, Bowdoin NWR and Hewitt Lake NWR.

Haig, S. M. 1992. Distribution and status of piping plovers in winter. Abstract, 6th Annual Meeting of the Society for Conservation Biology, pp. 69.

Montana Bird Distribution Committee. 1996. Skaar's Montana Bird Distribution, 5th ed. Special Publication No. 3. Montana Natural Heritage Program, Helena, MT. 130 pp.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Montana Department of Fish, Wildlife & Parks. 2003. Online informational search on piping plovers in Montana. http://www.fwp.state.mt.us/wildthings/t&e/threatened.asp.

Montana Piping Plover Recovery Committee. 1995. 1994 surveys for piping plover (*Charadrius melodus*) and least tern (*Sterna antillarum*) in Montana. 117 pp. + appendices.

Montana Piping Plover Recovery Committee. 1994. 1993 surveys for piping plover (*Charadrius melodus*) and least tern (*Sterna antillarum*) in Montana. Unpublished report. 116 pp. plus appendices.

U.S. Fish and Wildlife Service. 2003. Online informational search on piping plover in Montana. http://mountain-prairie.fws.gov/pipingplover/Piping_Plover_Q&A_Sept5.htm.

Mountain Plover (*Charadrius montanus*)

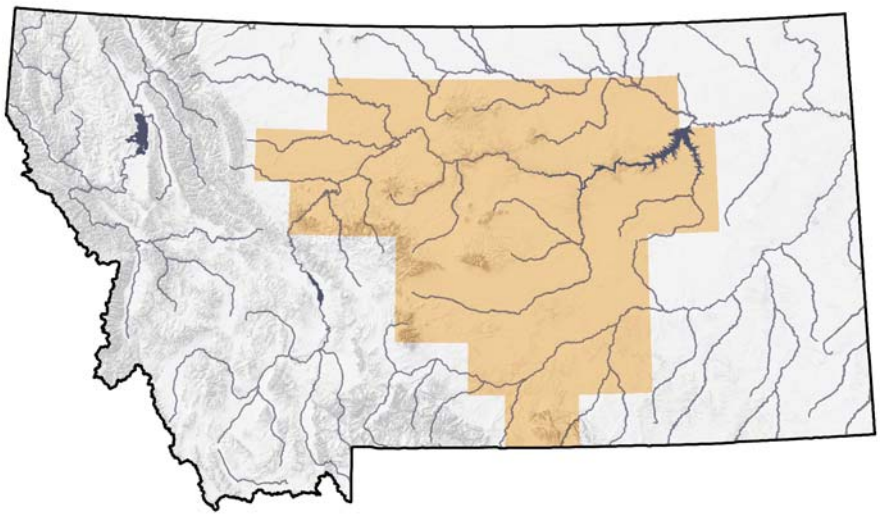


Figure 78. Distribution of the Mountain Plover
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

Primary breeding habitat of the mountain plover is found in the north-central portion of the state in Phillips, Blaine, and northern Fergus and Petroleum counties (FaunaWest 1995). This area contains the largest population of mountain plovers in Montana, with additional breeding areas in the state in Valley County (Little Beaver Creek) in the northeastern portion of the state; in Wheatland, Golden, and Musselshell counties near the Little Belt, Big Snowy, and Little Snowy mountains in central Montana; and in Jefferson, Madison, and Broadwater counties in the southwestern portion of the state (FaunaWest 1995). Additionally, surveys in 2003 revealed mountain plovers in Big Horn, Carbon, Fergus, Hill, Petroleum, Rosebud, and Treasure counties (Federal Register 68).

Mountain plovers arrive in April and may remain in the state as late as early October (Johngard 1986; Dinsomore 2001; Grensten 2005). The species is a rare migrant west of the Continental Divide, but is a breeding resident of the prairie lands to the east.

Habitat

Habitat use in Montana appears similar to other areas within the species' global breeding range, i.e., use of prairie dog colonies are primarily used in Montana; however, other short-grass prairie sites are confirmed as preferred breeding habitat. Records indicate the species utilizes towns of both white-tailed (*Cynomys leucurus*) and black-tailed prairie dogs (*Cynomys ludoviscianus*) (MBD

2003). Prairie dog towns provide greater horizontal visibility, a higher percentage of bare ground, refugia for consumption, and a higher diversity of forbs than adjacent areas (Olsen 1985). Mountain plovers will use towns as small as 3 hectares (Knowles et al. 1982); the average in one study was 57.5 hectares (Knowles and Knowles 1984), from 6 to 50 hectares in another study (Olson-Edge and Edge 1987), and from 2 to more than 150 hectares in another (Dinsmore 2001).

Primary habitat use in Montana during the breeding season includes heavily grazed, short-grass prairie sites. Habitat in Phillips and Blaine counties, the area containing the largest known populations of mountain plover in the state, is dominated by the native plant species *Bouteloua gracilis* and *Koeleria cristata.* This area also contains *Stipa comata*, *Agropyron smithii*, *Carex* spp., *Artemisia frigida*, *Opuntia polyacantha*, and *Gutierrezia sarothrae* (FaunaWest 1991). Knowles (1993) determined that in the northeastern portion of the state, mountain plover also selected sites associated with habitat dominated by *Atriplex gardneri* and *Eriogonum multiceps*, while use in the central and southwestern areas of the state was associated with *Bouteloua gracilis* and *Stipa comata*. Strong preference was also given to sites with slopes less than 5 percent and grass height of less than 6 centimeters (3 inches) (Knowles, Maj, and Hinckley 1995). Knowles (1993) indicates that sites selected within these habitat types were restricted to areas intensively grazed by prairie dogs, sheep, and/or cattle, especially those of the *Stipa comata* and *Bouteloua gracilis* habitat type (Knowles and Knowles 1997).

Management

Only the Bureau of Land Management (BLM) has some management activities specific to mountain plover; increased coordinated management activities in Montana are needed. However, the unifying habitat features desirable to mountain plovers are extremely short vegetation, a high percentage of bare soil, and an extensive area (0.5 to 1 kilometer in diameter) of nearly level terrain (Knowles and Knowles 1997). Management practices should emulate these parameters to ensure that these populations persist. Several studies have suggested specific conservation actions that could be taken to benefit mountain plover habitat (Wershler 1989; FaunaWest Wildlife Consultants 1991; Knopf 1991; Carter and Barker 1993; U.S. Fish and Wildlife Service 1995; Dinsmore 2001).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of livestock grazing (increase in vegetation height above 4 inches or 30 percent cover)	Cooperate with resource users in order to support sustainable domestic livestock practices that promote mountain plover habitat

Invasive non-native plant species	Shrub and noxious weed encroachment should be controlled at known and potential breeding sites
Habitat loss of short-grass prairies due to conversion to cropland	Existing native grassland should be protected from conversion to cropland
Decrease in prairie dog colonies	Continued management and potential enhancement to prairie dog colonies

Management Plans

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Citations

Carter, M. F., and K. Barker. 1993. An interactive database for setting conservation priorities for western neotropical migrants. U.S.D.A. Forest Service General Technical Report RM-229: 120–144.

Dinsmore, Stephen J. 2001. Population Biology of Mountain Plovers in Southern Valley County, Montana. Dissertation, Colorado State University. 109 pp.

FaunaWest Wildlife Consultants. 2004. Mountain Plover Population Trends for Three Montana Sites. Report to Montana Fish, Wildlife & Parks. FaunaWest Wildlife Consultants, Boulder, MT. 8 pp.

FaunaWest Wildlife Consultants. 1995. Mountain plover numbers, reproduction, and habitat use in three areas of Montana. Unpublished report. Bureau of Land Management, Billings, MT. 26 pp.

FaunaWest Wildlife Consultants. 1991. Status and breeding distribution of the mountain plover in Montana. Report to USDI Bureau of Land Management. FaunaWest Wildlife Consultants, Boulder, MT. 44 pp.

Grensten, John. 2004. Personal communication with Stephen Dinsmore.

Johnsgard, P. A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the northern Rocky Mountain region. Colorado Associated University Press, Boulder, CO. 504 pp. + xi.

Knopf, F. L. 1991. Status and conservation of mountain plovers: the evolving regional effort. Report of research activities, USFWS National Ecology Research Center, Fort Collins, CO, 9 pp.

Knowles, C., and P. Knowles. 1997. Mountain Plover Numbers, Reproduction, and Habitat Use in Montana: A Summary of Six Survey Years. FaunaWest Wildlife Consultants. Prepared for the Montana Department of Fish, Wildlife & Parks, Great Falls, MT, and the Bureau of Land Management, Billings, MT. April, 22, 1997.

Knowles, C., P. Knowles, M. Maj, and D. Hinckley. 1995. Mountain Plover Numbers, Reproduction, and Habitat Use in Three Areas of Montana. Prepared by FaunaWest Wildlife Consultants for Bureau of Land Management, Billings, MT.

Knowles, C. J., and P. R. Knowles. 1993. Mountain plover numbers, reproduction, and habitat use in three areas of Montana. Unpublished report for the Bureau of Land Management, Billings, MT. 50 pp.

Knowles, C. J., and P. R. Knowles. 1984. Additional records of mountain plovers using prairie dog towns in Montana. Prairie Naturalist 16:183–186.

Knowles, C. J., C. J. Stoner, and S. P. Gieb. 1982. Selective use of black-tailed prairie dog towns by mountain plovers. Condor 84:71–74.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Olson, S. L. 1985. Mountain plover food items on and adjacent to a prairie dog town. Prairie Naturalist 17(2):83–90.

Olson, S. L., and D. Edge. 1985. Nest site selection by mountain plovers in north-central Montana. Journal of Range Management 38(3):280–282.

Olson-Edge, S. L., and W. D. Edge. 1987. Density and distribution of the mountain plover on the Charles M. Russell National Wildlife Refuge. The Prairie Naturalist 19(4):233–238.

U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Government Printing Office:1996-404-911/44014. 22 pp.

Wershler, C. R. 1989. A management strategy for mountain plovers in Alberta. Proc. Prairie Cons. Endangered Species Workshop, Saskatchewan Natural History Society and Canadian Plains Resource Center. 5 pp.

Long-billed Curlew (*Numenius americanus*)

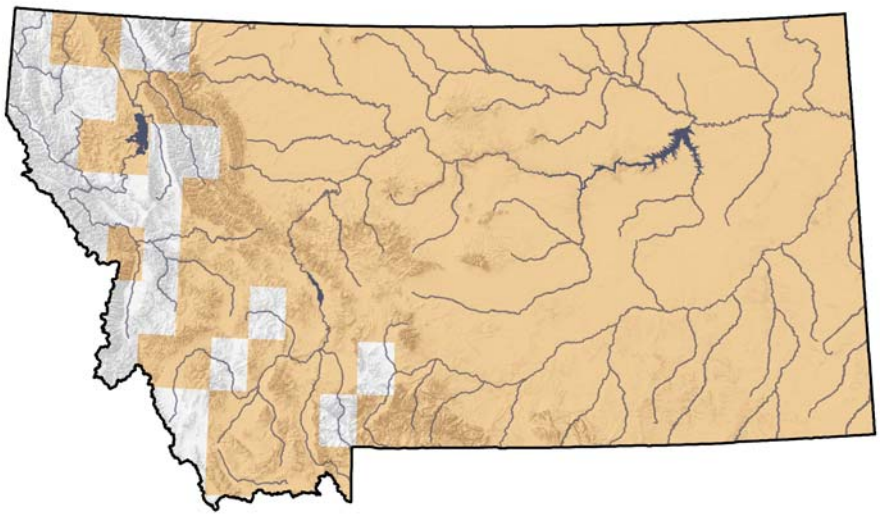


Figure 79. Distribution of the Long-billed Curlew
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The long-billed curlew breeds widely throughout the state, although it is more common east of the Rocky Mountains. Long-billed curlews do not overwinter in Montana.

Habitat

Long-billed curlews have four essential nesting habitat requirements in the northwestern United States: short grass (less than 30 centimeters, or 11.8 inches tall), bare ground components, shade, and abundant invertebrate prey. Long-billed curlews prefer native prairies but also occupy grazed mixed-grass communities and scrub prairies. Long-billed curlews probably select sites because of shortness of vegetation and the spacing of grass clumps. Because they rely on camouflage for protection of their eggs and themselves during incubation, the short grass presumably allows for better visibility of approaching danger, and the irregular pattern of grass clumps complements their cryptic coloration. They typically prefer areas with well-drained, gravelly soils and low, rolling terrain. Proximity to water may be another important factor in breeding habitat.

Management

Long-billed curlews are closely associated with grassland and shrub grassland habitats. Management should therefore be directed at protection and

enhancement of those habitats. Habitat areas need to be more than three times as large as a long-billed curlew's territory, which averages about 14 hectares (34.6 acres), in order for curlews to use them.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss (e.g., sodbusting, weed invasion, general conversion of prairie lands to other uses)	Prevent sodbusting, subdivision, and conversion of prairie lands to other land uses
Breeding habitat within state is either fragmented, unprotected, or mismanaged	Provide large blocks of suitable habitat
	Management activities and grazing should be delayed until after the breeding season (approximately July 15)
Human-directed disturbance to grassland habitats (disturbance includes impacts of cattle grazing, roads, and adjacent land activities, and may include pesticide application and draining of wetlands)	Maintain vertical structure through appropriate management techniques such as light grazing, haying, and occasional prescribed burning during nonbreeding season

Management Plans

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Citations

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, P. A. Rabie, and B. R. Euliss. 2000. Effects of management practices on grassland birds: long-billed curlew. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/fplbcu/fplbcu.htm (Version 29FEB2000).

Hart, M. M., W. A. Williams, P. C. Thornton, K. P. McLaughlin, C. M. Tobalske, B. A. Maxell, D. P. Hendricks, C. R. Peterson, and R. L. Redmond. 1998. Long-billed curlew (*Numernius americanus*) in Montana atlas of terrestrial vertebrates,

pp. 269–271. Unpublished report. Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT.

Redmond, R. L., and D. A. Jenni. 1986. Population ecology of the long-billed curlew (*Numernius americanus*) in western Idaho. Auk 103:755–767.

Interior Least Tern (*Sterna antillarum athalassos*)

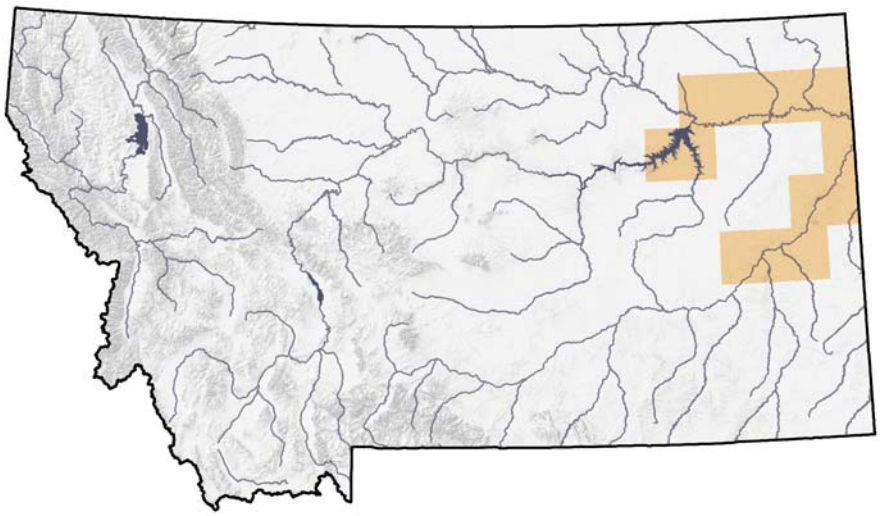


Figure 80. Distribution of the Interior Least Tern
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

Montana defines the western portion of the interior least tern's range. The species breeds along the lower portions of the Missouri River below Fort Peck Dam, on the beaches of Fort Peck Reservoir, and on the Yellowstone River below Glendive. Records of transient individuals are few and are limited primarily to these same areas (Montana Bird Distribution 2003).

Habitat

Interior least terns nest on unvegetated sand-pebble beaches and islands of large reservoirs and rivers in northeastern and southeastern Montana, specifically the Yellowstone and Missouri river systems (Christopherson et al. 1992). These wide-open river channels and lake and pothole shorelines provide the preferred characteristics for nesting terns. Sites with a gravel substrate provide the most suitable sites for nesting (Montana Piping Plover Recovery Committee (MPPRC) 1994). One of the most limiting factors to nesting site selection is vegetation encroachment; terns avoid areas where relatively thick vegetation provides cover for potential predators. Fine-textured soils are easier to treat mechanically than rocky or gravelly soils when vegetation is determined as a limiting factor in an area’s ability to provide suitable nesting habitat, but fine soils are not typically a preferred nesting substrate (MPPRC 1994).

In Montana, as in other areas, another and more important limiting factor in nest site selection is the location of nesting sites in relation to surrounding water

levels. Nests are often inundated because water levels are kept unnaturally high throughout the breeding season (and high winds can cause nests to be flooded) or nesting sites are not available, either because of encroaching vegetation or because water levels are so high that beaches are underwater during the early part of, and possibly throughout, the nesting season (MPPRC 1994).

Management

As identified in the recovery plan for the interior least tern, delisting can be considered when four censuses confirm that the interior population has reached 7,000 and remains stable for at least ten years. The goal for the Missouri River system is 2,100 birds (census numbers in 2003 revealed 735 birds for the Missouri River in total) (Pavelka, personal communication 2003). Appropriate water management, which includes natural seasonal flows, is identified as the major consideration for interior least tern conservation in Montana, because the greatest threat to breeding pairs, in some years, is the loss of existing nesting sites from inundation by high water during the breeding season (MPPRC 1994).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Human use and predation on adults, eggs, and young by birds (e.g., kestrels, night-herons, crows, northern harriers, gulls) and mammals (e.g., foxes, skunks, weasels, opossum, rats, feral hogs, and domestic cats and dogs)	Predator control
	Control access of nest locations to humans
Chemical spills and pesticide or heavy metal pollution	Decrease point and nonpoint inputs of pesticides and heavy metals into rivers and floodplains
Human modification of river flow (e.g., reduction of spring floods by dams) and bank stabilization and channelization, resulting in reduced availability of bare island/sandbar nesting habitat	Decrease human modifications of flows on larger rivers and Fort Peck Reservoir
	Conservation of riparian areas in northeast Montana, decreasing human impacts
Loss of aquatic habitat diversity and resulting changes in fish species composition and abundance	Work with agencies, organization and public to support native species conservation

Unsustainable irrigation may be a threat by lowering water levels/flows and reducing river areas when terns are breeding	Beach enhancement

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Kushlan, James A., Melanie J. Steinkamp, Katherine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, D.C. U.S.A., 78 pp.

U.S. Fish and Wildlife Service. 1990. Recovery plan for the interior population of the least tern (*Sterna Antillarum*). Twin Cities, MN. 90 pp.

Citations

Burger, J., and M. Gochfeld. 1990. Nest site selection in least terns (*Sterna Antillarum*) in New Jersey and New York. Colonial Waterbirds 13:31–40.

Christopherson, D. M., D. M. Prellwitz, and M.J. Rabenberg. 1992. Status of piping plovers and least tern in Montana.

Erickson, K., and D. M. Prellwitz. 1999. Piping plover surveys for Nelson Reservoir, Bowdoin NWR and Hewitt Lake NWR.

Figg, D. E. 1993. Missouri Department of Conservation wildlife diversity report, July 1992–June 1993. 75 pp.

Grover, P. B., and F. L. Knopf. 1982. Habitat requirements and breeding success of charadriiform birds nesting at Salt Plains National Wildlife Refuge, Oklahoma. Journal of Field Ornithology 53:139–148.

Montana Bird Distribution Committee. 1996. Skaar's Montana Bird Distribution, 5th ed. Special Publication No. 3. Montana Natural Heritage Program, Helena, MT. 130 pp.

Montana Bird Distribution Online Database. 2003. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Montana Department of Fish, Wildlife & Parks. 2003. Online information search on least tern in Montana. http//www.fwp.state.mt.us/wildthings/t&e/threatened.asp (accessed May 19, 2003).

Montana Piping Plover Recovery Committee. 1994. 1993 surveys for piping plover (*Charadrius melodus*) and least tern (*Sterna antillarum*) in Montana. Unpublished report. 116 pp. + appendices.

Pavelka, Greg. 2003. Threatened and Endangered Species Specialist. U.S. Army Corps of Engineers, Operations Division, Omaha District, Gavings Pt. Project Office. Personal communication regarding recent river censuses of least terns in Montana. August 12, 2003.

Schulenberg, J., and M. Ptacek. 1984. Status of the interior least tern in Kansas. American Birds 38:975–981.

Zickefoose, J. 1985. Least tern/piping plover recovery program. Final report to The Nature Conservancy, Connecticut Chapter. 22 pp.

Black Tern (*Chlidonias niger*)

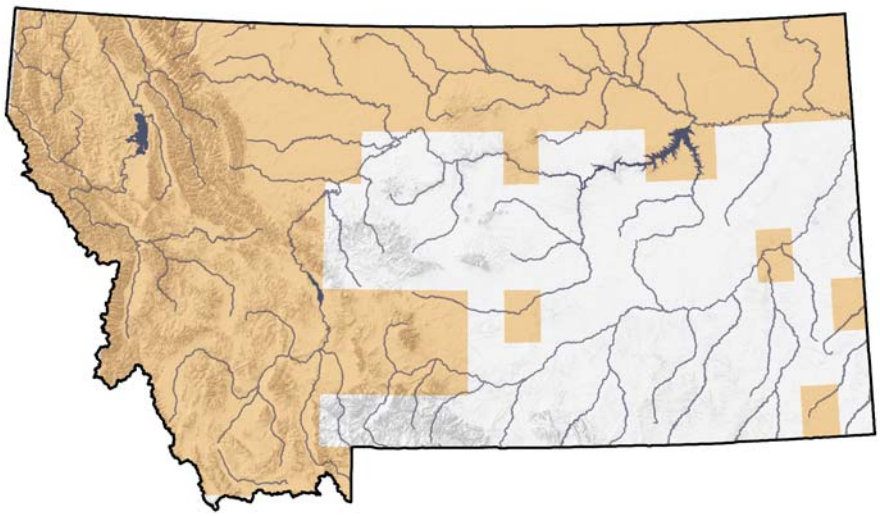


Figure 81. Distribution of the Black Tern
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

Black terns have been documented breeding in 12 Montana counties, most located in the northern half of the state. From east to west they include Sheridan, Phillips, Blaine, Cascade, Teton, Ponderosa, Glacier, Powell, Flathead, and Lake counties. Breeding records also exist for Beaverhead County in southwest Montana and Carter County in the southeast corner of the state.

Unconfirmed breeding also has been recorded in at least five more counties (Montana Bird Distribution 2003; MNHP 2003). Even though breeding black tern colonies are located throughout many areas of Montana, this apparently wide-ranging distribution is misleading. Black terns are limited to breeding locations with appropriate habitat, size, and vegetative composition. These limitations likely account for their widely scattered distribution. Black terns can nest wherever appropriate habitat exists, but appropriate habitat in Montana is patchy at best.

Little information is known about black tern migratory patterns in Montana. They are more likely to move north from wintering locations in the interior of the United States (Dunn and Argo 1995), so early sightings should occur in southern portions of the state. Migrating black terns have been observed just north of Dillon as early as April. However, the majority of spring migration observations have been in May and June. Black terns have been observed in transit in July and August albeit fewer observations, probably due to peak breeding. The latest recorded observation was in September near Medicine Lake National Wildlife Refuge in Sheridan County (Montana Bird Distribution 2003). Migration in fall is

less concentrated through the interior of the country because the birds also move to coastal areas (Dunn and Argo 1995).

Habitat

Black tern breeding habitat in Montana is mostly wetlands, marshes, prairie potholes, and small ponds. However, several locations are on man-made islands or islands in man-made reservoirs. Across all Montana sites where black terns are present, approximately 30 to 50 percent of the wetland complex is emergent vegetation. Vegetation within known breeding colonies includes alkali bulrushes, canary reed-grass, cattail spp., sedge spp., rush spp., reed spp., grass spp., *Polygonum* spp., *Juncus* spp., and *Potamogeton* spp., indicating that a wide variety of potential habitats are usable by black terns. Water levels in known breeding localities range from about 0.5 meters to greater than 2.0 meters, with most having depths between 0.5 and 1.0 meters (MNHP 2003).

Management

Active management for black terns in Montana is currently limited to continued population monitoring and water level fluctuation control. Several black tern colonies are under federal or state control, and population monitoring at those locations is completed annually. This monitoring can range from basic observation counts to nest location surveys. At some sites, federal or state agencies also monitor and regulate water levels during the breeding season for black terns, as well as other wetland species and waterfowl.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss or degradation of wetlands for breeding and migration	Incorporate black tern habitats (known and potential) into any wetland restoration programs
	Undertake continued management actions at waterfowl management areas to reduce salinity and selenium concentrations
	Continued water level regulation on impounded rivers and reservoirs at nesting locations
Human disturbance in nesting colonies	Implement a public education and sighting program, similar to the program for common loon nesting sites
Lack of information	Continue monitoring at breeding locations

Pesticide reduction of favored insect foods	Reduce nutrient loading from runoff at known black tern nesting sites

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Kushlan, James A., Melanie J. Steinkamp, Katherine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, D.C. U.S.A., 78 pp.

Citations

Dunn, E. H., and D. J. Agro. 1995. Black tern (*Chlidonias niger*). In: The Birds of North America, No. 147, A. Poole and F. Gill, eds. Philadelphia, PA: The Academy of Natural Sciences and Washington, DC: The American Ornithologists' Union. 24 pp.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Montana Natural Heritage Program (MNHP): Biological and Conservation Database. 2003. Helena, MT. (Accessed: March 20, 2003.)

Flammulated Owl (*Otus flameolus*)

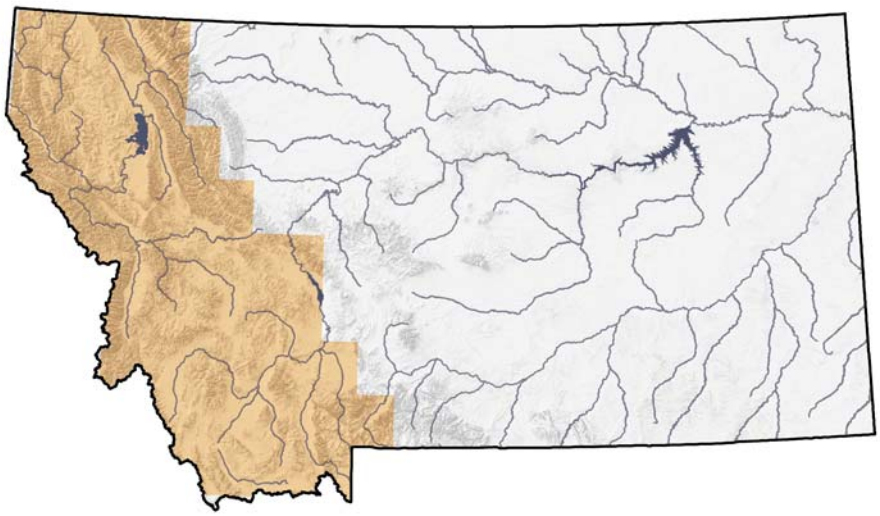


Figure 82. Distribution of the Flamulated Owl
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The range of flammulated owls in Montana is restricted to the western portion of the state, which includes areas east of the Continental Divide. Montana Bird Distribution notes eight observation records since 1996, with confirmed breeding in the Bitterroot Valley (Lenard et al. 2003). Additional breeding occurrences are confirmed in the Helena, Missoula, and Bozeman areas (Montana Bird Distribution Online Database 2001). Other areas of suspected breeding occur throughout western Montana. Low-elevation, old-growth ponderosa pine areas are especially important for flammulated owls.

Habitat

Information on breeding habitat in Montana is limited to one study in the Bitterroot Valley (Wright 2000). In Montana flammulated owls are associated with mature and old-growth xeric ponderosa pine/Douglas-fir stands (Holt and Hillis 1987; Wright et al. 1997) and in landscapes with higher proportions of suitable forest and forest with low to moderate canopy closure (Wright et al. 1997). They are absent from warm and humid pine forests and mesic ponderosa pine/Douglas-fir stands (McCallum 1994a; Wright et al. 1997). Information gathered from other studies throughout their range suggest the breeding habitat of flammulated owls is montane forest, usually open conifer forests containing pine with some brush or saplings (typical of the physiognomy of pre-European settlement ponderosa pine forests). The species shows a strong preference for ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*P. jeffreyi*) throughout its

range (McCallum 1994b). They prefer mature growth with open canopy and avoid dense young stands. Flammulated owls are found in a cooler, semiarid climate, with a high abundance of nocturnal arthropod prey and some dense foliage for roosting (McCallum 1994a). Most often they are found on ridges and upper slopes (Bull et al. 1990; Groves et al. 1997). The species may focus foraging in a few “intensive foraging areas” within the home range, averaging 1 hectare per range (Linkhart 1984, cited in McCallum 1994b).

In British Columbia, flammulated owls use dry interior Douglas-fir (*Pseudotsuga menziesii*) where ponderosa pine may be a codominant but pure ponderosa pine is avoided. A study in the Kamloops area testing a habitat model in Douglas-fir/ponderosa pine found three variables to be significant predictors for occupied habitat: elevation (between 850 and 1,150 meters), age class (older stands), and canopy closure (40 to 50 percent) (Christie and van Woudenberg 1997).

In Idaho they are found mostly in mature stands of ponderosa pine, Douglas-fir, or mixtures of the two with relatively open canopies (Atkinson and Atkinson 1990) and occasionally in stands of pure Douglas-fir or aspen where ponderosa pine is absent. In northeastern Oregon, nest trees were located in stands of old-growth ponderosa pine or mixed conifers near small clearings (Bull and Anderson 1978). In Colorado they show strong preference for old-growth ponderosa pine and Douglas-fir, using older trees for foraging and singing (Reynolds and Linkhart 1992; Linkhart and Reynolds 1997).

Territories consistently occupied by breeding pairs were those containing the largest portion (more than 75 percent) of old-growth (200 to 400 years), whereas territories occupied by unpaired males and rarely by breeding pairs contained 27 to 68 percent old-growth (Linkhart and Reynolds 1997). Aspen (*Populus tremuloides*) is often a component of nesting habitat in Colorado and Nevada (Reynolds and Linkhart 1987b; McCallum 1994b). In northern Utah the species has successfully nested in nest boxes in montane deciduous forests dominated by aspen with some scattered firs (Marti 1997).

Flammulated owls roost in dense vegetation and thickets that provide shade and protection from predators. They often roost close to the trunks of fir or pine trees, or in cavities (McCallum 1994b; USDA Forest Service 1994). In Oregon they use mixed coniferous forest rather than pure ponderosa pine (Goggans 1986, cited in McCallum 1994a). In Colorado large Douglas-firs or pines with a spreading form are used (Linkhart 1984, cited in McCallum 1994a). Flammulated owls roost close to nests (20 to 25 meters) during the nestling stage and just before fledging, and farther away before and after (McCallum 1994a). In British Columbia, they roost in regenerating thickets of Douglas-fir (Howie and Ritcey 1987). Migration habitat is in wooded and open areas in lowlands and mountains, including riparian areas and breeding habitat (McCallum 1994a).

Wright (1996) in the Bitterroot and Sapphire mountains in west-central Montana found flammulated owls in the breeding season related to the presence of snags and large trees near a nest area, openings at the territory scale, and the presence of low or moderate canopy closure in stands of ponderosa pine or Douglas-fir with a mosaic of grass/shrubs and forest edge.

McCallum (1994a) and Hayward and Verner (1994) provide substantive reviews of flammulated owl habitat, behavior, and general ecology. The preferred breeding habitat hosts a high diversity or abundance of nocturnal arthropods (primarily insects). Prey availability appears to be the primary factor for migration, and patterns in migration and winter habitat requirements are poorly known.

Management

No specific management activities for flammulated owls are currently occurring in Montana; however, management for old-growth ponderosa pine habitats is ongoing by a number of land management agencies, including the U.S. Forest Service (USFS). Management for this habitat type will be beneficial for flammulated owls in Montana. The USFS Region 1 designates the flammulated owl as a sensitive species.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of old-growth forests	Conservation of old-growth forests
Inadequate monitoring efforts	Continue monitoring efforts, to include night monitoring
Found in cluster distributions so that one catastrophic event could lead to loss of population	Evaluate the quality and quantity of suitable but unoccupied habitat or habitat that would be suitable with restoration
Fire suppression	Consider use of prescribed fire near mature forest stands to reduce understory stocking and enhance the shrub component
Use of herbicides or insecticides near nests	Do not use insecticides near nest sites

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Citations

Atkinson, E. C., and M. L. Atkinson. 1990. Distribution and status of flammulated owls (*Otus flammeolus*) on the Salmon National Forest. Unpublished report. Idaho Natural Heritage Program, Idaho Department of Fish and Game, Salmon National Forest. 25 pp. + appendices.

Bull, E. L., A. L. Wright, and M. G. Henjum. 1990. Nesting habitat of flammulated owls in Oregon. Journal of Raptor Research 24:52–55.

Bull, E. L., and R. G. Anderson. 1978. Notes on flammulated owls in northeastern Oregon. Murrelet 59:26–28.

Christie, D. A., and A. M. van Woudenberg. 1997. Modeling critical habitat for flammulated owls (*Otus flammeolus*). Pp. 97–106 in J. R Duncan, D. H. Johnson, and T. H. Nicholls, eds. Biology and conservation of owls in the Northern Hemisphere. U.S.D.A. Forest Service General Technical Report.

Goggans, R. 1986. Habitat use by flammulated owls in northeastern Oregon. Master's thesis, Oregon State University, Corvallis, OR.

Groves, C., T. Frederick, G. Frederick, E. Atkinson, M. Atkinson, J. Shepard, and G. Servheen. 1997. Density, distribution, and habitat of flammulated owls in Oregon. Great Basin Naturalist 57:116–123.

Hayward, G. D., and J. Verner. 1994. Flammulated, boreal, and great gray owls in the United States. General Technical Report RM-253, U.S.D.A. Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Holt, D. W., and J. M. Hillis. 1987. Current status and habitat associations of forest owls in western Montana. Pp. 281–288 in biology and conservation of northern forest owls: symposium proceedings, February 3–7, Winnipeg, Manitoba. General Technical Report RM-142.

Howie, R. R., and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. Pp. 249–254 in B87NER01.

Lenard, S., J. Carlson, J. Ellis, C. Jones, and C. Tilly. 2003. P. D. Skaar's Montana Bird Distribution, 6th ed. Montana Audubon Society, Helena, MT. 144 pp. + vi.

Linkhart, B. D., and R. T. Reynolds. 1997. Territories of flammulated owls (*Otus flammeolus*): is occupancy a measure of habitat quality? Pp. 150–154. J. R. Duncan, D. H. Johnson, and T. H. Nicholls, eds. Biology and conservation of owls in the Northern Hemisphere.

Linkhart, B. D. 1984. Range, activity, and habitat use by nesting flammulated owls in a Colorado ponderosa pine forest. Master's thesis, Colorado State University, Fort Collins, CO.

Marti, C. 1997. Flammulated owls (*Otus flammeolus*) breeding in deciduous forests. Pp. 262–266 in J. R. Duncan, D. H. Johnson, and T. H. Nicholls, eds. Biology and conservation of owls in the Northern Hemisphere. U.S.D.A. Forest Service General Technical Report.

McCallum, D. A. 1994a. Flammulated owl (*Otus flammeolus*). In The Birds of North America, No. 93, A. Poole and F. Gill, eds. Philadelphia, PA: The Academy of Natural Sciences and Washington, DC: The American Ornithologists' Union. 24 pp.

McCallum, D. A. 1994b. Review of technical knowledge: flammulated owls. Pp. 14–46 in G. D. Hayward and J. Verner, eds. Flammulated, boreal and great gray owls in the United States: a technical conservation assessment. U.S.D.A. Forest Service General Technical Report.

Montana Bird Distribution Online Database. 2001. Helena, Montana, USA. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Redmond, R. L., M. M. Hart, J. C. Winne, W. A. Williams, P. C. Thornton, Z. Ma, C. M. Tobalske, M. M. Thornton, K. P. McLaughlin, T. P. Tady, F. B. Fisher, and S. W. Running. 1998. The Montana Gap Analysis Project: Final Report. Unpublished report. Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT.

Reynolds, R. T., and B. D. Linkhart. 1992. Flammulated owls in ponderosa pine: evidence of preference for old growth. In M. R. Kaufmann, W. H. Moir, and R. L. Bassett (tech. coord.). Old-growth forests in the Southwest and Rocky Mountain regions. U.S.D.A. Forest Service General Technical Report RM-213. 201 pp.

Reynolds, R. T., R. A. Ryder, and B. D. Linkhart. 1989. Small forest owls. Pp. 131–143 in National Wildlife Federation. Proceedings of the western raptor management symposium and workshop. National Wildlife Federation Scientific and Technical Series No.

Reynolds, R. T., and B. D. Linkhart. 1987. The nesting biology of flammulated owls in Colorado. Pp. 239–248 in R. W. Nero et al., eds. Biology and conservation of northern forest owls. U.S.D.A. Forest Service General Technical Report RM-142.

U.S.D.A. Forest Service. 2004. Draft Multiple Species Inventory and Monitoring Technical Guide. Ecotype Management Coordination. U.S.D.A. Forest Service, Washington DC.

U.S.D.A. Forest Service (USFS). 1994. Neotropical Migratory Bird Reference Book. U.S.D.A. Forest Service, Pacific Southwest Region. 832 pp.

Van Woudenberg, A. M. 1999. Status of the flammulated owl (*Otus flammeolus*) in British Columbia. Working Report No. 96, British Columbia Ministry of Environment, Lands, and Parks, Victoria, B.C. 45 pp.

Wright, V. 1996. Multi-scale analysis of flammulated owl habitat use: owl distribution, habitat management, and conservation. Unpublished M.S. thesis, University of Montana, Missoula, MT.

Wright, V., S. Hejl, and R. L. Hutto. 1997. Conservation implications of a multi-scale study of flammulated owl (*Otus flammeolus*) habitat use in the northern Rocky Mountains, USA. Pp. 506–516 in J. R. Duncan, D. H. Johnson, and T. H. Nicholls, eds. B

Wright, V. 2000. The Aldo Leopold Wilderness Research Institute: A National Wilderness Research Program in Support of Wilderness Management. In Stephen F. McCool, David N. Cole, William T. Borrie, Jennifer O'Loughlin, comps. Wilderness Science in a Time of Change Conference Vol. 3: Wilderness as a place for scientific inquiry, May 23–27, 1999, Missoula, MT. Proc. RMRS-P-15-VOL-3. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Pp. 260–268.

Burrowing Owl (*Speotyto cunicularia*)

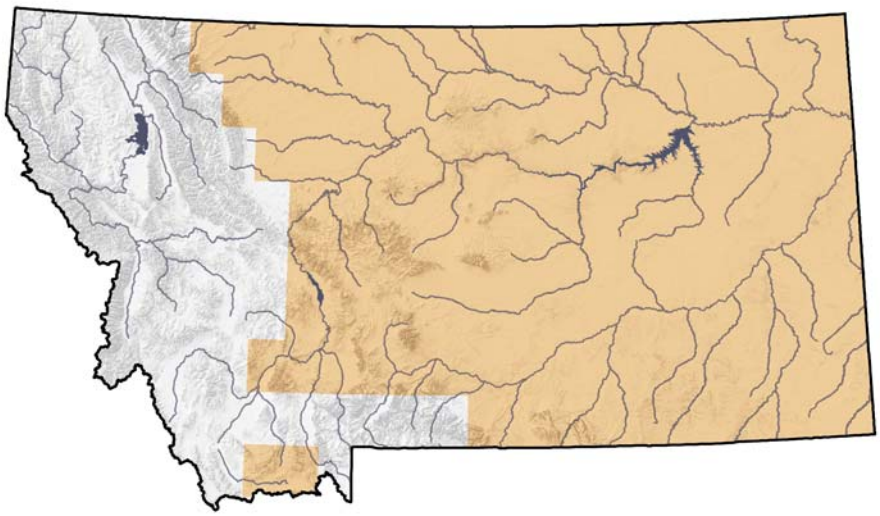


Figure 83. Distribution of the Burrowing Owl
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

Burrowing owls continue to be widely distributed in appropriate habitat east of the Continental Divide (Lenard et al. 2002).

Habitat

The burrowing owl breeds in habitats ranging from open grasslands (Orth and Kennedy 2001) to savanna and in some areas of human habitation (e.g., airports, golf courses, road rights-of-way) (Jones and Bock 2002). Areas used for breeding are often associated with burrows created by small mammals (e.g., prairie dogs, badgers, yellow-bellied marmots, and others) (Haug et al. 1993).

The presence of burrows is a critical habitat requirement and are often found abandoned by mammals in open grasslands. In Montana, black-tailed prairie dog (*Cynomys ludoviscianus*) and Richardson's ground squirrel (*Spermophilus richardsonii*) colonies provide the primary and secondary habitats for burrowing owls (Klute et al. 2003). The burrows may be enlarged or modified, making them more suitable. Burrowing owls spend much of their time on the ground or on low perches such as fence posts or dirt mounds.

Management

Wildlife managers outside of Montana have tried conservation actions such as the creation of artificial burrows and perches for burrowing owls and the regulation/protection of burrowing mammals. Successful approaches should be considered.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Elimination of burrowing mammals that provide critical habitat	Continued maintenance, monitoring, and surveying of burrowing mammals and their colonies
Habitat loss and fragmentation due to agricultural and urban development	Conservation easements and other conservation practices that recover or protect native prairie grassland areas
Petroleum exploration and development	Research the impacts such as road building and water retention pond construction as they relate gas and oil development activities
Residual effects of pesticide use	Continue monitoring residual levels of contaminants
Nest site disturbance	Increased education and information to increase awareness of importance of nesting sites and reducing disturbance

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Klute, D. S., L. W. Ayers, M. T. Green, W. H. Howe, S. L. Jones, J. A. Shaffer, S. R. Sheffield, and T. S. Zimmerman. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. U.S. Department of the Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, DC.

Citations

Gervais, J. A., and R. G. Anthony. 2003. Chronic organochlorine contaminants, environmental variability, and demographics of a burrowing owl population. Ecological Applications 13:1250–1262.

Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. In Birds of North America, No. 61, A. Poole and F. Gill, eds. Academy of Natural Science, Philadelphia, PA, and American Ornithologist's Union, Washington, DC.

Jones, Z. F., and C. E. Bock. 2002. Conservation of grassland birds in an urbanizing landscape: a historical perspective. Condor 104:643–651.

Lenard, S., J. Carlson, J. Ellis, C. Jones, and C. Tilly. 2003. P. D. Skaar's Montana Bird Distribution, 6th ed. Montana Audubon Society, Helena, MT.144 pp + vi.

Orth, P. B., and P. L. Kennedy. 2001. Do land-use patterns influence nest site selection by burrowing owls (*Athene cuncularia hypugaea*) in northeastern Colorado. Canadian Journal of Zoology 79:1038–1045.

Todd, L. D., R. G. Poulin, T. I. Wellicome, and R. M. Brigham 2003. Post-fledging survival of burrowing owls in Saskatchewan. Journal of Wildlife Management 67: 51–519.

Black-backed Woodpecker (*Picoides arcticus*)

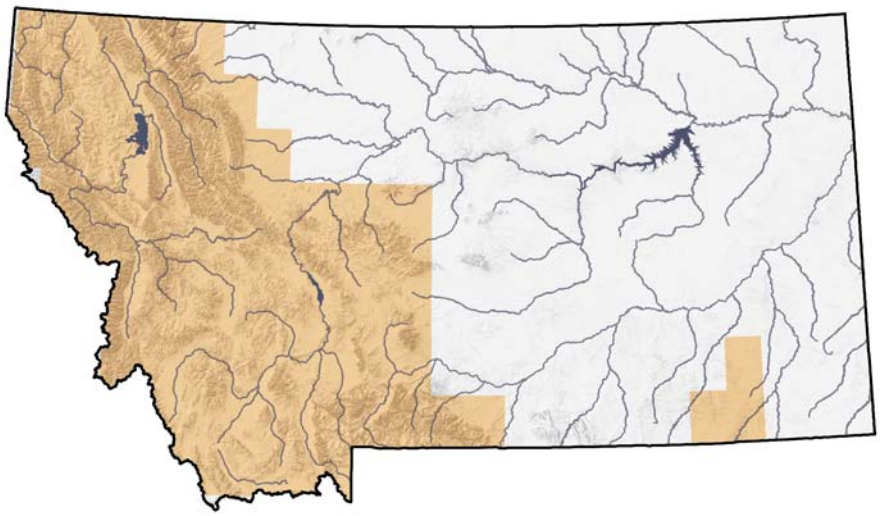


Figure 84. Distribution of the Black-backed Woodpecker
(Distribution reflects entire range and does not discriminate between breeding and non-breeding areas)

Range

The range of the black-backed woodpecker in Montana is primarily confined to the western portion of the state. The Montana Bird Distribution (2003) and the Montana Natural Heritage Program (2003) have approximately 16 confirmed breeding records for the species. Except for a single record from the south-central area of the state (southern Park County), all the breeding records are located in northwestern counties (Lincoln, Sanders, Flathead, Missoula, Lewis and Clark, and Powell) (MBD 2003). Unconfirmed but potential breeding records also exist for black-backed woodpeckers and would expand their range to most counties in the western part of the state, including areas in southwestern Montana, the Big and Little Belt mountains area, and the Bridger Range (MBD 2003). Several unconfirmed breeding records also exist for a small area in southeast Montana (Custer National Forest) (MBD 2003).

The black-backed woodpecker breeds from central Alaska and northern Canada south to the mountainous regions of California, Wyoming, the Black Hills, the upper Great Lakes, the New England states, and into Newfoundland. Like most woodpeckers, they feed on insects living in dead or diseased trees and hunt for wood-boring insects by peeling away patches of dead bark.

Habitat

The habitat of black-backed woodpeckers in Montana is early successional burned forest of mixed conifer, lodgepole pine, Douglas-fir, and spruce-fir (Hutto

1995a, 1995b), although they are more numerous in lower elevation Douglas-fir and pine forest habitats than in higher elevation subalpine spruce forest habitats (Bock and Bock 1974). This is supported by Harris (1982), who found black-backed woodpeckers in two recently burned forests composed of 73 percent and 77 percent Douglas-fir, respectively. They appear to concentrate in recently burned forests and remain for several years (three to five) before leaving due to prey source decline (Harris 1982). In northwestern Montana, black-backed woodpeckers nested in areas of western larch (*Larix occidentalis*)/Douglas-fir forest with a major component of old growth (McClelland et al. 1979). Harris (1982) found black-backed woodpeckers nesting within western larch even though the stand was predominately Douglas-fir. McClelland et al. (1979) determined that the decay of heartwood within a hard outer shell of western larch creates an ideal nesting site for black-backed woodpeckers to excavate.

The black-backed woodpecker is thought to be sedentary during the winter months. Black-backed nests have been monitored in Idaho (burned ponderosa pine forests), Wyoming (burned lodgepole pine forests), Oregon (unburned mixed-pine forest with bark-beetle outbreaks), and Montana (patchily burned mixed-conifer forests) (Dixon and Saab 2000). Bent (1939) found that more than 75 percent of the black-backed woodpecker's diet was composed of cerambycids (flatheaded wood borers) and buprestids (round-headed woodborers). It is believed the black-backed is able to more effectively extract wood-boring insect larva than other woodpeckers (Kirby 1980).

The value in long-term observations is evident in understanding wildlife habitat relationships (Sergio and Newton 2003). Information from the Montana Heritage Program (through May 2003) and the Idaho Data Conservation Center (through January 2003) show most black-backed woodpecker nests (n = 14) in Idaho are near (within 1,000 meters) or within insect outbreaks. In Montana, nest site information is lacking, but most observations are in or near insect outbreaks or recently burned areas. More detailed information of black-backed nest sites, foraging, and general behavior and ecology in the breeding season is found in recently published reviews (Dixon and Saab 2000) and peer-reviewed literature (McIver and Starr 2001; Hoyt and Hannon 2002).

Management

No known active management is ongoing for black-backed woodpeckers in the state. Studies by the U.S. Forest Service in the Rocky Mountains with locations in Montana has been underway in the last few years to provide more information about black-backed woodpecker habitat needs and ecology.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Increased timber harvest	Work with agencies and companies that work in forest management to promote conservation practices
Fire suppression	Decrease fire suppression to allow natural occurrences in isolated areas
Removal of fire-killed or insect-infested trees	Manage “salvage” logging techniques in order to provide sufficient snags
	Leave parts of fire areas unsalvaged, in blocks as large as practicable
Conversion of mature and old-growth forests to young stands with few decayed trees	Ensure that fire, insects, and wind are allowed to regularly disturb habitat throughout space and time
Human disturbance near nest sites	Avoid human-related factors that may impact behavior

Management Plan

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Citations

Bent, A. C. 1939. Life histories of North American woodpeckers. U.S. National Museum Bulletin 174, Washington DC.

Bock, C. E., and J. H. Bock. 1974. On the geographical ecology and evolution of the three-toed woodpeckers (*Picoides tridactylus* and *P. arcticus*). American Midland Naturalist 92(2):397–405.

Caton, E. M. 1996. Cavity nesting birds in a post-fire habitat in northwestern Montana. Ph.D. dissertation, University of Montana, Missoula, MT.

Dixon, R. D., and V. A. Saab. 2000. Black-backed woodpecker (*Picoides arcticus*). In Birds of North America, No. 509, A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists’ Union, Washington, DC. The Birds of North America, Inc., Philadelphia, PA.

Environment Canada. 1997. Sustaining Canada’s Forests: Timber Harvesting. National Environmental Indicator Series, SOE Bulletin No. 95-4. Online. Available at http://199.212.18.79/ind/English/Forest/Bulletin.

Goggans, R. 1989. Black-backed woodpecker. Pp. 88–89 in T. W. Clark, A. H. Harvey, R. D. Dorn, D. L. Genter, and C. Groves, eds. Rare, sensitive, and threatened species of the Greater Yellowstone ecotype. Northern Rockies Conservation Cooperative.

Gurevitch, J., P. S. Curtis, and M. H. Jones. 2001. Meta-analysis in ecology. Advances in Ecological Research 32:200–241.

Harris, M. A. 1982. Habitat use among woodpeckers in forest burns. M.S. thesis, University of Montana, Missoula, MT. 62 pp.

Hoffman, N. J. 1997. Distribution of *Picoides* woodpeckers in relation to habitat disturbance within the Yellowstone area. M.S. thesis, Montana State University. Bozeman, MT. 74 pp.

Hoyt, J. S, and S. J. Hannon. 2002. Habitat associations of black-backed and three-toed woodpeckers in the boreal forest of Alberta. Canadian Journal of Forest Research. 32:1881–1888.

Hutto, R. L. 1995a. USFS Northern Region Songbird Monitoring Program: Distribution and habitat relationships. U.S.D.A. Forest Service–Northern Region internal report, Missoula, MT.

Hutto, R. L. 1995b. Composition of bird communities following stand-replacement fires in northern Rocky Mountain conifer forests. Conservation Biology 9:1041–1058.

Kirby, V. C. 1980. An adaptive modification in the ribs of woodpeckers and piculets (*Picidae*). Auk 97:521–532.

Kotliar, N. B., S. Heil, R. L. Hutto, V. A. Saab, C. P. Melcher, and M. E. McFadzen. 2002. Effects of fire and post-fire salvage logging on avian communities in conifer-dominated forests of the western United States. Studies in Avian Biology 25:49–64.

McClelland, B. R., S. S. Frissell, W. C. Fischer, and C. H. Halvorson. 1979. Habitat management for hole-nesting birds in forests of western larch and Douglas-fir. Journal of Forestry 77:480–483.

McIver, J. D, and L. Starr, L. 2001. A literature review on the environmental effects of post fire. Western Journal of Applied Forestry 16:159–168.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Reed, J. M. 1995. Relative vulnerability to extirpation of montane breeding birds in the Great Basin. Great Basin Naturalist 55:342–351.

Sergio, I., and I. Newton 2003. Occupancy as a measure of territory quality. Journal of Animal Ecology 72:857–865.

Stohlgren, T. J. 1998. Rocky Mountains. Pp. 473–504 in M. J. Mac, P. A. Opler, C. E. Puckett Haecker, and P. D. Doran, eds. Status and Trends of the Nation's Biological Resources. USDI U.S. Geological Survey, Washington, DC.

Taylor, A. R., and R. L. Knight. 2003. Wildlife responses to recreation and associated visitor perceptions. Ecological Applications 13:951–963.

Thompson, I. D., H. A. Hogan, and W. A. Montevecchi. 1999. Avian communities of mature balsam forests in Newfoundland: age-dependence and implications for timber harvest. Condor 99:311–323.

U.S.D.A. Forest Service. 2004. Draft Multiple Species Inventory and Monitoring Technical Guide. Ecotype Management Coordination. U.S.D.A. Forest Service, Washington DC.

Wisdom, M. J., R. S. Holthausen, B. C. Wales, C. D. Hargis, V. A. Saab, D. C. Lee, W. J. Hann, T. D. Rich, M. M. Rowland, W. J. Murphy, and M. R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia Basin: broad-scale trends and management implications. Vols. 1–3. General Technical Report PNW-GTR-485. U.S.D.A. Forest Service Pacific Northwest Research Station, Portland OR.

Yunick, R. P. 1985. A review of recent irruptions of the black-backed woodpecker and three-toed woodpecker in eastern North America. Journal of Field Ornithology 56:138–152.

Olive-Sided Flycatcher (*Contopus cooperi*)

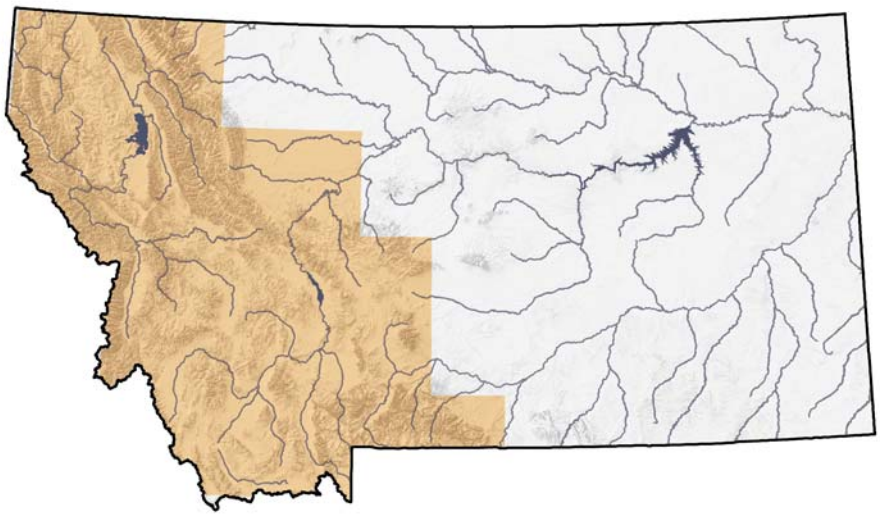


Figure 85. Distribution of the Olive-Sided Flycatcher
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The olive-sided flycatcher breeds throughout mountainous areas of the western portion of the state with unconfirmed reports of breeding in the central region of Montana (Casey 2000; Montana Bird Distribution 2003). The species; propensity for higher elevations, usually from 920 to 2,130 meters, explains the transient nature of individuals reported at locations north and east of Billings (Montana Bird Distribution 2003).

Habitat

A species that generally breeds in the montane and boreal forests in the mountains of western North America, olive-sided flycatchers are highly adapted to the dynamics of a landscape frequently altered by fire. They are more often associated with post-fire habitat than any other major habitat type, but may also be found in other forest openings (clear-cuts and other disturbed forested habitat), open forests with a low percentage of canopy cover, and forest edges near natural meadows, wetlands, or canyons (Hutto and Young 1999; Altman and Sallabanks 2000). Their affinity for forested edges near water may be because of a higher presence of flying insects in these areas (Altman and Sallabanks 2000). The species forages on flying insects aerially from high, exposed perches atop tall trees or snags. They are a species common in spruce and aspen (*Populus tremuloides*), but uncommon in mixed-conifer, ponderosa pine (*Pinus ponderosa*), pine-oak (*Pinus-Quercus*), and cedar-hemlock

(*Cupressaceae-Tsuga*) forests and rarely present in lodgepole pine (*Pinus contorta*) or pinyon-juniper (Hejl et. al. 1995, as cited in Casey 2000).

The olive-sided flycatcher is a contrast species, which used a mosaic of coniferous old forests for nesting and either openings or gaps in old forests for foraging (Altman and Sallabanks 2000). Current habitat conditions are likely inferior in quantity and quality to historical conditions because of changes in historical fire regimes, but the magnitude of the change is unknown (Wisdom et al. 2000). The species is the only common species detected more often at forest edges than in forest interiors.

Management

Management actions in Montana are currently limited by lack of conclusive information about the specific relationship between the species' habitat use and reproductive success. It is yet to be determined if stand-replacing fire regimes or fires of less magnitude provide more appropriate habitat for successful reproduction (Casey 2000). The olive-sided flycatcher is a Species of Management Concern in USFWS Region 6 (U.S. Fish and Wildlife Service 1995).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Fire suppression management	Use prescribed fire, timber harvest, and thinning to change forest composition and structure to restore old open forest conditions
	Identify occupied habitat and evaluate the quality and quantity of unoccupied habitat or habitat that would be suitable with restoration with fire or other action
Decreased post-fire snags and large trees	Selective logging practices
	Retain, maintain, and/or restore stands of open-canopy mature and older ponderosa pine and cottonwood and actively manage to promote long-term sustainability
Conversion of forest to urban and residential areas	Retention of forested edge habitat around riparian and wetland features

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Citations

Altman, B., and R. Sallabanks. 2000. Olive-sided flycatcher (*Contopus cooperi*). In The birds of North America, No. 502, A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA. 28 pp.

Hejl, S.J., R.L. Hutto, C.R. Preston, and D.M. Finch. 1995. Effects of silvicultural treatments in the Rocky Mountains. Pp. 220–244 in T. E. Martin and D. M. Finch, eds. Ecology and management of neotropical migratory birds. Oxford University Press.

Hutto, R. L., and J. S. Young. 1999. Habitat relationships of land birds in the Northern Region, U.S.D.A. Forest Service. General Technical Report RMRS-GTR-32. U.S.D.A. Forest Service, Rocky Mountain Research Station, Ogden, UT.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Montana Online Animal Field Guide. 2004. http://www.fwp.state.mt.us/fieldguide/help.aspx#overview (accessed May 27, 2004). Montana Heritage Program and Montana Department of Fish, Wildlife & Parks. Helena, MT.

U.S.D.A. Forest Service. 2004. Draft Multiple Species Inventory and Monitoring (MSIM) Technical Guide. Ecotype Management Coordination, U.S.D.A. Forest Service, Washington DC.

U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Government Printing Office: 1996-404-911/44014. 22 pp.

Wisdom, M. J., R. S. Holthausen, B. C. Wales, C. D. Hargis, V. A. Saab, D. C. Lee, W. J. Hann, T. D. Rich, M. M. Rowland, W. J. Murphy, and M. R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the interior Columbia Basin: broad-scale trends and management implications. Vols. 1–3. General Technical Report PNW-GTR-485. U.S.D.A. Forest Service Pacific Northwest Research Station, Portland OR.

Sedge Wren (*Cistothorus plantensis*)

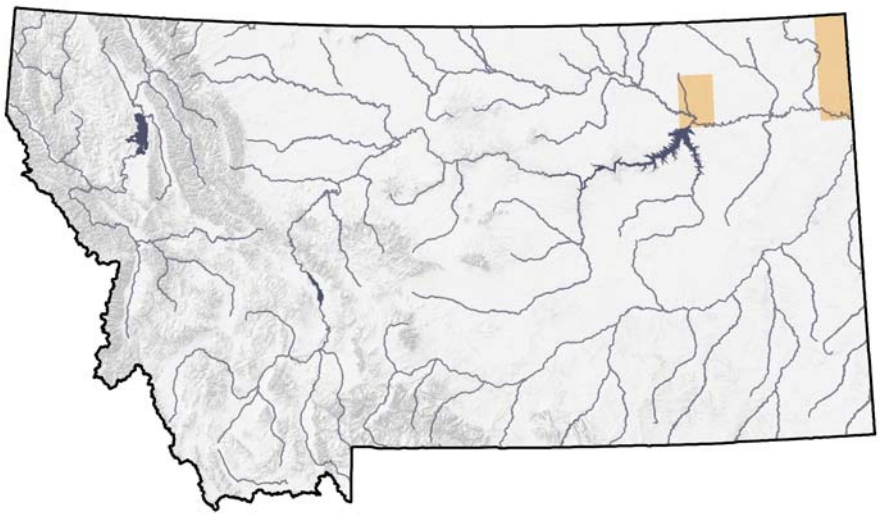


Figure 86. Distribution of the Sedge Wren
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The migratory pattern of this species in Montana is poorly known, and few records exist for the state. The earliest recorded date for the sedge wren in Montana occurred in April 1909 in Gallatin County. Two recent records for Westby and Fort Peck indicate the presence of individuals in May (Montana Bird Distribution 2003).

Habitat

No specific information exists, but appropriate wetland habitat is present in the areas of the state in which the species has been recorded.

Management

No known active management is ongoing for sedge wren in the state. Sedge wrens are a Species of Management Concern in USFWS Region 6 (U.S. Fish and Wildlife Service 1995).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Lack of information	Determine breeding status and identify breeding locations

	Increased survey, inventory, and monitoring projects
Human-directed disturbance to wetland habitats (e.g., disturbance can/does include impacts of cattle grazing, draining, vegetation manipulation, invasion of non-native plant and animal species, etc.)	Appropriate conservation management of wetland habitats of known use by sedge wrens

Management Plan

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Citations

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Government Printing Office: 1996-404-911/44014. 22 pp.

Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*)

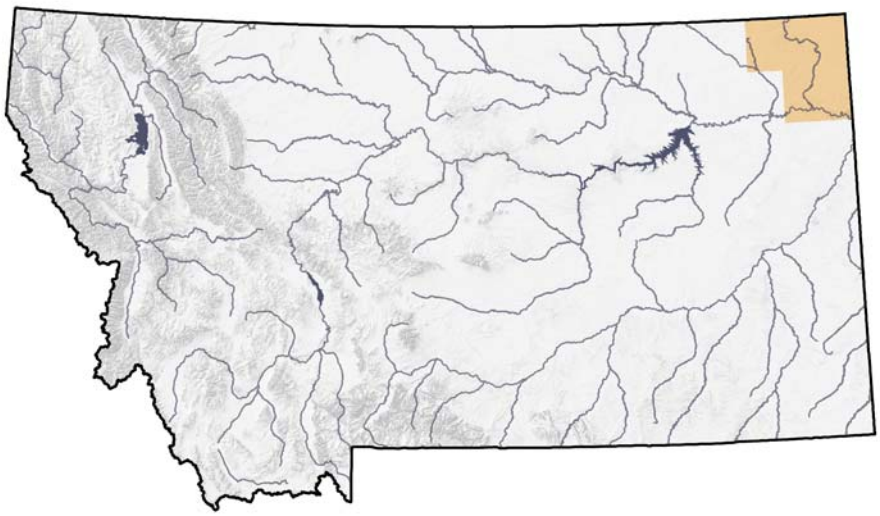


Figure 87. Distribution of the Nelson's Sharp-tailed Sparrow
(Distribution reflects entire range and does not discriminate between breeding and nonbreeding areas)

Range

The Nelson's sharp-tailed sparrow has an extremely limited range in Montana. The species has only been observed in eastern Sheridan and northeastern Roosevelt counties. About a dozen observations for this species have been made, and only a single breeding occurrence has been documented (Montana Bird Distribution 2003; MNHP 2003).

Habitat

There is very little information about the habitat for this species in Montana; however, it is assumed that the habitat is similar to that used in other portions of the species' range. This species prefers freshwater wetlands with dense, emergent vegetation or damp areas with dense grasses (Bownan 1904; Murray 1969; Stewart 1975; Krapu and Green 1978; Knapton 1979; Williams and Zimmer 1992; Berkey et al. 1993). In North Dakota, Nelson's sharp-tailed sparrows were common in prairie cordgrass (*Spartina pectinata*) stands, occurred at the edges of common reed (*Phragmites australis*) stands, and nested in sprangletop (Murray 1969). In northeastern North Dakota, they nested in thin, sparse grass on a wet alkali flat (Rolfe 1899; Hill 1968).

Nests usually are found in stands of grasses with litter that is persistent from year to year (Greenlaw 1993) and are built on or slightly above the ground in damp areas among emergent vegetation (Murray 1969; Stewart 1975). In North Dakota, Nelson's sharp-tailed sparrows are more abundant in dry years than in

wet years (Stewart 1975). In dry years, they nest in the shallow-marsh and deep-marsh zones of wetlands. In wet years, they nest in cordgrass (*Spartina* spp.) within wet-meadow zones.

Management

No known active management is ongoing for Nelson's sharp-tailed sparrows in the state. Conservation Reserve Program practices may provide large blocks of suitable habitat for this species in northeastern Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Not adequately monitored or understood	Increased monitoring and survey efforts, especially breeding sites
Due to small occupied area, risk of extirpation from the state is high	Protection of areas where species is found
Wetland destruction	Wetland restoration and protection
	Increased management of grazing regimes that promote healthy habitat
Parasitism by brown-headed cowbird	Support research to better understand natural relationship between host and parasite

Management Plans

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.

Citations

Berkey, G., R. Crawford, S. Galipeau, D. Johnson, D. Lambeth, and R. Kreil. 1993. A review of wildlife management practices in North Dakota: effects on nongame bird populations and habitats. Report submitted to USFWS Region 6. U.S. Fish and Wildlife Service, Denver, CO. 51 pp.

Bownan, C. W. 1904. Nelson's sharp-tailed sparrow in North Dakota. Auk 21:385–386.

Greenlaw, J. S. 1993. Behavioral and morphological diversification in sharp-tailed sparrows (*Ammodramus caudacutus*) of the Atlantic coast. Auk 110:286–303.

Hill, N. P. 1968. Nelson's sharp-tailed sparrow. Pp. 815–819 in O. L. Austin, Jr., ed. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. Dover Publications Inc., New York, NY.

Knapton, R. W. 1979. Birds of the Gainsborough-Lyleton region. Saskatchewan Natural History Society Special Publication 10. 72 pp.

Krapu, G. L., and R. K. Green. 1978. Breeding bird populations of selected semi-permanent wetlands in south-central North Dakota. American Birds 32:110–112.

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Montana Natural Heritage Program (MNHP): Biological and Conservation Database. 2003. Helena, MT. (Accessed: March 20, 2003.)

Murray, B. G., Jr. 1969. A comparative study of Le Conte's and sharp-tailed sparrows. Auk 86:199–231.

Rolfe, E. S. 1899. Nesting of Nelson's sharp-tailed sparrow (*Ammodramus nelsoni*) in North Dakota. Auk 16:356–357.

Stewart, R. E. 1975. Breeding birds of North Dakota. Tri-College Center for Environmental Studies, Fargo, ND. 295 pp.

Williams, J. D., and M. Zimmer. 1992. First sharp-tailed sparrow South Dakota nesting record. South Dakota Bird Notes 44:84–85.

Mammals

Spotted Bat (*Euderma maculatum*)

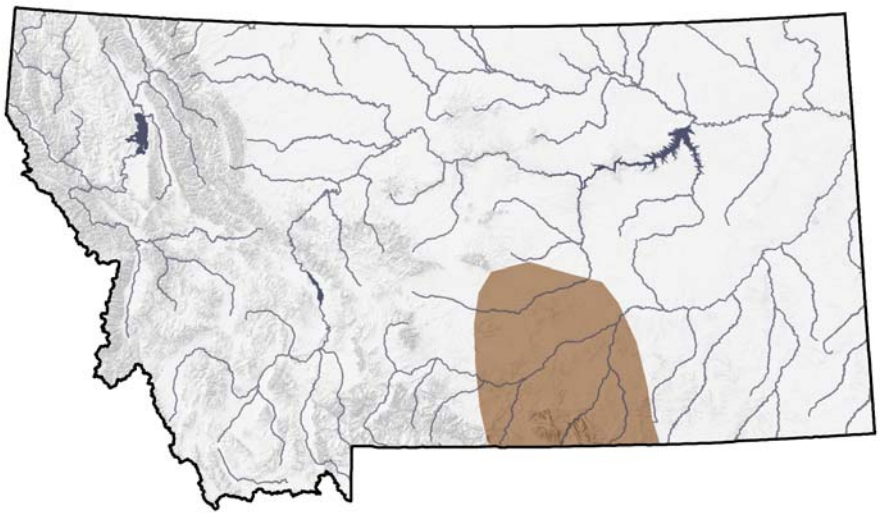


Figure 88. Distribution of the Spotted Bat

Range

The full extent of the spotted bat's range in Montana is unknown due to limited survey efforts and less than two dozen reported encounters (mostly from Carbon County). Spotted bats appear to be restricted to areas east of the Continental Divide in south-central Montana. Voucher specimens exist for Carbon and Yellowstone counties, and there are reports from Big Horn and Powder River counties, all dating from 1949 to 1990 (Nicholson 1950; Fenton et al. 1987; Worthington 1991a, 1991b; Foresman 2001). There also are recent observations from additional localities in Carbon County (Hendricks and Carlson 2001). Recently, they have been heard along the Missouri River at several locations in the Wild and Scenic section (DuBois personal communication 2005). Spotted bats in Montana have been encountered at elevations ranging from 3,124 to 7,800 feet (952 to 2,377 meters).

Habitat

Spotted bats often have been encountered or detected in open, arid habitats in close proximity to tall cliffs. Outside Montana, these areas are sometimes dominated by Utah juniper (*Juniperus osteosperma*) and sagebrush (*Artemisia tridentata* and *A. nova*), sometimes intermixed with limber pine or Douglas-fir, or in grassy meadows in ponderosa pine savannah (Fenton et al. 1987; Worthington 1991b; Hendricks and Carlson 2001). In Montana, these areas are sometimes dominated by Rocky Mountain juniper (*juniperus scopulorum*). Cliffs, rocky outcrops, and water are other attributes of sites where spotted bats have

been found (Foresman 2001), which are typical for the global range. A spotted bat was captured foraging over an isolated pond within a few kilometers of huge limestone escarpments in the Big Horn Canyon National Recreation Area, Carbon County (Worthington 1991a, 1991b), and the first record for the state was of an individual that flew in an open window at a private residence in Billings, Yellowstone County (Nicholson 1950). Spotted bats are now known to be fairly widespread but quite sparse in population, adding to the difficulty of detection (DuBois personal communication 2005). Factors that limit their distribution are not understood, and roost habitats and sites have not been documented in Montana. In other areas, spotted bats have been detected at water sources and in meadow openings, often with large cliffs nearby (Leonard and Fenton 1983; Storz 1995; Perry et al. 1997; Rabe et al. 1998; Gitzen et al. 2001).

Spotted bats roost in caves and in cracks and crevices in the cliffs and canyons with which this species is consistently associated; it can crawl with ease on both horizontal and vertical surfaces (Snow 1974; Van Zyll de Jong 1985). In British Columbia, individuals used the same roost each night during May through July, but not after early August (Wai-Ping and Fenton 1989). Winter habitat is poorly documented. A possible explanation for the early paucity of collections in natural situations is the bat's narrow habitat tolerance (Handley 1959; Snow 1974).

Management

Spotted bats have persisted for more than 50 years in the general area of the state where they were first discovered (Nicholson 1950; Hendricks and Carlson 2001). This is encouraging given that essentially nothing is known in Montana of spotted bat abundance, reproductive biology, habitat requirements, movements, and roost site selection. Their audible calls make a survey much easier to conduct (Pierson and Rainey 1998), because no special skill is needed other than familiarity with the calls and knowledge of the habitats likely to support spotted bats.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Riparian degradation that could affect sustainable prey (moths) populations	Complete the Montana Bat Management Plan (in progress)
Open waste sumps and similar hazardous standing water bodies associated with oil and gas fields	Protection of water sources in arid regions
Lack of information due to difficulty of surveying	Increase monitoring and surveys
Recreational climbing disturbs roost sites	Protect roost sites

Use of pesticides that bats may accumulate through their diet and that kill their prey	Support and cooperate in studies to determine more about the impacts of humans

Management Plans

Altenbach, J. S., W. Amy, P. V. Bradley, P. E. Brown, K. Dewberry, D. B. Hall, J. Jeffers, B. Lund, J. E. Newmark, M. J. O'Farrell, M. Rahn, R. E. Sherwin, C. R. Tomlinson, and J. A. Williams. 2002. Nevada Bat Conservation Plan. Nevada Bat Working Group. Austin, NV. 188 pp.

Ellison, L. E., M. B. Wunder, C. A. Jones, C. Mosch, K. W. Navo, K. Peckham, J. E. Burghardt, J. Annear, R. West, J. Siemers, R. A. Adams, and E. Brekke. 2003. Colorado bat conservation plan. Colorado Committee of the Western Bat Working Group. Available at http://www.wbwg.org/colorado/colorado.htm.

Hinman, K. E., and T. K. Snow, eds. 2003. Arizona Bat Conservation Strategic Plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report (in progress). Arizona Game and Fish Department, Phoenix, AZ.

Citations

Dubois, K. 2005. Personal communication. Native Species Coordinator, Montana Fish Wildlife & Parks. Missoula, MT.

Fenton, M. B., D. C. Tennant, and J. Wyszecki. 1987. Using echolocation calls to measure distribution of bats: the case of *Euderma maculatum*. Journal of Mammalogy 68:142–144.

Foresman, K. R. 2001. The wild mammals of Montana. Special Publication No. 12. American Society of Mammologists.

Gitzen, R. A., S. D. West, and J. A. Baumgardt. 2001. A record of the spotted bat (*Euderma maculatum*) from Crescent Bar, Washington. Northwestern Naturalist 82:28–30.

Handley, C. O., Jr. 1959. A revision of American bats of the genera *Euderma* and *Plecotus*. Proc. U.S. Natl. Mus. 110:95–246.

Hendricks, P., and J. C. Carlson. 2001. Bat use of abandoned mines in the Pryor Mountains. Report to the Montana Department of Environmental Quality, Mine Waste Cleanup Bureau. Montana Natural Heritage Program, Helena, MT. 8 pp.

Leonard, M. L., and M. B. Fenton. 1983. Habitat use by spotted bats (*Euderma maculatum*, Chiroptera: Vespertilionidae): roosting and foraging behavior. Canadian Journal of Zoology 61:1487–1491.

Nicholson, A. J. 1950. A record of the spotted bat (*Euderma maculatum*) for Montana. Journal of Mammalogy 31:197.

Perry, T. W., P. M. Cryan, S. R. Davenport, and M. A. Bogan. 1997. New locality for *Euderma maculatum* (Chiroptera: Vespertilionidae) in New Mexico. Southwestern Naturalist 42:99–101.

Pierson, E. D., and W. E. Rainey. 1998. Distribution of the spotted bat, (*Euderma maculatum*), in California. Journal of Mammalogy 79:1296–1305.

Rabe, M. J., M. S. Siders, C. R. Miller, and T. K. Snow. 1998. Long foraging distance for a spotted bat (*Euderma maculatum*) in northern Arizona. Southwestern Naturalist 43:266–269.

Snow, C. 1974. Habitat management series for endangered species Report No. 4. Spotted bat (*Euderma maculatum*). USDI Bureau of Land Management Technical Note TN 170.

Storz, J. 1995. Local distribution and foraging behavior of the spotted bat (*Euderma maculatum*) in northwestern Colorado and adjacent Utah. Great Basin Naturalist 55(1):78–83.

Van Zyll de Jong, C. G. 1985. Handbook of Canadian mammals, Vol. 2, bats. National Museums of Canada, Ottawa.

Wai-Ping, V., and M. B. Fenton. 1989. Ecology of spotted bat (*Euderma maculatum*) roosting and foraging. Journal of Mammalogy 70:617–622.

Worthington, D. J. 1991. Abundance, distribution, and sexual segregation of bats in the Pryor Mountains of south-central Montana. M.A. thesis, University of Montana, Missoula, MT. 41 pp.

Worthington, D. J. 1991. Abundance and distribution of bats in the Pryor Mountains of south-central Montana and northeastern Wyoming. Montana Natural Heritage Program. Helena, MT. 23 pp.

Townsend's Big-eared Bat (*Corynorhinus townsendii*)

Figure 89. Distribution of the Townsend's Big-eared Bat

Range

The complete extent of the range of the Townsend's big-eared bat in Montana is unknown, due to the limited survey effort across many areas. It has been documented in more than 20 counties (voucher specimens from 14) and on both sides of the Continental Divide, from the Idaho state line in the west to the North Dakota and South Dakota state lines in the east, and from the Wyoming state line in the south to the Canadian border at Alberta in the northwest (Hoffmann et al. 1969; Swenson and Shanks 1979; Hendricks et al. 1996; Hendricks and Kampwerth 2001; Foresman 2001), at elevations of 1,968 to 7,820 feet (600 to 2,384 meters). The only known location north of the Missouri River in northeastern Montana is in the Little Rocky Mountains (Hendricks et al. 2000); the species has not yet been reported in Alberta or Saskatchewan.

Habitat

Habitat use in Montana has not been evaluated in detail, but it seems to be similar to other localities in the western United States. Caves and abandoned mines are used for maternity roosts and hibernacula (Worthington 1991; Hendricks et al. 1996; Hendricks 2000; Hendricks et al. 2000; Foresman 2001; Hendricks and Kampwerth 2001); use of buildings in late summer also has been reported (Swenson and Shanks 1979). Habitats in the vicinity of roosts include Douglas-fir and lodgepole pine forests, ponderosa pine woodlands, Utah juniper-sagebrush scrub, and cottonwood bottomlands. In hibernacula, ambient temperatures ranged from minus 1 to 8 degrees F (30 to 46 degrees F when torpid Townsend's big-eared bats were present) (Hendricks and Kampwerth 2001). Temperatures at maternity roosts are poorly documented; the temperature

was 54 degrees F in mid-July near a colony in an abandoned mine in Lake County and 66 degrees F in August near a colony in a large and relatively open cave chamber in Lewis and Clark County. Many caves and mines in Montana remain cool in summer, with the potential of being too cool to be used as maternity roosts. Townsend's big-eared bats feed on many different flying insects and may be a moth specialist.

Management

The response by Townsend's big-eared bats to human activities is largely undocumented in Montana. The maternity colony at Lewis and Clark Caverns has persisted for more than a century but has decreased in recent years (no bats returned in 2005). In eastern Montana numerous abandoned coal mines, several of which were used as hibernacula, have been completely closed in recent decades; these mines are no longer accessible to bats. Abandoned mine reclamation has also been underway in western Montana during the same time. During the last decade, mine surveys prior to closure have been undertaken by land management agencies to determine the potential of abandoned mines as bat habitat. In some cases bat-friendly gates were installed at known Townsend's big-eared bat roosts, and the roosts have continued to be used after gate installation (Hendricks 1999; Hendricks and Kampwerth 2001). Some caves in the Pryor Mountains and Little Rocky Mountains with documented use by Townsend's big-eared bat are protected with bat-friendly gates (Worthington 1991; Hendricks et al. 2000). Surveys should follow protocols in the conservation assessment and conservation strategy (Pierson et al. 1999). All observations of Townsend's big-eared bat roosts should be reported to the appropriate land management agency, the Montana Natural Heritage Program, or the Montana Department of Fish, Wildlife & Parks.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Vandalism to maternity colonies and hibernacula	Identification of maternity colonies and hibernacula and closures to recreationists to these areas
	Reduce levels of human activities around known bat roosts through road management, signs, and public education
	Continue surveying caves and mines for maternity colonies and hibernacula
Abandoned mine closures	Install bat-friendly gates on coal mines instead of closure
	Recruit and educate recreational caving groups to assist with management of caves

Toxic material impoundments	Ensure utilization of nontoxic materials and nontoxic byproducts during mining activities
Degradation and loss of native riparian vegetation	Complete the Montana Bat Management Plan (in progress)
	Maintain and improve the condition of riparian vegetation for bat foraging areas

Management Plans

Altenbach, J. S., W. Amy, P. V. Bradley, P. E. Brown, K. Dewberry, D. B. Hall, J. Jeffers, B. Lund, J. E. Newmark, M. J. O'Farrell, M. Rahn, R. E. Sherwin, C. R. Tomlinson, and J. A. Williams. 2002. Nevada Bat Conservation Plan. Nevada Bat Working Group. Austin, NV. 188 pp.

Ellison, L. E., M. B. Wunder, C. A. Jones, C. Mosch, K. W. Navo, K. Peckham, J. E. Burghardt, J. Annear, R. West, J. Siemers, R. A. Adams, and E. Brekke. 2003. Colorado bat conservation plan. Colorado Committee of the Western Bat Working Group. Available at http://www.wbwg.org/colorado/colorado.htm

Hinman, K. E., and T. K. Snow, eds. 2003. Arizona Bat Conservation Strategic Plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report (in progress). Arizona Game and Fish Department, Phoenix, AZ.

Pierson, E. D., M. C. Wackenhut, J. S. Altenbach, P. Bradley, P. Call, D. L. Genter, C. E. Harris, B. L. Keller, B. Lengus, L. Lewis, B. Luce, K. W. Navo, J. M. Perkins, S. Smith, and L. Welch. 1999. Species conservation assessment and strategy for Townsend's big-eared bat (*Corynorhinus townsendii townsendii* and *Coynorhinus townsendii pallescens*). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, ID.

Citations

Christy, R. E., and S. D. West. 1993. Biology of bats in Douglas-fir forests. General Technical Report PNW-GTR-308. U.S.D.A. Forest Service, Pacific Northwest Research Station, Portland, OR.

Ecotype. T. W. Clark, A. H. Harvey, R. D. Dorn, D. L. Genter, and C. Groves, eds. Northern Rockies Conservation Cooperative, Montana Heritage Program, The Nature Conservancy, and Mountain West Environmental Services, Helena, MT.

Engle, J. C., and C. E. Harris. 2001. Idaho species of special concern element state ranking reviews. Nongame and Endangered Wildlife Program. Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Foresman, K. R. 2001. The wild mammals of Montana. American Society of Mammalogists, Special Publication No. 12. 278 pp.

Gillies, K. E. and R. Dixon. 2004. Draft Idaho Bat Conservation Plan. Nongame and Endangered Wildlife Program Technical Report. Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Hendricks, P., and D. Kampwerth. 2001. Roost environments for bats using abandoned mines in southwestern Montana: a preliminary assessment. Report to the U.S. Bureau of Land Management. Montana Natural Heritage Program, Helena, MT. 19 pp.

Hendricks, P., D. L. Genter, and S. Martinez. 2000. Bats of Azure Cave and the Little Rocky Mountains, Montana. Canadian Field-Naturalist 114:89–97.

Hendricks, P. 1999. Effect of gate installation on continued use by bats of four abandoned mine workings in western Montana. Unpublished report to Montana Department of Environmental Quality. Montana Natural Heritage Program, Helena, MT. 13 pp.

Hendricks, P., K. A. Jurist, D. L. Genter, and J. D. Reichel. 1996. Bats of the Kootenai National Forest, Montana. Unpublished report. Montana Natural Heritage Program, Helena, MT. 99 pp.

Hickman, G. R., B. G. Dixon, and J. Corn. 1999. Small mammals. Pp. 4.1–4.16 in the effects of recreation on Rocky Mountain wildlife: a review for Montana.

Hoffmann, R. S., D. L. Pattie, and J. F. Bell. 1969. The distribution of some mammals in Montana. II. Bats. Journal of Mammalogy 50(4):737–741.

Joslin, G. and H. Youmans, coordinators. Committee on Effects of Recreation on Wildlife. Montana Chapter of The Wildlife Society, Helena, MT.

Montana Online Animal Field Guide. 2004. Montana Heritage Program and Montana Department of Fish, Wildlife & Parks, Helena, MT. http://www.fwp.state.mt.us/fieldguide/help.aspx#overview (accessed May 18, 2004).

Swenson, J. E., and G. F. Shanks, Jr. 1979. Noteworthy records of bats from northeastern Montana. Journal of Mammalogy 60:650–652.

Worthington, D. J. 1991. Abundance, distribution, and sexual segregation of bats in the Pryor Mountains of south-central Montana. M.A. thesis, University of Montana, Missoula, MT. 41 pp.

Pallid Bat (*Antrozous pallidus*)

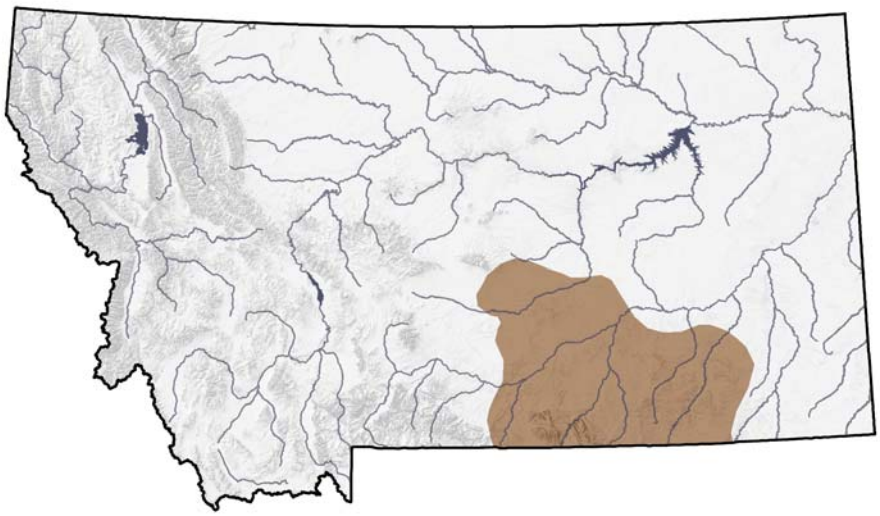


Figure 90. Distribution of the Pallid Bat

Range

The known distribution of the pallid bat in the state is not yet well defined, but Montana is at the northeastern edge of its global range. Several have been captured east of the Continental Divide in south-central Montana at Layout Creek and Gyp Spring in southern Carbon County (Shryer and Flath 1980; Worthington 1991; P. Hendricks and J. Carlson, personal observation) and west of Colstrip in Rosebud County. Montana records are from elevations between 3,800 and 4,600 feet (1,158 to 1,402 meters).

Habitat

Habitat at the Carbon County sites is Utah juniper-black sagebrush (*Juniperus osteosperma-Artemisia nova*). The Rosebud County site is in an area of ponderosa pine (*Pinus ponderosa*) savannah and big sagebrush (*Artemisia tridentata*). Both areas have rock outcrops (limestone or sandstone) in the immediate vicinity or within a short flying distance. This species has not yet been detected at rock crevices, caves, or abandoned mines in Montana; most observations have been at water sources (spring-fed streams or ponds, e.g., Carbon County) (Shryer 1980). However, habitat use in Montana by this species remains poorly known and unstudied.

At other locations, pallid bats have been found in arid deserts, juniper woodlands, sagebrush shrub-steppes, and grasslands, often with rocky outcrops and water nearby. They are less abundant in evergreen and mixed-conifer woodlands, but have been found in ponderosa pine forests near cliffs (Nagorsen and Brigham 1993). They typically roost in rock crevices or buildings and less often in caves,

tree hollows, under bridges, and in abandoned mines (Hermanson and O'Shea 1983; Verts and Carraway 1998). In Oklahoma, night roosts often are in caves (Caire et al. 1989). Four summer roosts in Wyoming were in rock shelters (1), caves (2), and mines (1) (Priday and Luce 1997). Day and night roosts are usually distinct. In Oregon, night roosts were in buildings, under rock overhangs, and under bridges; bats generally were faithful to particular night roosts both within and between years (Lewis 1994). Night roosts in British Columbia were often in cavities in ponderosa pines (Nagorsen and Brigham 1993). Day roosts include rock piles, tree hollows, and rock crevices. Pallid bats found in caves or mines usually use crevices within these places (Hermanson and O'Shea 1983; Caire et al. 1989). Maternity colonies are often located in horizontal crevices in rock outcrops and man-made structures, where temperatures are a fairly constant 30 degrees F. Pallid bats forage on or near the ground and consume invertebrates such as scorpions, centipedes, crickets, grasshoppers, and beetles.

Management

Pallid bats have persisted for more than 20 years in the general area of the state where they were first discovered (Shryer and Flath 1980; Worthington 1991; P. Hendricks and J. Carlson, personal observation). This is encouraging given that essentially nothing is known in Montana of the pallid bat's abundance, reproductive biology, habitat requirements, movements, and roost site selection, nor have the potential threats to this bat been identified.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Little information of distribution, population, and requirements	Complete the Montana Bat Management Plan (in progress)
	Increased survey and monitoring techniques
Oil and gas fields disturbance of water sources	Protection of water sources in arid regions
Roost disturbance	Protection of roost sites
Recreational caving	Educate recreationists on the threats to bats
Closure of mines for reclamation	Work to install new entrance barriers that allow free passage of bats
Use of pesticides that bats may accumulate through their diet and that kill their prey	Support and cooperate in studies to determine more about the impacts of humans

Management Plans

Altenbach, J. S., W. Amy, P. V. Bradley, P. E. Brown, K. Dewberry, D. B. Hall, J. Jeffers, B. Lund, J. E. Newmark, M. J. O'Farrell, M. Rahn, R. E. Sherwin, C. R. Tomlinson, J. A. Williams. 2002. Nevada Bat Conservation Plan. Nevada Bat Working Group. Austin, NV. 188 pp.

Ellison, L. E., M. B. Wunder, C. A. Jones, C. Mosch, K. W. Navo, K. Peckham, J. E. Burghardt, J. Annear, R. West, J. Siemers, R. A. Adams, and E. Brekke. 2003. Colorado bat conservation plan. Colorado Committee of the Western Bat Working Group. Available at http://www.wbwg.org/colorado/colorado.htm.

Hinman, K. E., and T. K. Snow, eds. 2003. Arizona Bat Conservation Strategic Plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report (in progress). Arizona Game and Fish Department, Phoenix, AZ.

Citations

Caire, W., et al. 1989. Mammals of Oklahoma. University of Oklahoma Press, Norman, OK. 567 pp.

Hermanson, J. W., and T. J. O'Shea 1983. *Antrozous pallidus*. Mammalian Species 213:1–8.

Lewis, S. E. 1994. Night roosting ecology of pallid bats (*Antrozous pallidus*) in Oregon. American Midland Naturalist 132:219–226.

Nagorsen, D., and R. M. Bringham. 1993. Bats of British Columbia. University of British Columbia Press, Vancouver, B.C. 164 pp.

Priday, J., and B. Luce. 1997. Inventory of bats and bat habitat associated with caves and mines in Wyoming: completion report. Pp. 50–109 in endangered and nongame bird and mammal investigations annual completion report. Nongame Program, Biological Science.

Shryer, J. S., and D. S. Flath. 1980. First record of the pallid bat (*Antrozous pallidus*) from Montana. Great Basin Naturalist 40(2):115.

Verts, B. J., and L. N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley, CA. 668 pp + xvi.

Worthington, D. J. 1991. Abundance, distribution, and sexual segregation of bats in the Pryor Mountains of south-central Montana. M.A. thesis, University of Montana, Missoula, MT. 41 pp.

Pygmy Rabbit (*Brachylagus idahoensis*)

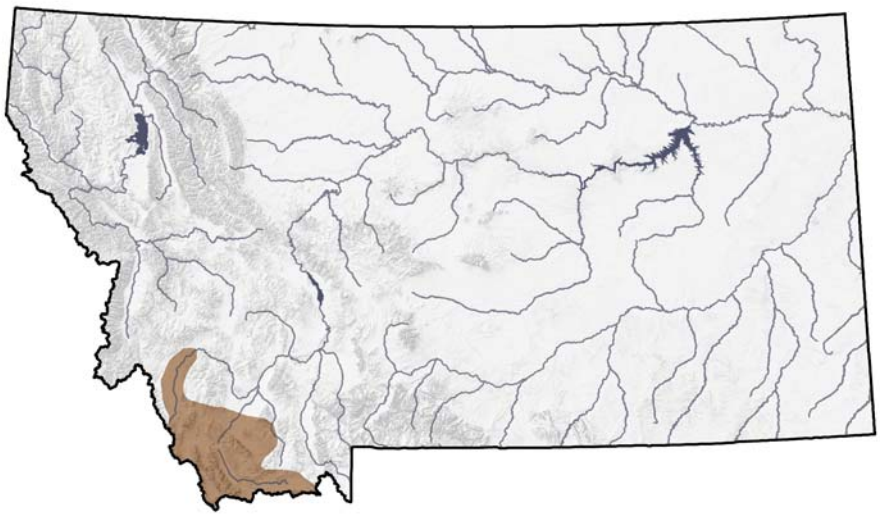


Figure 91. Distribution of the Pygmy Rabbit

Range

Montana lies on the northeastern edge of pygmy rabbit distribution. There are confirmed records dating back to 1918 from three southwestern counties (Beaverhead, Jefferson, and Madison), with most of the Montana range in Beaverhead County (Davis 1937; Hoffmann et al. 1969; Rauscher 1997; Foresman 2001a); a 1937 specimen reported from near Lake Como in Ravalli County needs verification. Rauscher (1977) documented occupation in the southern portion of Silver Bow County. Records are from elevations between 4,500 and 6,700 feet (1,372 to 2,042 meters).

Habitat

Occupied habitats in Montana include shrub grasslands on alluvial fans, floodplains, plateaus, high mountain valleys, and mountain slopes where suitable sagebrush cover and soils for burrowing are available. Some occupied sites may support a relatively sparse cover of sagebrush and shallow soils but usually support patches of dense sagebrush and deeper soils. Big sagebrush was the dominant shrub at all occupied sites, averaging 21.3 to 22.6 percent coverage; bare ground averaged 33 percent and forbs 5.8 percent. Average height of sagebrush in occupied sites was 0.4 meter (Rauscher 1997). In southwestern Wyoming, pygmy rabbits selectively used dense and structurally diverse stands of sagebrush that accumulated a relatively large amount of snow; the subnivean environment provided access to a relatively constant supply of food and protection from predators and thermal extremes (Katzner and Parker 1997).

Pygmy rabbits dig burrows extending to a depth of 1 meter, and they form

chambers as part of the burrow system. Burrows have been excavated, but no nests have been found and the location of nests is not known (Green and Flinders 1980a). A recent increase in surveying by the Montana Natural Heritage Program has identified more observations of individuals, burrow locations, and habitat preferences.

Management

No special management activities have been developed or implemented in Montana specifically for pygmy rabbits. However, conservation habitat management to preserve sagebrush habitat for other species, e.g., sage grouse, will likely benefit pygmy rabbits. Removal of sagebrush will make the landscape unsuitable for pygmy rabbits. This species is found where grazing occurs and will continue to survive as long as sagebrush cover is maintained. Dense stands of sagebrush along streams, fence lines, and borrow ditches are probably essential avenues for dispersal of pygmy rabbits.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Loss of sagebrush habitat due to range management practices	Consider preparing a management plan for the pygmy rabbit or include it into other comprehensive taxonomic plans
	Livestock rest and rotation on lands
Fragmentation of available habitat	Coordination efforts with federal agencies including BLM and USFS
	Continue surveying for new populations and monitoring of existing ones
Habitat specialist on all scales	Sagebrush protection on a large scale

Management Plan

None

Citations

Davis, W. B. 1937. Some mammals from western Montana and eastern Idaho. Murrelet 18:22–27.

Foresman, K. R. 2001. The wild mammals of Montana. Special Publication No. 12. American Society of Mammalogists.

Green, J. S., and J. T. Flinders. 1980. Habitat and dietary relationships of the pygmy rabbit. Journal of Range Management 33(2):136–142.

Heady, L.T., K. I. Gabler, and J. W. Laundre. 2001. Habitat selection by pygmy rabbits in southeast Idaho. Technical Bulletin No. 01-7. Idaho Bureau of Land Management.

Hoffmann, R. S., P. L. Wright, and F. E. Newby. 1969. Distribution of some mammals in Montana. I. Mammals other than bats. Journal of Mammalogy 50(3): 579–604.

Katzner, T. E., and K.,L. Parker. 1997. Vegetative characteristics and size of home ranges used by pygmy rabbits (*Brachylagus idahoensis*) during winter. Journal of Mammalogy 78:1063–1072.

Rauscher, Ryan. 1997. Status and distribution of the pygmy rabbit in Montana. Montana Department of Fish, Wildlife & Parks, nongame program. Unpublished report. 19 pp. + appendices.

Roberts, Hadley B. 2001. Survey of pygmy rabbit distribution, numbers and habitat use in Lemhi and Custer counties, Idaho. Technical Bulletin No. 01-11. Idaho Bureau of Land Management.

Hoary Marmot (*Marmota caligata*)

Figure 92. Distribution of the Hoary Marmot

Range

Although the distribution map provided above indicates that haory marmots occur throughout western Montana, they most likely only occupy 5 to 10 percent of the area depicted. They do not occur in the Salish Mountains and occur only in small pockets in the Whitefish Range. They are generally confined to high subalpine and alpine habitats and may move through coniferous forests in northwest Montana. There are small, scattered, isolated populations south of the Mission Mountains (Foresman 2001).

Habitat

The hoary marmot is found primarily in rocky outcroppings and large boulder fields in high subalpine and alpine regions of Montana where they feed, burrow, and raise young.

Management

There are no management strategies for this species in Montana at this time.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Lack of data on status and size of Montana's populations	Prepare conservation plan, addressing conservation concerns and establishing a monitoring protocol

	Conduct inventory to obtain estimates of population status and size and habitat needs and distribution, mountain range by mountain range
Little or no connectivity between populations in distinct mountain ranges	Determine the effects of inbreeding in isolated populations and examine feasibility of transplanting individuals between populations in an effort to increase genetic diversity
	Conserve small populations found on the periphery of their distribution, including scattered populations in the high mountains of the Mission and Swan mountains
Change in climate due to global warming	Conduct monitoring program to establish long-term trends of abundance and distribution of populations

Management Plan

None

Citations

Foresman, K. R. 2001. The wild mammals of Montana. Special Publication No. 12. American Society of Mammalogists.

Black-tailed Prairie Dog (*Cynomys ludovicianus*)

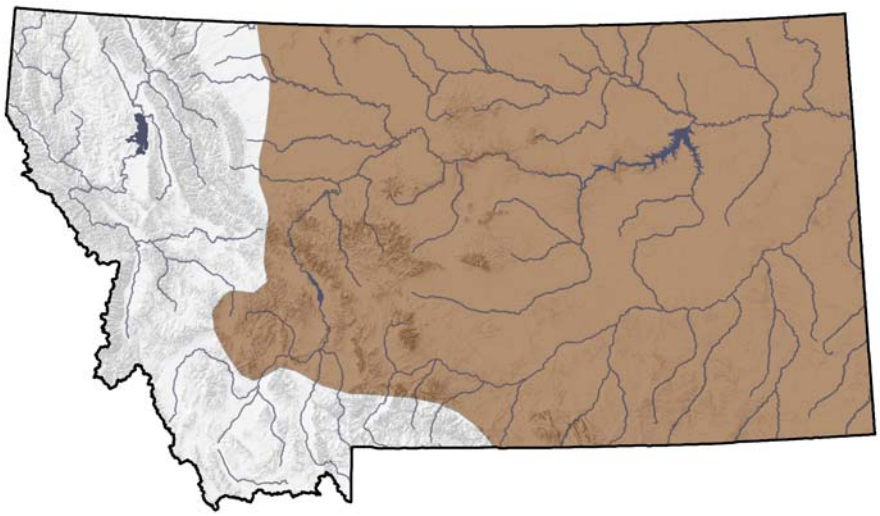


Figure 93. Distribution of the Black-tailed Prairie Dog

Range

Black-tailed prairie dogs are found across eastern Montana except in the northeastern corner and the Clarks Fork of the Yellowstone drainage (Campbell 1989).

Habitat

Prairie dog colonies are found on flat, open grasslands and shrub grasslands with low, relatively sparse vegetation. The most frequently occupied habitat in Montana is dominated by western wheatgrass, blue grama, and big sagebrush (Montana Fish, Wildlife & Parks 2002). Colonies are associated with silty clay loams, sandy clay loams, and loams (Thorp 1949; Bonham and Lerwick 1976; Klatt and Hein 1978; Agnew et al. 1986), and fine- to medium-textured soils are preferred (Merriam 1902; Thorp 1949; Koford 1958) presumably because burrows and other structures tend to retain their shape and strength better than in coarse, loose soils. Encroachment into sandy soil (e.g., loamy fine sand) does occur if the habitat is needed for colony expansion (Osborn 1942).

Shallow slopes of less than 10 percent are preferred (Koford 1958; Hillman et al. 1979; Dalsted et al. 1981) presumably in part because such areas drain well and are only slightly prone to flooding. By colonizing areas with low vegetative stature, prairie dogs often select areas with past human (as well as animal) disturbance, including areas heavily used by cattle such as near water tanks and at long-term supplemental feeding sites (Licht and Sanchez 1993; FaunaWest 1998).

Management

In Montana, the black-tailed prairie dog has been designated a nongame wildlife species in need of management. Shooting of prairie dogs on public lands (excluding state school trust lands) is regulated. Contact Montana Fish, Wildlife & Parks for the latest regulations. Prairie dogs are managed under the Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana (Montana Prairie Dog Working Group 2002). Please consult this plan for details concerning prairie dog management in Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Conversion of native rangelands to agriculture and, to a lesser degree, residential development	Institute a landowner incentive program and a prairie dog control program designed to manage prairie dog acreage, rather than eradicate prairie dogs
Conflicts between the present abundance of prairie dogs and other land uses	Develop regional prairie dog distribution and abundance goals
	Identify and support or conduct research projects designed to form solutions to short-term and long-term biological and social problems related to black-tailed prairie dog communities and their management
	Identify isolated prairie dog colonies and apply management measures necessary to maintain current distribution
Disease, particularly sylvatic plague (Yersinia pestis)	Continue prairie dog inventory and monitoring efforts
	Assist in funding research projects targeting effects of disease on prairie ecosystems, particularly sylvatic plague (Yersinia pestis)
Poisoning as a governmental control program	Develop and implement a prairie dog ecosystem education program

Management Plans

Bureau of Land Management (BLM). 1979. Habitat management plan for prairie dog ecotypes. USDI, BLM, Montana State Office. Wildlife Habitat Area MT-02-06-07-S1. 61 pp.

Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana (Montana Prairie Dog Working Group 2002).

Citations

Agnew, W., D. W. Uresk, and R. M. Hansen. 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. Journal of Range Management 39:135–9.

Bonham, C. D., and A. Lerwick. 1976. Vegetation changes induced by prairie dogs on short-grass range. Journal of Range Management 29:221–25.

Campbell, T. M., III. 1989. Prairie dog colony location surveys and black-footed ferret searches in Montana. Pp. 1_12 in the prairie dog ecotype: managing for biological diversity. Montana BLM Wildlife Technical Bulletin No. 2. 55 pp.

Dalsted, K. J., et. al. 1981. Application of remote sensing to prairie dog management. Journal of Range Management 34:218–23.

FaunaWest. 1998. Status of the black- and white-tailed prairie dog in Montana. Montana Fish, Wildlife & Parks, Helena, MT. 34 pp.

Hillman, C. N., R. L. Linder, and R. B. Dahlgren. 1979. Prairie dog (*Cynomys ludovicianus*) distribution in areas inhabited by black-footed ferrets (*Mustela nigripes*). American Midland Naturalist 102:185–7.

Klatt, L. E., and D. Hein. 1978. Vegetative differences among active and abandoned towns of black-tailed prairie dogs (*Cynomys ludovicianus*). Journal of Range Management 31:315–7.

Koford, C. B. 1958. Prairie dogs, whitefaces, and blue grama. Wildlife Monograph 3:1–78.

Licht, D. S., and K. D. Sanchez. 1993. Association of black-tailed prairie dog colonies with cattle point attractants in the northern Great Plains. Great Basin Naturalist 53:385–389.

Merriam, C. H. 1902. The prairie dog of the Great Plains. Pp. 257–70 in USDA Yearbook Agriculture for 1901, U.S. Government Printing Office, Washington, DC.

Miller, B., G. Ceballos, and R. Reading. 1994. The prairie dog and biotic diversity. Conservation Biology 8(3):677–681.

Osborn, B. 1942. Prairie dogs in shinnery (oak scrub) savannah. Ecology 23:110–5.

Thorp, J. 1949. Effects of certain animals that live in soils. Scientific Monthly 68:180–91.

White-tailed Prairie Dog (*Cynomys leucurus*)

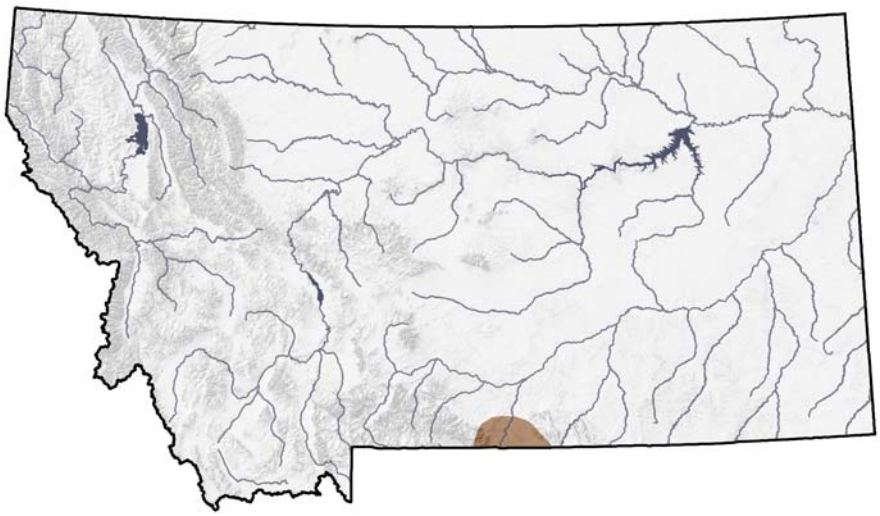


Figure 94. Distribution of the White-tailed Prairie Dog

Range

In Montana, white-tailed prairie dogs now only inhabit a small area in the south-central portion of state, near the Pryor Mountains.

Habitat

Throughout their range, white-tailed prairie dogs inhabit xeric sites with mixed stands of shrubs and grasses. In Montana they inhabit sites dominated by Nuttall saltbrush with lesser amounts of big sage and areas with povery sumpweed (Flath 1979). They live at higher elevations and in meadows with more diverse grass and herb cover than do black-tailed prairie dogs (Hoffmann, in Wilson and Ruff 1999), and their range in Montana is at higher elevations than other sites within their distribution.

Management

White-tailed prairie dogs are designated as a nongame wildlife species in need of management in Montana. Public lands (excluding state school trust lands) in the portion of Carbon County occupied by white-tailed prairie dogs has been closed to sport shooting on a year-round basis. Contact Montana Fish, Wildlife & Parks for the most current regulations concerning prairie dogs. White-tailed prairie dogs are managed under the Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana (Montana Prairie Dog Working Group 2002). Please consult this plan for details concerning prairie dog management in Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Conversion of native rangelands to agriculture, and, to a lesser degree, residential development	Institute a landowner incentive program and a prairie dog control program designed to manage prairie dog acreage, rather than eradicate prairie dogs
Disease, particularly sylvatic plague (Yersima pestis)	Assist in funding research projects targeting effects of disease on prairie ecosystems, particularly sylvatic plague (Yersinia pestis)
Vulnerability of remaining small and isolated colonies to extirpation, which could result in contraction in the current range of this species	Translocate white-tailed prairie dogs from a colony in the path of a highway upgrade project to a formerly occupied site on BLM land
	Reintroduce white-tailed prairie dogs to sites that were formerly occupied until the early 1990s

Management Plans

Bureau of Land Management (BLM). 1979. Habitat management plan for prairie dog ecotypes. USDI, BLM, Montana State Office. Wildlife Habitat Area MT-02-06-07-S1. 61 pp.

Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana. Montana Prairie Dog Working Group 2002.

Citations

An Inventory of Black-tailed and White-tailed Prairie Dog Colonies in the Billings and Powder River Areas. 2004.

Flath, D. L. 1979. Status of the white-tailed prairie dog in Montana. Proceedings of the Montana Academy of Sciences 38:63–67.

Knowles, C. J. 2002. Status of the white-tailed and Gunnison's prairie dog. Environmental Defense and National Wildlife Federation. FaunaWest Wildlife Consultants. Boulder, MT.

Wilson, D. E., and S. Ruff. 1999. The Smithsonian book of North American mammals. Smithsonian Institution, Washington, DC. 750 pp.

Great Basin Pocket Mouse (*Perognathus parvus*)

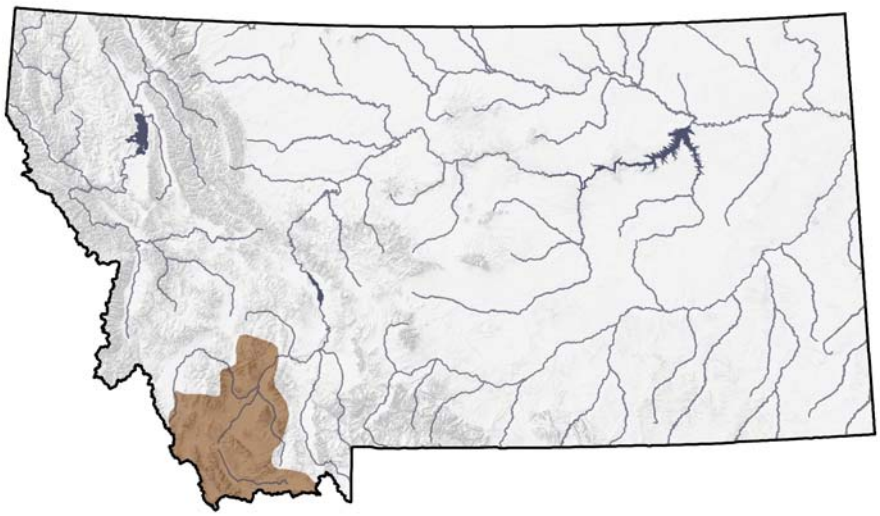


Figure 95. Distribution of the Great Basin Pocket Mouse

Range

The Great Basin pocket mouse is restricted in Montana to the extreme southwestern portion of the state, east of the Continental Divide. All records are from Beaverhead County except one from Jefferson County (Hoffmann et al. 1969; Foresman 2001a; Hendricks and Roedel 2002). Great Basin pocket mice are suspected to occur in Madison County. Individuals have been captured at elevations up to 6,660 feet (2,030 meters). The Great Basin pocket mouse is found throughout the Great Basin and adjacent regions of the West, from south-central British Columbia southward through eastern Washington and Oregon to southern California, Nevada, northern Arizona, western Utah, southern Idaho, southwestern Montana, and southwestern Wyoming (Verts and Kirkland 1988). It usually occurs below elevations of 8,200 feet (2,500 meters).

Habitat

Occupied habitats in Montana are arid and sometimes sparsely vegetated. They include grassland and shrubland with less than 40 percent cover; stabilized sandhills; and landscapes with sandy soils, more than 28 percent sagebrush cover, and 0.3 to 2 meters shrub height (Hoffmann et al. 1969; Frissell 1978; Hendricks and Roedel 2001, 2002; P. Hendricks, unpublished data).

Data from other portions of its range suggest a variety of western arid and semiarid habitats are occupied, including pine woodlands, juniper-sagebrush scablands, sandy short-grass steppes, and shrublands covered with sagebrush, bitterbrush, greasewood, and rabbitbrush; heavily forested habitats are avoided. Great Basin pocket mice are captured more often than expected (based on

availability) at sites with more than 40 percent ground cover. On plots where fire has killed the shrub cover, the species is one-third as abundant as on adjacent unburned plots. Great Basin pocket mice usually are found in habitats with light-textured, deep soils, and sometimes in shrublands among rocks. Presence is positively correlated with percent sand and negatively with percent clay. Adults sleep and rear young in underground burrows (Verts and Kirkland 1988; Verts and Carraway 1998).

Management

No special management activities are currently recognized in order to maintain viable populations of this species in Montana.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat loss, large-scale removal of sagebrush	Land management designed to maintain a mosaic of sagebrush cover, size, and age classes will benefit this species, especially if it promotes the growth of grasses and forbs within sagebrush stands
	Evaluate the quality and quantity of occupied and potentially suitable areas
Competition for grasses (livestock probably compete with pocket mice for grasses and reduce shrub and grass cover)	Rotation of livestock areas
Lack of biological information on Great Basin Pocket Mouse in Montana	Consider preparing a management plan for the Great Basin pocket mouse or include it into other comprehensive taxonomic plans

Management Plan

None

Citations

Foresman, K. R. 2001. The wild mammals of Montana. Special Publication No. 12. American Society of Mammologists.

Frissell, S. S. 1978. Nongame wildlife inventory. Prepared for U.S. Department of the Interior, Bureau of Land Management, Dillon Resource Area, Dillon, MT. 194 pp.

Hall, E. R. 1981. The Mammals of North America, Vols. I and II. John Wiley & Sons, New York, NY.

Hendricks, P., and M. Roedel. 2001. A faunal survey of the Centennial Valley sandhills, Beaverhead County, Montana. Report to the U.S. Bureau of Land Management and U.S. Fish and Wildlife Service. Montana Natural Heritage Program, Helena, MT.

Hendricks, P., and M. Roedel. 2002. Preble's Shrew and Great Basin Pocket Mouse from the Centennial Valley Sandhills of Montana. Northwestern Naturalist 83:31–34.

Hoffmann, R. S., P. L. Wright, and F. E. Newby. 1969. Distribution of some mammals in Montana. I. Mammals other than bats. Journal of Mammalogy 50(3):579–604.

NatureServe Explorer: An online encyclopedia of life. 2002. Version 1.6. Arlington, VA. http://www.natureserve.org/explorer.http://MNHP.nris.state.mt.us/animalguide (accessed: March 20, 2003).

Verts, B. J., and G. L. Kirkland, Jr. 1988. *Perognathus parvus*. American Society of Mammologists, Mammalian Species 318:1–8.

Verts, B. J., and L. N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley, CA. 668 pp.

Northern Bog Lemming (*Synaptomys borealis*)

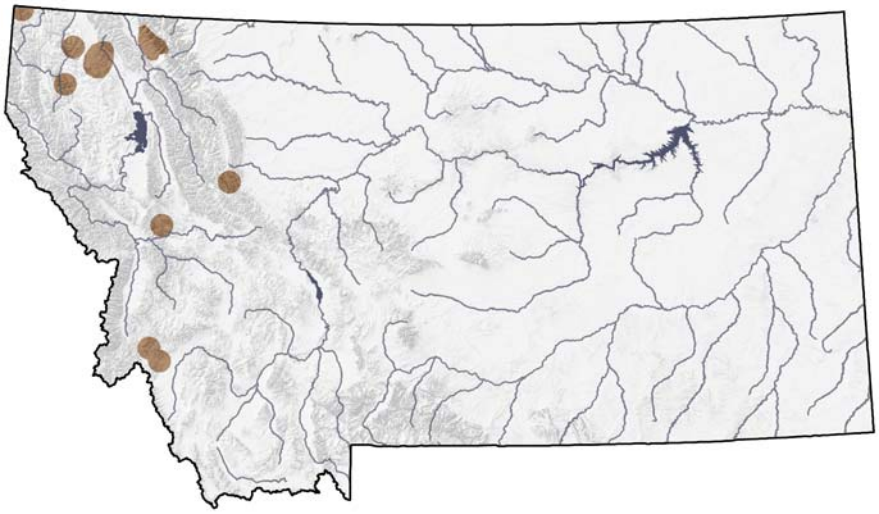


Figure 96. Distribution of the Northern Bog Lemming

Range

The northern bog lemming has a widespread distribution extending from Alaska east to Labrador and south to portions of the northern United States. In Montana the northern bog lemming is at the southern margin of its global distribution in the Rocky Mountains and has been documented at 18 isolated sites, found mainly on U.S. Forest Service–managed lands. Records are available for six counties (Beaverhead, Flathead, Lewis and Clark, Lincoln, Missoula, and Ravalli), with all but two sites (one in Beaverhead County, Lost Trail Pass, and one in Lewis and Clark County) occurring west of the Continental Divide (Reichel and Corn 1997; Foresman 2001a). Elevation of these sites ranges from 3,340 to 6,520 feet (1,018 to 1,987 meters), but a 2003 record from a new site in Ravalli County extends the upper elevation limit to 7,400 feet (2,256 meters) (B. Maxell, personal communication).

Habitat

Northern bog lemmings occupy a variety of habitats throughout their range, especially near the southern edge of their global distribution. Typically, these habitats have high moisture levels and include sphagnum bogs, wet meadows, moist mixed and coniferous forests, montane sedge meadows, krummholz spruce-fir forests with dense herbaceous and mossy understory, alpine tundra, mossy streamsides, and even sagebrush slopes in the case of *S. b. artemisiae* in British Columbia (Clough and Albright 1987; West 1999; Streubel 2000). Within these habitats, they occupy surface runways and burrow systems up to 12 inches deep and can be found in small colonies with population densities that may reach 36 individuals per acre. (Streubel 2000). They are active day and night

throughout the year, feeding on grasses and other herbaceous vegetation. Young are born in nests that may be underground or on the surface in concealing vegetation. Northern bog lemmings in Montana have been found in at least nine community types, including Engelmann spruce, subalpine fir, birch, willow, sedge (*Carex*), spike rush (*Eleocharis*), or combinations of the above, often occurring in wet meadows, fens, or boglike environments. Wright (1950) captured lemmings in a swampy area containing spruce trees, timothy, alder, and other moist-site plants (Wright 1950). The Upper Rattlesnake Creek specimen was captured in a wet-sedge/bluejoint meadow near subalpine fir (Adelman 1979). Areas with extensive moss mats, primarily sphagnum, are the most likely sites to find new populations (Wright 1950; Reichel and Beckstrom 1994; Reichel and Corn 1997; Pearson 1999; Foresman 2001a).

Management

No coordinated management activities have been developed or implemented for this species in Montana. Nevertheless, some populations on U.S. Forest Service lands are provided added protection through special management/conservation policy guidelines applied to peatlands, including the Research Natural Area (RNA) designation (Chadde et al. 1998). RNA designation typically prohibits manipulative management, such as timber harvest and livestock grazing. The Clean Water Act and state water quality standards protect water quality of these peatlands. Protection guidelines (Reichel and Corn 1997) should be applied to all sites where northern bog lemmings are known to occur, as well as potential peatland sites not yet surveyed for them.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Bogs/fens are threatened by range management practices, invasion of heavily grazed fens by exotic plants, and potential changes in the water regimes feeding the bogs/fens.	Minimize livestock grazing in drainages with unsurveyed moss mats
Timber harvest around bog/fen habitats as well as adjacent riparian areas used as dispersal corridors	Working with coordinating federal and state agencies, limit timber harvests within a buffer zone of 100 meters surrounding sphagnum or other fen moss mats or associated riparian areas that could provide corridors for dispersal to adjacent patches of suitable habitat

Poorly understood distribution of the species in Montana	Consider preparing a management plan for the northern bog lemming or include it into other comprehensive taxonomic plans
	Known sites should be monitored routinely to determine population persistence and trends
Human disturbances (timber harvesting and roads) are directly related to the decreased diversity of vascular plants, a common food source for northern bog lemmings in bogs/fens	Elimination of management activities that could destroy bogs (road-building, pothole blasting, trail construction, dam construction, alteration of surface and subsurface water flow, recreational vehicle use in fen habitats)

Management Plan

None

Citations

Adelman, E. B. 1979. A survey of the nongame mammals in the Upper Rattlesnake Creek drainage of western Montana. M.S. thesis, University of Montana, Missoula MT. 129 pp.

Chadde, S. W., J. S. Shelly, R. J. Bursik, R. K. Moseley, A. G. Evenden, M. Mantas, F. Rabe, and B. Heidel. 1998. Peatlands on national forests of the Northern Rockies.

Clough, G. C., and J. J. Albright. 1987. Occurrence of the northern bog lemming (*Synaptomys borealis*) in the northeastern United States. Canadian Field-Naturalist 101:611–613.

Foresman, K. R. 2001. The wild mammals of Montana. American Society of Mammalogists, Special Publication No. 12. 278 pp.

Groves, C. R. 1994. Effects of Timber Harvest on Small Mammals and Amphibians in Old-Growth Coniferous Forests on the Priest Lake Ranger District, Unpublished report to the Priest Lake Ranger District, Idaho Panhandle National Forest. The Nature Conservancy, Boulder, CO.

Idaho Fish and Game. http://fishandgame.idaho.gov/tech/CDC/county_spp_lists (accessed April 26, 2004).

Jones, W. M. 2003. Kootenai National Forest Peatlands: Description and Effect of Forest Management. Report to the Kootenai National Forest, Montana. Montana Natural Heritage Program, Helena, MT.

Pearson, Dean E. 1999. Small mammals of the Bitterroot National Forest: a literature review and annotated bibliography. General Technical Report RRS-GTR-25. Ogden, UT: U.S.D.A. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 63 pp.

Reichel, J. D., and J. G. Corn. 1997. Northern bog lemmings: survey, population parameters, and population analysis. Unpublished report to the Kootenai National Forest. Montana Natural Heritage Program, Helena, MT. 27 pp.

Reichel, J. D., and S. G. Beckstrom. 1994. Northern bog lemming survey: 1993. Unpublished report. Montana Natural Heritage Program. Helena, MT. 87 pp.

West, S. D. 1999. Northern bog lemming (*Synaptomys borealis*). Pp. 655–656 in the Smithsonian book of North American mammals, D. E. Wilson and S. Ruff, eds. Smithsonian Institution Press, Washington, DC.

Wright, P. L. 1950. *Synaptomys borealis* from Glacier National Park, Montana. Journal of Mammalogy 31(4):460.

Meadow Jumping Mouse (*Zapus hudsonius*)

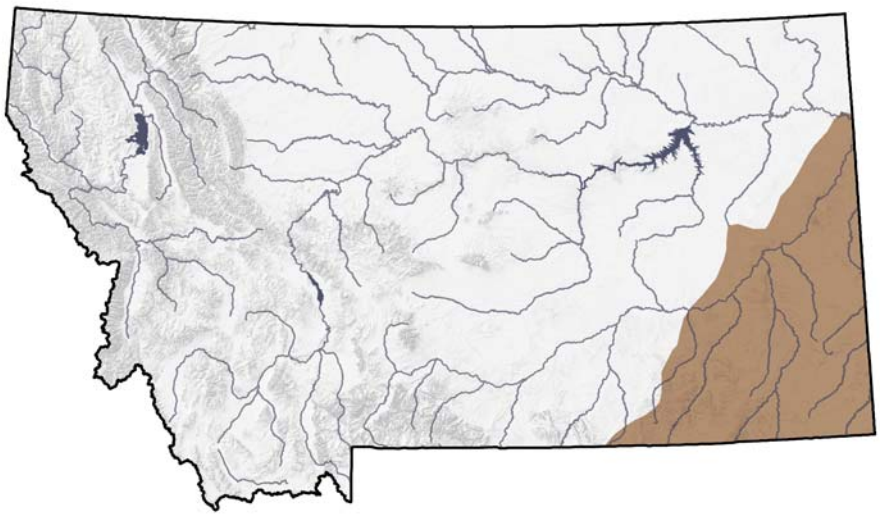


Figure 97. Distribution of the Meadow Jumping Mouse

Range

Montana is on the western edge of the species' global distribution in the northern Great Plains. The meadow jumping mouse has been documented in six eastern and southeastern counties (Bighorn, Carter, Dawson, Powder River, Richland, and Wibaux), at elevations up to 4,200 feet (1,272 meters) (Foresman 2001a; Montana Natural Heritage Program database).

Habitat

In Montana, meadow jumping mice have been found in dense, tall, and lush grasses and forbs in marshy areas (sometimes with standing water), riparian areas, woody draws, and grassy upland slopes, sometimes within or near forested sites of ponderosa pine (Lampe et al. 1974; Matthews 1980; Matthews and Swenson 1982).

The meadow jumping mouse is generally described as a species that occupies moist lowland habitats rather than drier uplands, preferring relatively dense vegetation in open grassy and brushy areas of marshes, meadows, swamps, and open conifer forests and often favoring sites bordered by small streams. On the northern Great Plains this usually results in its restriction primarily to riparian habitats. When inactive, meadow jumping mice occupy underground burrows, usually in banks or hills (in winter) or under logs or grass clumps. Young are born in an underground nest or under other cover (Krutzsch 1954; Whitaker 1972; Jones et al. 1983).

Management

No special management activities have been developed or implemented for this species in Montana. Refer to the following articles for more information on the management of the meadow jumping mouse: Lampe et al. 1974; Matthews 1980; Matthews and Swenson 1982.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Destruction of natural springs/seeps by and for livestock, and wetland conversion	Increased management and protection of all springs and seeps within the potential range
Lack of knowledge regarding immediate and long-term impacts of grazing	Prepare a conservation plan addressing species-specific concerns and actions or those pertaining to a suite of species with similar habitat use and needs
Lack of data on species status, distribution, habitat use, and abundance in Montana	Standardized surveys in eastern and southeastern Montana to obtain estimates of population status, distribution, and habitat use, and to monitor known populations

Management Plan

None

Citations

Foresman, K. R. 2001. The wild mammals of Montana. American Society of Mammalogists, Special Publication No. 12. 278 pp.

Jones, J. K., Jr., D. M. Armstrong, R. S. Hoffmann, and C Jones. 1983. Mammals of the northern Great Plains. University of Nebraska Press, Lincoln, NE. 379 pp.

Krutzsch, P. H. 1954. North American jumping mice (genus *Zapus*). University of Kansas Publications, Museum of Natural History 7:349–472.

Lampe, R. P., J. K. Jones Jr., R. S. Hoffman, and E. C. Birney. 1974. The mammals of Carter County, southeastern Montana. Occasional Paper. Museum of Natural History, University of Kansas 25:1–39.

Matthews, W. L., and J. E. Swenson. 1982. The mammals of east-central Montana. Proceedings of the Montana Academy of Sciences 39:1–13.

Matthews, W. L. 1980. The meadow jumping mouse in southeastern Montana. The Prairie Naturalist 12(2):63–64.

Whitaker, J. O., Jr. 1972. *Zapus hudsonius*. American Society of Mammalogists, Mammalian Species No. 11. 7 pp.

Gray Wolf (*Canis lupus*)

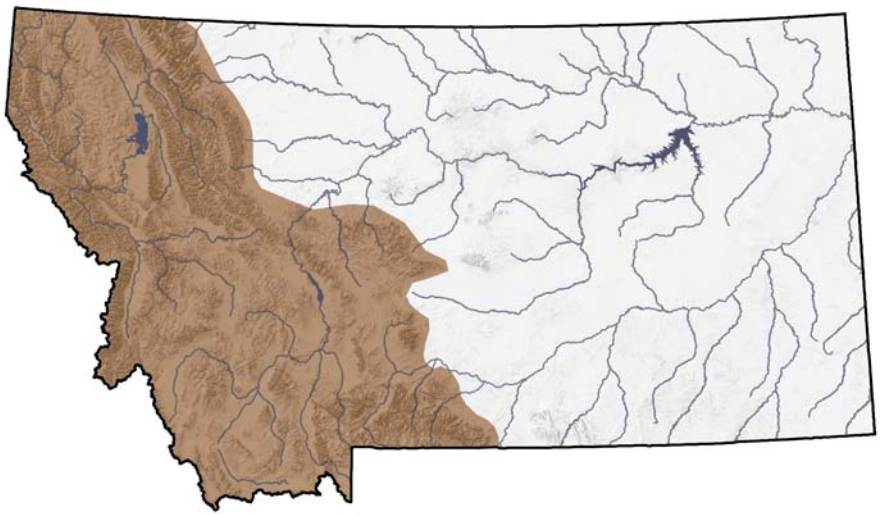


Figure 98. Distribution of the Gray Wolf

Range

There are three federally designated wolf recovery areas in the Northern Rockies. Montana contains portions of all three. Natural dispersers decolonized northwest Montana beginning in the late 1970s. In 1995 and 1996 wolves were reintroduced in both central Idaho and Yellowstone National Park. As those reintroduced populations grew, the wolves dispersed, and the three distinct recovery areas now function increasingly as one large meta-population. The distribution of wolves in Montana has expanded accordingly, but is still primarily in western Montana. Wolves are capable of dispersing long distances and could plausibly attempt to colonize eastern Montana. Individual wolves have been documented in eastern Montana, but no packs have been confirmed.

Habitat

The gray wolf exhibits no particular habitat preference. Wolves establishing new packs in Montana have demonstrated greater tolerance of human presence and disturbance than previously thought characteristic of this species (Thiel 1985; Mech et al. 1988; Mech 1989). They have established territories where prey is more abundant at lower elevations than expected, especially in winter (Montana Fish, Wildlife & Parks 2003).

Management

Although wolves dispersing from Canada were occasionally observed, gray wolves were essentially extirpated from Montana and the rest of the western United States in the early 1900s primarily due to conflicts with people. Wolves

started recolonizing the area around Glacier National Park in 1979, and the first den documented in Montana in more than 50 years was found in Glacier National Park in 1986. Wolves have since colonized much of northwestern Montana as a result of dispersal from Canada and Glacier National Park. In 1995 and 1996 wolves were reintroduced into Yellowstone National Park and central Idaho. Wolves resulting from these reintroductions have since expanded into areas in Montana near these reintroduction sites and continue to expand in numbers and distribution in Montana.

Gray wolves in Montana are classified under the Endangered Species Act as "endangered" in the northwest Montana federal recovery area and as "experimental non-essential" across southern Montana in the federal central Idaho and Greater Yellowstone recovery areas. Gray wolves reached biological recovery goals for the northern Rocky Mountains at the end of 2001. However, the process of delisting the species is currently on hold due to the lack of approved management plans from all three states (Montana, Idaho, and Wyoming). Early in 2004 the U.S. Fish and Wildlife Service approved the Montana Gray Wolf Conservation and Management Plan (Montana Fish, Wildlife & Parks 2003). Since then, Montana Fish, Wildlife & Parks (FWP) has been expanding its role, and the agency is now implementing the state's wolf conservation and management plan. FWP assumed that management responsibility through a cooperative agreement between the two agencies. The agreement transferred legal authority to FWP to begin implementing as much of the state plan as allowed under federal regulations, even though wolves currently remain listed.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Variable public tolerance in Montana	Public outreach to increase awareness of wolf biology, conservation, and management
	Technical assistance to private landowners to decrease potential for negative livestock-wolf interactions
Human-caused mortality (illegal shooting, conflicts with livestock, misidentification, vehicle or train strikes)	Adaptive management that is dynamic with the status of wolf populations and distribution
	Monitoring to document maintenance of a recovered population via different protocols
Disease	Monitor populations through blood sampling to identify the extent of the problem

Management Plan

Montana Fish, Wildlife & Parks. 2003. Montana Gray Wolf Conservation and Management Plan.

Northern Rocky Mountain Wolf Recovery Team. 1980. Northern Rocky Mountain wolf recovery plan interagency report. 67 pp.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. U.S. Fish and Wildlife Service, Denver CO. 119 pp.

U.S. Fish and Wildlife Service. 1970. A summary of the northern Rocky Mountain wolf recovery plan.

Citations

Mech, L. D. 1989. Wolf population survival in an area of high road density. American Midland Naturalist 121:387–389.

Mech, L. D., et al. 1988. Wolf distribution and road density in Minnesota. Wildlife Society Bulletin 16:85–87.

Thiel, R. P. 1985. Relationship between road densities and wolf habitat suitability in Wisconsin. American Midland Naturalist 113:404–407.

Grizzly Bear (*Ursus arctos horribilis*)

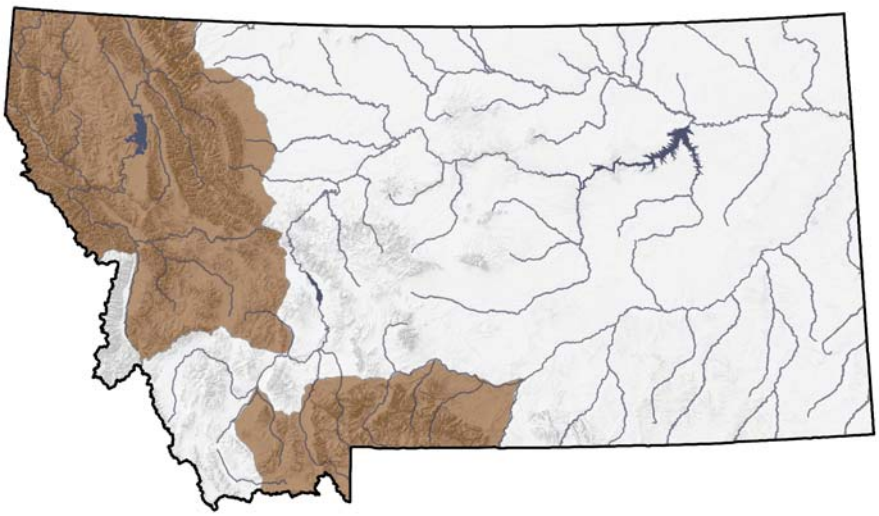


Figure 99. Distribution of the Grizzly Bear

Range

In Montana, grizzlies occur in northwest Montana, extending through Glacier National Park, into the Bob Marshall Wilderness area, and to the Blackfoot River. Grizzlies are also found coming down east off the Rocky Mountain Front. Individuals may also be found in the Helena, Bitterroot, and Lolo national forests. In addition, grizzlies are found in Yellowstone National Park, and individuals are moving into the Absaroka-Beartooth Wilderness and the Gallatin and Beaverhead/Deerlodge national forests.

Habitat

In Montana, grizzlies primarily use meadows, seeps, riparian zones, mixed shrub fields, closed timber, open timber, side-hill parks, snow chutes, and alpine slabrock habitats. Habitat use is highly variable between areas, seasons, local populations, and individuals (Servheen 1983; Craighead et al. 1982; Aune et al. 1984). Historically, the grizzly also was present on the plains occurring throughout most of eastern Montana.

Management

Current grizzly bear management throughout its range in Montana is dictated by its threatened listing under the Endangered Species Act (ESA). Under the ESA, no federal actions can cause further endangerment of grizzly bears. Federal land management agencies such as the U.S. Forest Service and the Bureau of Land Management must conduct management actions on their lands so that grizzly bears are not jeopardized. Interagency grizzly bear management guidelines have

been developed for these managed lands. In addition, the state of Montana has the Grizzly Bear Policy (MCA 12.9.103), which outlines policy guidelines for Montana Fish, Wildlife & Parks to promote the conservation of grizzly bears in Montana. Other regionally specific management plans include the Grizzly Bear Management Plan for Southwestern Montana 2002–2012 (Montana Fish, Wildlife & Parks 2002) and various tribal, national forest, and national park plans and policies. Most of these management plans are centered on three major themes: (1) Management of habitat to ensure grizzly bears have large expanses of suitable interconnected lands in which to exist, (2) Management of grizzly/human interactions, which most often result in death for the bears (and sometimes humans) involved (this is a particularly important concern for female bears because their removal may have significant impacts on the demography of isolated populations), and (3) Research to determine the population size and trends to ensure that grizzly bear populations are not being jeopardized. Please consult any of the management plans listed above for grizzly bear management specifics.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Human-bear and bear-livestock interactions	Proactive management including public outreach, utilizing Montana citizens
	Reduce human-caused mortality, including vehicles and trains
	Continued interagency management efforts
Habitat loss, degradation, and fragmentation	Protection of critical habitats through easements and other methods
Genetic fragmentation among Montana populations	Ongoing research projects, including genetic analysis projects

Management Plans

Dood, A. R., R. D. Brannon, R. D. Mace. 1986. Final Programmatic Environmental Impact Statement: The Grizzly Bear in Northwestern Montana. Montana Department of Fish, Wildlife & Parks.

Montana Fish, Wildlife & Parks. 2002. Grizzly Bear Management Plan for Southwestern Montana 2002–2012.

Montana Fish, Wildlife & Parks. 2001. Conservation Plan for Grizzly Bears in Montana. Pursuant to Section 6(C)(1) of the Endangered Species Act and Montana Fish, Wildlife & Parks Endangered Wildlife Program E-6. Montana Department of Fish, Wildlife & Parks, 1420 East Sixth Avenue, P.O. Box 200701, Helena, MT 59620.

Servheen, C. 1993. Grizzly bear recovery plan. Unpublished report to the U.S. Fish and Wildlife Service. University of Montana, Missoula, MT. 181 pp.

Shaffer, M. 1992. Keeping the grizzly bear in the American West: an alternative recovery plan. The Wilderness Society, Washington, DC.

U.S. Fish and Wildlife Service. 1982. Grizzly bear recovery plan. Unpublished report prepared in cooperation with recovery team leader Don L. Brown of the Montana Department of Fish, Wildlife & Parks. 195 pp.

Citations

Aune, K., T. Stivers, and M. Madel. 1984. Rocky Mountain Front grizzly bear monitoring and investigation. Montana Department of Fish, Wildlife & Parks, Helena, MT. 239 pp.

Craighead, J. J., J. Sumner, and G. Scaggs. 1982. A definitive system for analysis of grizzly bear habitat and other wilderness resources. Wildlife-Wildlands Institute Monograph 1. University of Montana, Missoula, MT. 279 pp.

Servheen, C. 1983. Grizzly bear food habits, movements and habitat selection in the Mission Mountains, Montana. Journal of Wildlife Management 47:1026–1035.

Black-footed Ferret (*Mustela nigripes*)

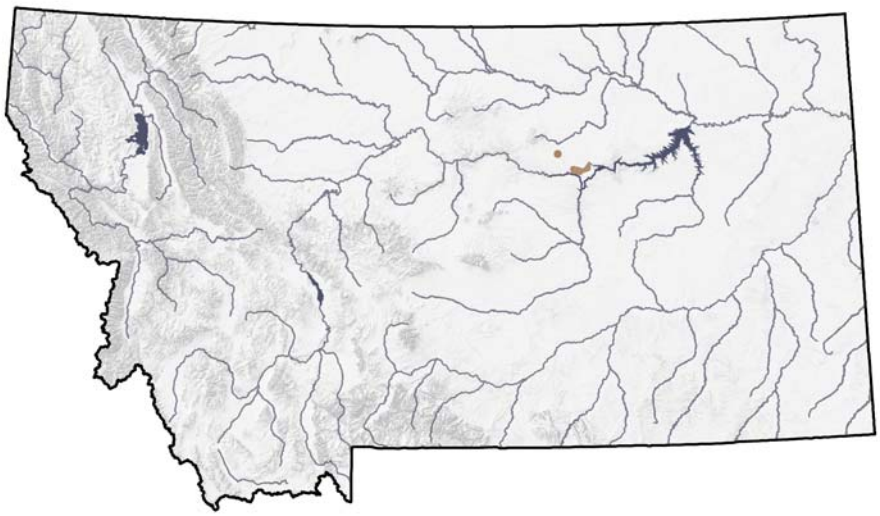


Figure 100. Distribution of the Black-footed Ferret

Range

Only reintroduced populations of the black-footed ferret in southern Phillips County are currently present. Historically, ferrets ranged throughout much of central and eastern Montana.

Habitat

Black-footed ferrets are intimately tied to prairie dogs (*Cynomys* spp.) throughout their range and have only been found in association with prairie dogs. They are therefore limited to the same open habitat used by prairie dogs: grasslands, steppe, and shrub-steppe. Black-footed ferrets do not dig their own burrows and rely on abandoned prairie dog burrows for shelter. Only large complexes (several thousand acres of closely spaced colonies) can support and sustain a breeding population of black-footed ferrets. It has been estimated that about 40 to 60 hectares of prairie dog colony is needed to support one ferret, and females with litters have never been found on colonies smaller than 49 hectares (Miller et al. 1996). Ferrets scent-mark to maintain spatial separation (Richardson 1986).

Management

Black-footed ferrets have been extirpated from most of their former large range largely as a result of loss of habitat due to prairie dog control programs. Canine distemper, in conjunction with captures for captive breeding, resulted in extirpation of the last known wild population near Meeteetse, Wyoming, by early 1987. See Miller et al. (1996) for more information on the discovery of the Meeteetse ferrets and subsequent distemper-caused decline and captive

breeding decisions that occurred in 1985. All known populations are a result of the reintroduction of captive-bred ferrets from animals taken into captivity from this population. Reintroductions have occurred annually in Montana on federal and/or tribal land since 1994 with varying success. It is unknown why reintroductions in Montana have not established a self-sustaining population. Predation by coyotes and badgers and long-distance dispersal may be the primary problems with the reintroduction efforts. Disease, such as sylvatic plague, has also apparently resulted in deaths for released animals. Some wild reproduction has occurred, but no self-sustaining populations have been established yet.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Reduction of habitat	Research to validate critical habitat needs of black-footed ferrets
	Support strategic conservation easements by conservation organizations and public agencies to enhance critical habitat
	Work to develop information campaign to inform land owners and public concerning the need to maintain healthy critical habitats for black-footed ferret
Lack of prey base due to declining prairie dog colonies	Work through cooperative agreements to manage for healthy populations of prairie dogs
Disease, such as canine distemper	Continue monitoring diseases that impacts health of populations
Failure of reintroduction efforts	Continue supporting future reintroduction efforts that include the adaptive management paradigm

Management Plans

Anderson, M. E. et al. 1978. Black-footed ferret recovery plan. U.S. Fish and Wildlife Service Black-footed Ferret Recovery Team. 150 pp.

Bureau of Land Management (BLM). 1979. Habitat management plan prairie dog ecotypes. USDI, BLM, Montana State Office. Wildlife Habitat Area MT-02-06-07-S1. 61 pp.

Christopherson, D., R. Stoneberg, R. Matchett, D. Biggins, J. Grensten, A. Dood, B. Haglan. 1994. Black-footed ferret reintroduction in Montana: project description and 1994 protocol. 31 pp + appendix.

Montana Fish, Wildlife & Parks. 1992. North-central Montana black-footed ferret reintroduction and management plan. Prepared by North Central Montana Working Group. 59 pp.

U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants: establishment of a nonessential experimental population of black-footed ferrets in north-central Montana; final rule. Federal Register 59:42696-42715.

U.S. Fish and Wildlife Service (USFWS). 1988. Black-footed ferret recovery plan. Denver, CO. 154 pp.

Citations

Miller, B., R. P. Reading, and S. Forrest. 1996. Prairie Night. Smithsonian Institute Press. Washington DC. 320 pp.

Richardson, L. 1986. On the track of the last black-footed ferrets. Nat. Hist. 95(2):69–77.

Canada Lynx (*Felis lynx*)

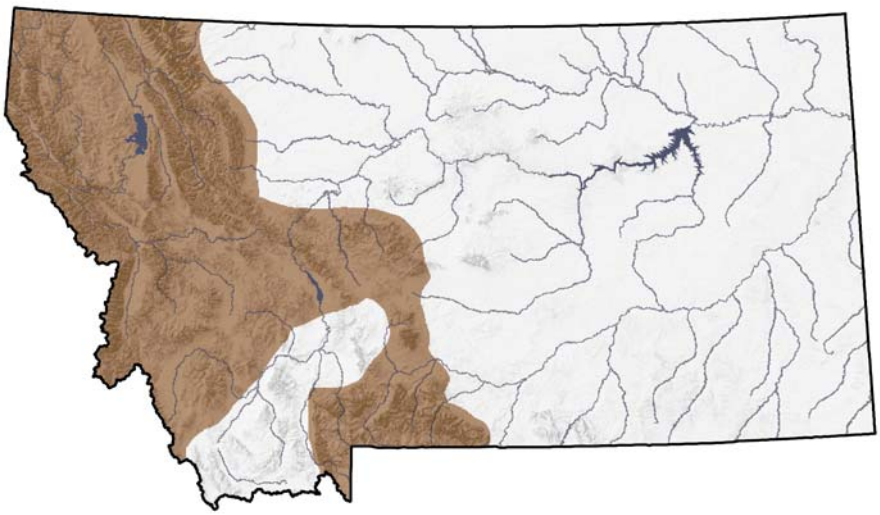


Figure 101. Distribution of the Canada Lynx

Range

Canada lynx are limited to western mountains of Montana; however, dispersers have been occasionally documented in eastern Montana.

Habitat

Canada lynx west of the Continental Divide generally occur in subalpine forests at elevations between 1,220 and 2,150 meters, in stands composed of pure lodgepole pine but also mixed stands of subalpine fir, lodgepole pine, Douglas-fir, grand fir, western larch, and hardwoods (J. Squires, personal communication 1999, in Ruediger et al. 2000). In extreme northwestern Montana, primary vegetation may include cedar-hemlock habitat types (Ruediger et al. 2000). East of the Continental Divide, the subalpine forests inhabited by lynx occur at higher elevations (1,650 to 2,400 meters) and are composed mostly of subalpine fir. Secondary habitat is intermixed Engelmann spruce and Douglas-fir habitat types where lodgepole pine is a major seral species (Ruediger et al. 2000). Throughout their range, shrub-steppe habitats may provide important linkage habitat between the primary habitat types described above (Reudiger et al. 2000). Typical snow conditions are important factors for the species, with lynx occurring primarily in habitats that also receive relatively uniform and moderately deep snowfall amounts (total annual snowfall of 100 to 127 centimeters) (Kelsall et al. 1977). Within these habitat types, disturbances that create early successional stages, such as fire, insect infestations, and timber harvest, provide foraging habitat for lynx by creating forage and cover for snowshoe hares, although older forests also provide habitats for snowshoe hares and lynx for longer periods of time than disturbance-created habitats (Ruediger et al. 2000).

Canada lynx avoid large openings but often hunt along edges in areas of dense cover (Ruediger et al. 2000). When inactive or birthing, they occupy dens typically in hollow trees, under stumps, or in thick brush. Den sites tend to be in mature or old-growth stands with a high density of logs (Koehler 1990; Koehler and Brittell 1990). These habitats must be near or adjacent to foraging habitat because the hunting range of the female is reduced during this time (Ruediger et al. 2000).

In the South Fork Flathead River, Canada lynx were mostly located in fire-created, densely stocked young stands of lodgepole pine where snowshoe hares were most abundant. No locations in open or semi-open areas were observed (Koehler at al. 1979). In the Garnet Range, most were found in subalpine fir forest (Smith 1984). Denning sites are found in mature and old-growth lodgepole pine, spruce, and subalpine fir forests with a high density of logs (Koehler 1990, Koehler and Brittell 1990). Denning stands need not be large (1 to 3 hectares), but several stands should be interconnected (Koehler and Brittell 1990). Lynx require cover for stalking and security, and usually do not cross openings wider than 100 meters (Koehler and Brittell 1990).

Management

Canada lynx are classified as a furbearer in Montana, but the trapping season is currently closed in the state. Any lynx accidentally trapped must be released uninjured and reported to designated Montana Fish, Wildlife & Parks (FWP) employees in the trapping district within five days. Any lynx trapped that cannot be released unharmed must be reported to FWP for assistance to determine disposition and/or collection of the animal. The Canada Lynx was listed as a threatened species under the Endangered Species Act in the contiguous United States in 2000 because of the inadequacy of guidance for conservation of lynx in the National Forest Land and Resource Management Plans and Bureau of Land Management Land Use Plans (Reudiger et al. 2000). Subsequently, the Canada Lynx Conservation Assessment and Strategy (Reudiger et al. 2000) was produced to provide guidance for conservation measures on federally managed lands to ensure that lynx populations were not jeopardized by management of critical habitat. Please consult the plan for details of this strategy.

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Habitat, specifically conifer loss and destruction	Adequate management strategies between agencies to protect dense tree stands
	Maintain natural mosaic of forest by allowing low- to medium-level fires

Fragmented landscapes suppress principle prey (snowshoe hare) populations	Continue research on prey base (snowshoe hare and red squirrel)
Road construction decreases connectivity and movement and increases potential for human disturbance	Conserve contiguous tracks of habitat by working with state and federal agencies to manage for road construction and development
Grazing increases competition for forage resources with Canada lynx prey	Manage forests for sustainable livestock grazing

Management Plan

Ruediger, Bill, and 14 others on Lynx Biology Team. 2000. Canada Lynx Conservation Assessment and Strategy. 120 pp.

Citations

Kelsall, J. P., E. S. Telfar, and T. D. Wright. 1977. The effects of fire on the ecology of the boreal forest, with particular reference to the Canadian north: a review and selected bibliography. Canadian Wildlife Service, Occasional Paper No. 32. Ottawa, Canada.

Koehler, G. M., and J. D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. Journal of Forestry, October 1990.

Koehler, G. M., M. G. Hornocker, and H. S. Hash. 1979. Lynx movements and habitat use in Montana. Canadian Field-Naturalist 93(4):441–442.

Paige, L.C. 2000. America’s Wildlife: The Challenge Ahead. International Association of Fish and Wildlife Agencies. Washington, DC.

Smith, D. S. 1984. Habitat use, home range, and movements of bobcats in western Montana. M.S. thesis, University of Montana, Missoula, MT. 58 pp.

American Bison (*Bos bison*)

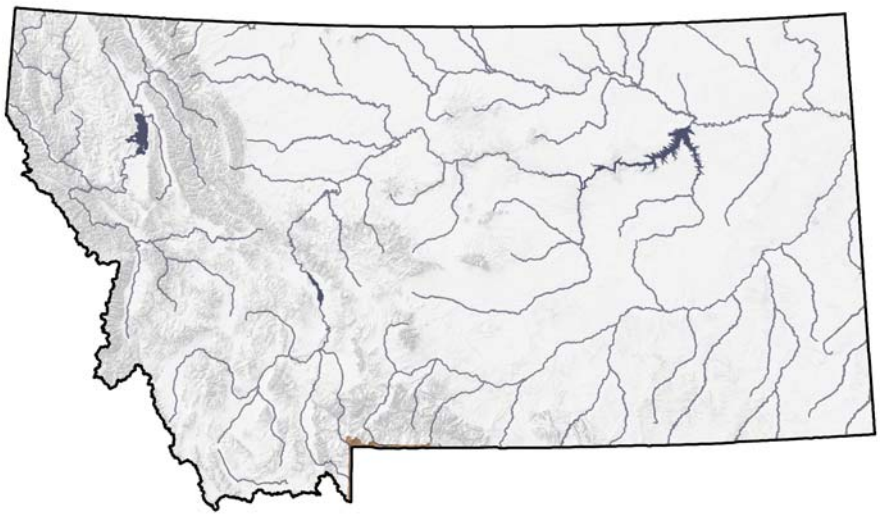


Figure 102. Distribution of the American Bison

Range

Free-ranging American bison in Montana are located only in areas surrounding Yellowstone National Park. Another semi-wild population occurs at the National Bison Range in northwestern Montana. American bison are also located on private ranches throughout Montana. The animals in Yellowstone National Park are partially descended from animals originally found in the park. Intervention has led to a genetically diverse population with genetics derived from bison imported in the early 1900s mixed with remnant native bison following the great reduction in the 1800s. Other bison descended from five founder herds captured in various portions of the bison's former range, including Canada. Some were caught along the Milk River in Montana (Pattie and Hoffman 1992). American bison were formerly widespread in North America from Alaska and western Canada across the United States into northern Mexico.

Some American bison migrate out of Yellowstone National Park during the winter; these movements are more frequent and involve greater numbers of animals during years of heavy snow when populations are high (generally more than 3,000 individuals) (National Academy of Sciences 1998). Recently (1985–1986), bison harvest has resumed in response to Montana movements out of Yellowstone National Park. American bison at the National Bison Range are confined to the range and no migration is possible. This species previously made mass migrations across the prairie in spring and fall, with mountain populations moving to lower elevations in valleys.

Taxonomists recognize two subspecies of bison—the plains and the woodland bison—which have distinct differences in habitat preference and historical range.

Habitat

Because of restrictions, currently occupied habitat does not reflect the full natural range for American bison. Throughout their range, American bison inhabit woodlands and open plains and grasslands. Woodlands and openings in boreal forests, meadows, and river valleys are used in the northern parts of their range. Like other large grazers, they are attracted to burn areas the next growing season (Shaw and Carter 1990). During the growing season at the Konza Prairie in northeastern Kansas, they preferred areas that had been burned in spring. Summer grazing was concentrated in a large watershed area (79 to 119 hectares) dominated by warm-season, perennial C4 grasses. In fall and winter they grazed both burned and unburned watersheds more uniformly, but grazed most intensively in areas with large stands of cool-season, C3 grasses (Vinton et al. 1993).

Management

Management of free-ranging American bison in Montana has been controversial. The presence of brucellosis in these animals and their migration out of Yellowstone National Park into adjacent public and private lands has led to conflicts between private landowners, citizens, public administrative agencies, and public land management agencies. Free-ranging herds in Montana are currently managed under the Interagency Bison Management Plan. The current distribution of Yellowstone National Park bison and the management potential of this herd is limited to several very small areas outside of Yellowstone National Park where they can be tolerated and will not pose a disease risk to cattle grazing on surrounding habitats. It is unlikely that the distribution of bison in the Greater Yellowstone area will dramatically change until brucellosis is eliminated from the herd. Efforts are currently being explored to isolate a brucellosis-free population with acceptable genetics in order to establish free-ranging herds outside Yellowstone National Park. Establishing this type of herd would require extensive cooperation from various federal and state agencies and private partners. If successful, these herds could serve to help restore the ecology of many community types in greatest need of conservation, such as grassland complexes, mixed shrub/grass associations, woody draws, and mixed broadleaf forests. Along with the restoration of these community types, many associated species in greatest need of conservation could benefit (e.g., prairie dogs, blackfooted ferrets, and swift foxes).

Conservation Concerns & Strategies

Conservation Concerns	Conservation Strategies
Disease (brucellosis)	Brucellosis control
Control issues for bison moving in and out of Yellowstone National Park	Continue development of working relationships with landowners

The American bison is ecologically extinct outside Yellowstone National Park and has a very reduced range of free-roaming herds	Establish free-ranging, disease-free American bison populations in suitable grassland habitats outside Yellowstone National Park where they can function ecologically and operate as keystone species to restore grassland systems
Bison genome has been eroded by unnatural management practices and introgression with domestic cattle genes	Preserve wild bison genome through herd expansion and restoration projects in North America
Exclusion of American bison from management plans as part of the natural mammalian fauna in Montana eligible for regulated harvest	Create populations of wild bison that can be harvested and provide economic and social benefits to Montana

Management Plan

Montana Department of Livestock and Montana Fish, Wildlife & Parks. 1996. Interim bison management plan. 70 pp.

USDI National Park Service. 2000. Bison Management for the State of Montana and Yellowstone National Park. Final Environmental Impact Statement for the Interagency Bison Management Plan for the State of Montana and Yellowstone National Park. Vol. I. August 2000.

Citations

Keiter, R. B. 1997. Greater Yellowstone's bison: unraveling of an early American wildlife conservation achievement. Journal of Wildlife Management 61:1–11.

National Academy of Sciences. 1998. Brucellosis in the Greater Yellowstone Area, by N. F. Cheville, D. R. McCullough, and L.R. Paulson. Washington, DC: National Academy Press.

Pattie, D. L., and R. S. Hoffmann. 1992. Mammals of the North American Parks and Prairies. Self-published.

Shaw, J. A., and T. S. Carter. 1990. Bison movements in relation to fire and seasonality. Wildlife Society Bulletin 18:426–430.

Vinton, M. A., D. C. Hartnett, E. J. Finck, and J. M. Briggs. 1993. Interactive effects of fire, bison (*Bison bison*) grazing and plant community composition in tallgrass prairie. American Midland Naturalist 129:10–18.

Component IV: Greatest Inventory Needs

> *"Over time, this Strategy will allow FWP to collect data for 1) species for which we do not have sufficient information to determine their level of conservation need, 2) species that are important or indicator species for the health of certain communities, or 3) species we think can help us measure the success we are having at conserving our fish and wildlife using a comprehensive approach."*

Prior to assessing inventory needs, we obtained and entered 130,000 additional observation points to the Point Observation Database (POD) maintained by the Montana Natural Heritage Program (MNHP). However, many species still have inadequate amounts of data, poor quality data, or outdated information. Without adequate occurrence data it is difficult to determine the abundance or distribution of a species, making it impossible to confidently classify the need for conservation of a species and the habitats that sustain it. Likewise, many species and groups of species that might have adequate observations offer unique opportunities to gauge the health of other fish and wildlife as well as habitats through ongoing monitoring. We define inventory as collecting data in order to establish the occurrence and distribution of species, but we also recognize that collecting data in order to establish population trends of species statewide over time is important and could occur coincidentally with inventory efforts. Future versions of this Strategy should consider developing separate species monitoring and species research components that assign species and species groups to tiers based on the specific need for trend monitoring or research.

The following species and groups of species were identified as Tier I (in greatest need of inventory). This tier assignment is separate from the species component tier assignments provided earlier in this Strategy. In other words, the species assigned Tier I for this inventory component were assessed whether or not the species has a population considered low or declining. Ongoing inventory for the following groups should continue, and coordinated efforts should be made to inventory these groups and species. The following legend can be used to provide information about why a group or species has been classified as Tier I, and can also be used to frame experimental designs. All species and group inventory tier assignments can be found in Tables 7 and 8.

Legend for Groups and Species in Greatest Inventory Needs:

Inventory:

I^1 : Observational data is lacking
I^2 : Observational data is outdated
I^3 : Observational data is of poor quality
I^4 : Statewide inventory needed
I^5 : Localized inventory needed
I^6 : Group/species require targeted survey efforts
I^7 : Information required to know if species is a migratory or peripheral species
I^M : Monitoring efforts required

Other:

O^1 : Dependant on critical habitats
O^2 : Opportunity exists for law enforcement to assist with inventory
Tier I Sp.: The species is a species of greatest conservation need (Tier I)

Groups with Greatest Inventory Needs

Groups with Greatest Inventory Needs	I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2
Invertebrate Group	X			X		X				
Crayfish Group	X			X		X				
Mussels Group	X			X		X				
Fish, Prairie Group	X			X		X				
Reptiles Group	X			X		X				
Birds, Shorebirds/Waterbirds Group	X			X		X			X	X
Birds, Nocturnal Group	X			X		X			X	
Mammals, Bats Group	X			X		X				
Mammals, Small Group	X			X		X				

Species with Greatest Inventory Needs

Species with Greatest Inventory Needs	I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Calico Crayfish	X			X		X		X		X	
Virile Crayfish	X			X		X		X		X	
A Crayfish	X			X		X		X		X	
Signal Crayfish	X			X		X		X		X	
Black Sandshell	X			X							
Western Pearlshell	X			X							X
Torrent Sculpin	X			X							
Spoonhead Sculpin	X			X							
Shortnose Gar	X				X						X
Lake Trout (native lakes)	X					X		X		X	X
Western Silvery Minnow	X			X		X		X			
Brassy Minnow	X			X		X		X			
Plains Minnow	X			X		X		X			
Pearl Dace	X			X							X
Trout-perch	X			X							X
Iowa Darter	X			X							
Coeur d' Alene Salamander	X						X	X			X
Plains Spadefoot	X			X				X			
Western Toad								X			X
Great Plains Toad	X						X	X			
Northern Leopard Frog								X			X
Snapping Turtle	X			X		X		X			X
Spiny Softshell	X			X		X		X			X
Northern Alligator Lizard	X			X		X		X			
Western Skink	X			X		X		X			
Rubber Boa	X			X		X		X			
Western Hog-nosed Snake	X			X		X		X			X

Species with Greatest Inventory Needs	I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Milksnake	X			X		X		X	X		X
Smooth Greensnake	X				X	X	X				X
American Bittern	X			X					X		
Black-crowned Night-heron	X			X					X		
White-faced Ibis	X			X					X		
Northern Goshawk	X					X		X			
Columbia Sharp-tailed Grouse	X					X		X		X	X
Yellow Rail	X			X			X				X
Greater Yellowlegs	X			X			X				
Solitary Sandpiper	X			X			X				
Semipalmated Sandpiper	X			X			X				
Western Sandpiper	X			X			X				
Least Sandpiper	X			X			X				
Baird's Sandpiper	X			X			X				
Pectoral Sandpiper	X			X			X				
Dunlin	X			X			X				
Long-billed Dowitcher	X			X			X				
Arctic Tern	X			X			X				
Black-billed Cuckoo	X			X					X		
Yellow-billed Cuckoo	X			X			X		X		
Barn Owl	X			X			X		X		
Northern Hawk Owl	X			X		X				X	
Common Nighthawk	X			X		X		X		X	
Common Poorwill	X			X		X		X			
Black Swift	X				X	X		X	X		
Chimney Swift	X			X		X			X		
White-throated Swift	X			X		X		X			
Black-chinned Hummingbird	X			X					X		
Alder Flycatcher	X			X		X		X			
Purple Martin	X			X		X	X				

Species with Greatest Inventory Needs	I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Canyon Wren	X			X		X		X	X		
Sedge Wren	X			X			X				X
American Dipper	X	X		X		X		X			
Blue-gray Gnatcatcher	X				X	X	X				
Eastern Bluebird	X			X			X				
Western Bluebird	X			X		X		X			
Black-and-white Warbler	X			X		X		X	X		
Indigo Bunting	X			X		X		X	X		
Green-tailed Towhee	X			X		X		X	X		
Field Sparrow	X				X	X	X	X			
Le Conte's Sparrow	X			X			X				
Nelson's Sharp-tailed Sparrow	X			X			X				X
Black Rosy-finch	X			X			X				
Arctic Shrew	X				X		X				
Northern Myotis	X			X			X				
Eastern Red Bat	X			X			X				
Spotted Bat	X			X		X		X			X
Townsend's Big-eared Bat	X			X		X		X	X		X
Pallid Bat	X			X			X				X
American Pika	X			X		X		X	X		
Eastern Cottontail	X			X			X				
Black-tailed Jackrabbit	X				X	X		X			
Uinta Chipmunk	X				X	X					
Hoary Marmot	X				X	X		X	X		X
Uinta Ground Squirrel	X				X	X		X			
Wyoming Ground Squirrel	X				X	X		X			
Northern Flying Squirrel	X				X	X		X			
Idaho Pocket Gopher	X				X	X		X			
Hispid Pocket Mouse	X				X		X				
Water Vole	X			X		X		X			

Species with Greatest Inventory Needs	**I^1**	**I^2**	**I^3**	**I^4**	**I^5**	**I^6**	**I^7**	**I^M**	**O^1**	**O^2**	**Tier 1 Sp.**
Sagebrush Vole	X			X		X		X			
Northern Bog Lemming	X				X	X		X	X		X
Meadow Jumping Mouse	X			X		X		X			X
Common Porcupine	X	X		X		X		X		X	
Western Spotted Skunk	X			X			X		X	X	

Revision and Monitoring of the Strategy

Monitoring

The scope of the Montana's strategy is tremendous, and most likely exceeds the current resources that would be necessary to fully implement all the conservation strategies identified for each conservation priority identified within the four components. As a result, there is an increased need to monitor the effectiveness of the strategy. Monitoring will be critical to increase our confidence in future management decisions, improve the effectiveness of the strategies that are implemented and to generally improve our knowledge about ecological relationships between species, habitat and community scale conservation so that future versions of this strategy are improved and species and their habitats more efficiently conserved.

Our goal is to determine the overall effectiveness of the strategy by monitoring all conservation efforts, determining if they are succeeding or failing, measuring the progress being made toward projected outcomes and then using all of this information to adapt and improve the strategy throughout time. In order to achieve this goal we will 1) determine if conservation strategies were implemented, 2) determine if the strategies that were implemented resulted in the anticipated outcomes, and 3) determine if the size of the species population or amount of habitat has increased or if condition have improved as a result of the strategies. All of this information will be incorporated into subsequent management decisions related to the implementation and revision of the strategy.

Revision

Strategies range from broad- to fine-scale, and the time needed to detect the success as a result of implementation may vary from years to decades. As such, we will monitor the overall conservation success for each of the four components at different intervals and incorporate this information into our decisions as soon as possible. Although components will be monitored separately, the overall strategy will be revised every six years.

Monitoring and Revision of Focus Area Conservation

Monitoring the success of strategies implemented within focus areas will be achieved by 1) identifying if strategies were not implemented, partially implemented, fully implemented, or are ongoing indefinite implementation, 2) incorporating appropriate monitoring concepts into project design at the operational level to ensure that the anticipated outcomes are achieved, and 3) by coordinating ongoing monitoring efforts by agencies and organizations to evaluate the trends of the species and habitats within the focus areas and determine if they are increasing or improving.

Note: In the future, adequate land cover layers need to be developed so that spatial analysis methods for monitoring the health and status of the focus areas can be improved and refined.

Because selection of the priority focus areas is based on the extent of the presence of fish and wildlife communities in greatest need, monitoring the overall effectiveness of strategies at conserving focus areas will require looking at strategies being implemented for all of the communities and species.

Fish, Wildlife & Parks staff will coordinate the revision of this component every six years in collaboration with its partners and through public review.

Monitoring and Revision of Community Types Conservation

Monitoring the success of strategies implemented for community types will be achieved by 1) identifying if strategies were not implemented, partially implemented, fully implemented, or are ongoing indefinite implementation, 2) incorporating appropriate monitoring concepts into project design at the operational level to ensure that the anticipated outcomes are achieved, and 3) by coordinating ongoing monitoring efforts by agencies and organization to evaluate the trends of the species and habitats that make up the essential community associations to determine if their condition is improving.

Fish and wildlife communities have not been fully defined in Montana. Although much of the information contained in this Strategy is not new, the strategy planning process provided an opportunity to begin developing general and essential associations for all fish and wildlife species with their habitats by building on many years of research and work. We linked fish and wildlife with plants and geographic characteristics to attempt to create community types. In order to best monitor the effectiveness of conservation strategies aimed at community types, much research is needed to fully develop and validate true fish and wildlife communities in Montana. Success at conserving these communities could then be measured by using methods such as monitoring an index of overall community condition.

Fish, Wildlife & Parks staff will coordinate the revision of this component every six years in collaboration with its partners and through public review.

Monitoring and Revision of Species Conservation

Monitoring the success of strategies implemented for species will be achieved by 1) identifying if strategies were not implemented, partially implemented, fully implemented, or are ongoing indefinite implementation, 2) incorporating appropriate monitoring concepts into project design at the operational level to ensure that the anticipated outcomes are achieved, and 3) by coordinating

ongoing agency and organization monitoring efforts to evaluate the trends of the species to determine if their populations are increasing.

The primary method for monitoring the overall effectiveness of conservation strategies implemented for species will be performed using the Montana Animal Species of Concern List (SOC), cooperatively maintained by FWP and MNHP, will be used to monitor species populations. Each year the MNHP senior zoologist and the chief of the FWP Information Management Unit conduct a review of the Montana Animal Species of Concern List using a protocol developed by NatureServe and modified for Montana. The review combines the quantitative documentation approach from NatureServe with the professional knowledge of staff from numerous agencies and organizations to determine species status. Subsequent to the annual review, the FWP Information Management Unit will use information from the updated Species of Concern List to recalculate the assignment of level of conservation need to all Montana fish and wildlife species as described in the species methods section of this Strategy. Changes in tier assignments will serve as one indicator to help gauge if species are being successfully conserved in Montana. Overall, the movement of any species from a higher tier to a lower tier (e.g., Tier I to Tier II) or off the list entirely could indicate improvement. Movement of species from a lower tier to a higher tier could indicate further decline.

Fish, Wildlife & Parks staff will coordinate the revision of this component every six years in collaboration with its partners and through public review.

Monitoring and Revision of the Inventory Component

Monitoring the success of implementing the inventory component of the strategy will be achieved by 1) identifying if no, partial or full inventory was conducted, and 2) incorporating appropriate monitoring concepts into inventory design at the operational level to ensure that the anticipated outcomes are achieved.

The primary method for monitoring the overall effectiveness of conducting inventories for species identified in the strategy will be achieved using the FWP/MNHP Point Observation Database (POD). The database is the statewide clearinghouse for fish and wildlife species data for inventories conducted by many agencies and organizations such as FWP, MNHP, the U.S. Forest Service, The Nature Conservancy, and the Audubon Society. The POD will be queried to determine if gaps in occurrence data for species and species groups identified in the Strategy as in greatest need of inventory have been met.

Fish, Wildlife & Parks staff will coordinate the revision of this component every six years in collaboration with its partners and through public review.

Law Enforcement, Con/Ed, and State Parks

To date, Congressional wording of legislation has not allowed, or has limited, the direct allocation of SWG funds to projects pertaining to law enforcement, outreach, or activities in state parks. This does not mean that opportunities do not exist for developing projects within these areas that would provide benefits to species and habitats in greatest need of conservation. In fact, activities of this type have already been and continue to be conducted within each of these areas without SWG funding. Law enforcement officers regularly use domestic livestock to assist fisheries biologists with the transport of arctic grayling and cutthroat trout for restoration projects occurring in wilderness and remote areas of the state. Montana Fish, Wildlife & Parks conservation education staff have been instrumental in helping develop information strategies for the SWG planning efforts and are actively involved in issues related to many species and habitats described in this Strategy such as loons, native fish, and invasive species that require intense education and information campaigns in order to address human-related conservation concerns. Montana's state parks have been involved with the recent inventory of small mammals, bats, and other wildlife species that have been identified as in greatest need and offer an unequaled venue for communicating the foundations of comprehensive conservation to Montana's public through interpretation and hands-on experience. Montana Fish, Wildlife & Parks firmly believes that the successful implementation of this Strategy will require that law enforcement, conservation education, and state parks be engaged in activities and be eligible for funding.

The following list is intended to provide examples of how these areas of FWP could be integrated with the implementation of the FWP Comprehensive Fish and Wildlife Conservation Strategy. The list is not complete, but should provide an idea of the diversity of opportunity that exists and will be required.

Law Enforcement

- Investigation and prosecution of individuals who seek to profit through the commercial exploitation of sensitive species or species of special concern

- Regular patrols, presence, and covert operations in areas where sensitive species projects (such as brood stock ponds or in-channel spawning and rearing areas for native fish) and efforts are in progress

- Investigate and prosecute illegal introductions of fish and wildlife and provide an enforcement presence in areas where the transportation of live fish to other bodies of water is suspected to occur

- Through SWG, augment financial resources through overtime and other means, for special species-related projects that merit an enhanced presence or protection by law enforcement officers

- Participate in the planning and management of sensitive species, offering social component information in season setting, season types, or special regulations for certain areas that would serve to enhance certain game species of concern

- Utilize relationships built with other resource agency's law enforcement and wildlife control divisions in the protection and enhancement of sensitive species

- Focus attention on violations associated with snowmobiles, ATVs, and water-based recreation that directly affect fish and wildlife and their habitats during certain times of the year

- Expand investigations and prosecution of individuals involved in the introduction of non-native or exotic plants and animals

- Continue a leadership role in the on-the-ground efforts to resolve conflicts between wildlife and humans (bears, ungulates in urban environments, etc.) and develop new technologies, equipment, and approaches to reduce the effects of wildlife damage to private property

- Provide equipment and technical expertise in the logistics of transporting personnel, equipment, and fish/wildlife species in restoration efforts

- Provide increased field assistance as well as informational support to biologists in the implementation of fish and wildlife inventories, tagging and marking operations, etc.

- Dovetail efforts with the Conservation Education Division in preparing sensitive species issues presentations in public forums such as hunter education classes, school programs, and the media. Work with biologists to conduct inventory of fish and wildlife through tagging, investigation of illegal kills and harvest, and road kills. Special opportunities exist in wilderness and remote areas where officers can provide domestic livestock for transportation. Opportunities exist at check stations and especially with species such as wolfs, raptors, and furbearers.

- Work directly with biologists with species-related issues such as disease and reintroduction

- Help conserve habitats by addressing issues related to snowmobiles and ATVs, no-wake zones, exotic introductions of plants and animals, human/bear and wolf conflicts, 310 permit violations

Conservation Education

The mission of Montana Fish, Wildlife & Parks is to provide for the stewardship of the fish, wildlife, parks, and recreational resources of Montana, while contributing to the quality of life for present and future generations. To carry out its mission, FWP's Conservation Education Division strives to provide and support fiscally responsible programs that help Montanans and others understand and appreciate the importance of the conservation and management of Montana's:

- Aquatic ecosystems, habitats, and species
- Terrestrial ecosystems, habitats, and species
- Important cultural and recreational resources

Under the CFWCS, FWP conservation education will focus on programs to:

- Provide aquatic education and informational materials and programs to the public and to schools and teachers
- Develop, refine, and expand native fish species programs
- Provide information about the problems caused by illegal introductions
- Conduct aquatic education and comprehensive fisheries management training for FWP staff
- Enhance the stewardship of public and private lands and their wildlife inhabitants through education
- Increase knowledge of species identified as being in greatest conservation need
- Provide wildlife-oriented informational and educational efforts to meet hunting and nonhunting public needs and to address changing social conditions
- Offer education and information programs to help people learn to live with all wildlife and reduce wildlife/human conflicts

State Parks

- Provide sites for the inventory of fish and wildlife species on state park properties
- Work with FWP's Conservation Education Division to create interpretive programs that inform the public about comprehensive conservation

- Provide programs that educate and inform the public about the species and habitats in greatest need of conservation and what conservation activities need to occur in order to conserve them

Methods

The strategy is organized from broad-scale (ecotype/focus area) to fine-scale (species). However, the priorities were actually developed using methods that work from species to ecotype/focus areas. FWP's first step was to update our occurrence databases and assess updated databases to determine which native Montana species are in greatest need of conservation (Tier I). Please refer to Categorizing the Levels of Conservation Need in the introduction of this strategy for complete definitions of the tiers used in this document. Using this information, community types were identified that offer some of the greatest opportunity to conserve these Tier I species. Finally, the community types in greatest need of conservation were used to locate the areas of the state where those communities are the richest and offer some of the best opportunities for comprehensive conservation of all associated species and their habitats.

Species

During the first year of planning, we collected as much observational data as possible from all agencies and organizations in Montana for incorporation into the existing FWP and Montana Natural Heritage Program (MNHP) Point Observation Database (POD). More than 130,000 new observations were added during this period. The updated database was used by FWP and MNHP to review the Montana Species of Concern List (except fish). In order to establish the low, declining or imperiled status of all Montana's species for this strategy, a matrix was developed that included all species occurring in Montana with their corresponding score for each of the fields listed below.

MP = Management plan (0=no, 1=yes)
CF = Current funding (0=none, 1=partial, 3=full)
CM = Current management effort (0=none, 1=group level, 2=species specific)
SC = Species of Concern rank (1=S1, 2=S2, 3=S3, 4=S4, 5=S5)
LR = Limited Montana range and secure population (0=yes, 1=no)
LT = Existing local threats (0=yes, 1=no)
I = Incidental to Montana (yes=default to Tier IV)
N = Non-native species (yes=default to Tier IV)

Tiers for conservation need had previously been identified for birds by the Partners in Flight effort and for fish by a separate FWP effort. We used these existing tier assignments to model the following equation and then calculated the original draft tier assignments for all species including land birds and fish using this equation.

Tier = (CF+CM+2*SC)/4+MP/4+LR-LT

Staff from MNHP and each of FWP's seven regions reviewed the draft tiers and recommended if species should be reassigned to a different tier. The planning

team was concerned about not including a species in Tier I that perhaps should have been and adopted rules for adjusting tier assignments. The rules required that only one FWP region indicate that any species should be assigned a greater conservation need status, such as from Tier II or Tier III to Tier I, for that species to be reassigned. However, the rules required at least two FWP administrative regions indicating that a species should be reassigned from a Tier II to a Tier III and three FWP regions indicating that a species should be reassigned from a Tier I to a Tier II before an adjustment was made.

The SWG technical and steering committees then reviewed the species tier assignments and made some final adjustments based on knowledge of future funding and management issues. All contacts from the agencies and non-governmental organizations that were invited to the October 2003 exploratory group were e-mailed the draft list, and comments were received and incorporated. The final draft of the species tier assignments was then reviewed and approved by the SWG steering committee (Table 2).

Community Types

Although fish and wildlife communities have never been formally established for Montana, associations were developed between species and their related habitats to the degree described in this strategy as community types. Future efforts should be made to define and validate fish and wildlife communities for Montana. To begin developing communities and identify those in greatest need of conservation, the FWP technical committee, field staff, and Habitat Montana staff determined the scales and coverages best suited for assessing the levels of community type conservation need.Three mapable coverages were selected to allow for planning at three scales: 1) the FWP Habitat Montana ecotypes, 2) USFS subsections (HUC for aquatic [*1]), and 3) GAP 50 covertypes [*2] (habitat descriptors for aquatic [*3]), (Montana Fish, Willdife & Parks 1991; Nesser et al. 1997; Fisher et al. 1998). All riparian and wetland covertypes from the GAP 50 were combined to create one covertype. The same was done for sagebrush and salt flats, shrub grassland associations, and grassland covertypes. Covertypes with minor associations such as snow and rock were removed prior to any analysis.

Fish and wildlife species addressed in the strategy were linked with the GAP covertypes to establish essential and general biological associations that are described in this strategy as community types. To accomplish this, GAP 50 and ecosystem codes were obtained from their respective GIS layers using all species locations in the POD database with a positional accuracy of less than 500 meters. These data were summarized for each species to obtain a count of occurrences within each habitat and ecosystem category, and then sorted in descending order. For each species we determined the major habitats and ecosystems utilized by each species, using ecological knowledge of that species in conjunction with the associations from POD. After the major ecosystems were

assigned, any ecosystems determined to be integral to the ecology of a particular species were designated as essential. After the major habitats were assigned, any habitats determined to be integral to the ecology of a particular species were designated as essential habitats. The newly created community types were then linked with the USFS subsections and HUCs and finally with the FWP Habitat Montana ecotypes.

GAP covertypes, such as for grasslands, one of Montana's most important habitats, are based on the amount of grass cover interpretable by remote sensing. They are not strongly associated with ecological site factors or a recognized vegetation classification like the National Vegetation Classification System. Future classifications and maps will have a stronger relationship to habitat if they are ecological and based on data that are more comprehensive. The scale of GAP coverage also is often not suitable for comprehensive mapping of wetlands and riparian areas, another significant habitat, which often occur as narrow or small areas. These habitats will be better known and managed if National Wetlands Inventory mapping or a similar product is completed for Montana.

*1 Note: We initially used USFS subsections for aquatic but later changed to HUC 4 to better represent aquatic communities.
*2 Note: For clarity of description, GAP 50 covertypes were used as a surrogate for habitat.
*3 Note: Aquatic communities were described as prairie streams, mixed source rivers, intermountain valley rivers, intermountain valley streams, mountain streams, prairie rivers, lowland lakes, lowland reservoirs, mountain lakes, and mountain reservoirs.

A habitat matrix containing all community types along with the information listed below was developed, and the following formula was used to calculate draft tiers for all community types within each subsection or HUC.

((S+AR+SAR+CR+CCR)/5)

S = Percentage of covertype in stewardship (1=private, 2=public, 3=wilderness/park)
AR = Animal richness (1=(more than 100), 2=(11 to 100), 3=(0 to 10))
SAR = Average of SWG tier ranks for animal richness (1=(0 to 2.34), 2=(2.34 to 2.647), 3=(2.647 to 3))
CR = MNHP community richness: based on National NHP community covertypes, i.e., how many Montana GAP covertypes are found in grouped community types? (1=(47 to 100), 2=(16 to 46), 3=(0 to 15))
CCR = MNHP community of concern richness: based on National NHP community of concern covertypes, i.e., how many Montana GAP covertypes of concern are found in grouped community types? (1=(10 to 17), 2=(4 to 9), 3=(0 to 3))

Staff from FWP administrative regions reviewed draft tiers that were assigned to each community type within the subsection or HUC under their authority, and adjustments to tier assignments were made. Reviewers also scored the level of threat (high, medium, or low) associated with the community type within each subsection or HUC. An average statewide tier was calculated for each community type using the staff's adjusted tier assignments for each community type within subsections and HUCs (Tables 3 and 4). Finally, these tables also describe the level of stability within each community type as either declining, stable or improving, as reviewed and revised by appropriate agency staff.

Focus Areas

USFS subsections and HUCs were inserted with the final statewide community type tier assignments to determine what areas contained the greatest percentage of Tier I community types. These subsections and HUCs were assigned Tier I status. Staff from FWP administrative regions were provided opportunities to review and comment on the draft focus area tier assignments. Habitat Montana, Upland Game Bird Habitat Enhancement, and Future Fisheries staff involved with administration of the programs then reviewed all adjusted draft tier assignments. Technical and steering committees reviewed and approved community and focus area tier assignments. Tier I focus areas were then organized by ecotype (Tables 5 and 6).

Inventory

The inventory component addresses species in greatest need of data collection in order to establish the distribution and status of that species. The inventory component was designed to help direct survey efforts toward species and groups of species that have inadequate occurrence data.

An inventory matrix was developed using the following information, and all groups of species and individual species were assigned as Tier I, II, or III (Tables 7 and 8).

IIS = Need for inventory of individual species
ISP = Need for inventory of species group (ISP 1–2.3 = Tier I, ISP 2.4–2.6 = Tier II, ISP 2.7–3 = Tier III)
IE = Inventory effort (observation points in point observation database): (0 to 100)=1, (101 to 500)=2, (more than 500)=3
I/P = Incidental/peripheral species: 1 = native incidental/peripheral, 2 = native not incidental/peripheral
ST= Sum of tier scores for all species in a given taxonomic group
SP= Number of species in a taxonomic group

IIS=(IE + I/P)/2 and ISP=ST/SP

Tables

Table 1. Conservation and Management Plans of Montana

Note:This is not a complete list of all management plans prepared for Montana. Please alert FWP to any additional plans for inclusion.

Taxonomic Group	Species or Area	Author	Year	Title
Fish	White Sturgeon	U.S. Fish and Wildlife Service	1999	White sturgeon, Kootenai River population recovery plan. Region 1, USFWS, Portland, OR.
	Pallid Sturgeon	U.S. Fish and Wildlife Service	1993	Pallid sturgeon recovery plan. U.S. Fish and Wildlife Service. Bismarck, ND. 55 pp.
	Paddlefish	North Dakota Game & Fish, Montana Fish, Wildlife & Parks and University of Idaho	1995	Montana-North Dakota Paddlefish Management Plan. A cooperative venture between North Dakota Game & Fish, Montana Fish, Wildlife & Parks, and University of Idaho. 45 pp.
	Yellowstone Cutthroat Trout	May, B. E., W. Urie, B. B. Shepard. Montana Cooperative Fishery Research Unit.	2003	Range-wide status of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). 2001.
		May, B. E.	1998	Yellowstone cutthroat trout: current status and conservation recommendations with the state of Montana. U.S. Forest Service, Gallatin National Forest, Bozeman, MT.
		Montana Fish, Wildlife & Parks	2000	Cooperative Conservation Agreement for Yellowstone cutthroat trout within Montana between Crow Tribe, Montana Fish, Wildlife & Parks (FWP), Montana Department of Environmental Quality (DEQ), Montana Department of Natural Resources and Conservation (DNRC), U.S. Forest Service–Northern Region, Gallatin and Custer national forests, Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), Bureau of Indian Affairs (BIA), Yellowstone National Park.
		Yellowstone Cutthroat Trout Working Group	1994	Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) management guide for the Yellowstone River drainage. Montana Fish, Wildlife & Parks, Helena, MT, and Wyoming Game and Fish, Cheyenne, WY.

	Westslope Cutthroat Trout	Montana Fish, Wildlife & Parks	1999	Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout (*Onchorhynchus clarki lewisi*) in Montana.
		Shepard, Brad B., B. E. May, W. Urie	2003	Status of westslope cutthroat trout (*Onchorhynchus clarki lewisi*) in the United States, 2002. Westslope Cutthroat Conservation Team.
	Bull Trout	MBTRT (Montana Bull Trout Restoration Team)	2000	Restoration plan for bull trout in the Clark Fork River basin and Kootenai River basin, Montana. Montana Department of Fish, Wildlife & Parks, Helena, MT. 116 pp.
		U.S. Fish and Wildlife Service	2002a	Endangered and threatened wildlife and plants: bull trout (*Salvelinus confluentus*) draft recovery plan. Available at http://pacific.fws.gov/bulltrout/recovery/Default.htm.
		U.S. Fish and Wildlife Service	2002b	Endangered and threatened wildlife and plants: proposed designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout. Federal Register 67:71235–71284. Available at http://pacific.fws.gov/bulltrout/criticalhab.htm.
	Arctic Grayling	Montana Fluvial Arctic Grayling Workgroup	1995	Montana Fluvial Arctic Grayling Restoration Plan. Montana Fish, Wildlife & Parks, Helena, MT.
		Kaya, Calvin M.	1990	Status report on fluvial arctic grayling (*Thymallus arcticus*) in Montana. Biology Department, Montana State University, Bozeman. Prepared for Fish, Wildlife & Parks, Helena, MT.
		Magee, James P.	2000	Montana fluvial arctic grayling recovery project: annual monitoring report.
	Burbot	Jones-Wuellner, Melissa R., and Christopher S. Guy	2004	Status of burbot in Montana. Prepared for Montana Fish, Wildlife & Parks. Montana Cooperative Fisheries Research Unit, Montana State University, Bozeman, MT.
	Sauger	Montana Fish, Wildlife & Parks	2005	Memorandum of Understanding and Conservation Agreement for Sauger (*Sander canadensis*) in Montana. 23 pp. Draft in progress.
	Hauser Reservoir	Montana Fish, Wildlife & Parks	1994	Hauser Reservoir: fisheries management plan: September 1989–September 1994. 16 pp.

Amphibians & Reptiles	All	Maxell, Bryce A.	2000	Management of Montana's amphibians: a review of factors that may present a risk to population viability and accounts on the identification, distribution, taxonomy, habitat use, natural history, and the status and conservation of individual species. Contract No. 43-0343-0-0224.
Birds	Waterfowl	James A. Kushlan, Melanie J. Steinkamp, Katherine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl	2002	Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, DC. 78 pp.
	Waterfowl	North America Waterfowl Planning Team	1998	North American Waterfowl Management Plan. Expanding the Vision (update). 32 pp.
	Waterfowl	Will, G. C.	1986	Waterfowl, Sandhill Crane and Snipe Management Plan.
	Shore Birds	Brown, S., C. Hickey, B. Harrington, and R. Gill, eds.	2001	The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.
	Land Birds	Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D.W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will.	2004	Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY.
	Montana Birds	Casey, D	2000	Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.
	Common Loon	Evers, D.C.	2004	Status Assessment and Conservation Plan for the Common Loon (*Gavia immer*) in North America. BioDiversity Research Institute.
		Skaar, D.	1990	Montana common loon management plan. Unpublished report prepared for U.S. Forest Service, Region 1. 61 pp.

		Skaar, D.	1988	Creation of a management plan for the common loon in Montana. Pp. 101_102 in North American Loon Fund conference report.
	Trumpeter Swan	Mississippi and Central Flyway Councils	1997	Subcommittee on the Interior Population of Trumpeter Swans. Mississippi and Central flyway management plan for the interior population of trumpeter swan. Mississippi and Central Flyway Councils. C/o USFWS, Migratory Bird Coordinator, Twin Cities, MN.
		Pacific Flyway Council and USFWS	2003	Pacific Flyway Implementation Plan for the Rocky Mountain Population of Trumpeter Swans 2003 Annual Report. 29 pp.
		Trumpeter Swan Recovery Group	1984	The North American Management Plan for Trumpeter Swans.
	Harlequin Duck	Cassirer, E. F., J. D. Reichel, R. L. Wallen, and E. C. Atkinson	1996	Harlequin duck (*Histrionicus histrionicus*) conservation assessment and strategy for the U.S. Rocky Mountains. Unpublished technical report, Idaho Department of Fish and Game, Lewiston, ID.
	Bald Eagle	Escano, R., D. Flath, R. Hazelwood and B. Klaver. (eds.) for Bureau of Land Management	1986	Montana eagle management plan. Montana Bald Eagle Working Group. Bureau of Land Management, Montana State Office. 61pp.
		Montana Bald Eagle Working Group	1994	Montana bald eagle management plan. 2nd ed. Bureau of Reclamation. 104 pp.
		Zubik, R. J.	1988	A site-specific management plan for the lower Stillwater bald eagle territory. Unpublished report. Montana Department of Fish, Wildlife & Parks, Kalispell, MT. 43 pp.
	Golden Eagle	U.S. Fish and Wildlife Service	1981	Draft western golden eagle management plan. Washington, DC.
	Peregrine Falcon	U.S. Fish and Wildlife Service	1984	American peregrine falcon recovery plan (Rocky Mountain/southwest population). Prepared in cooperation with American peregrine falcon recovery team. USFWS, Denver, CO.
	Chukar	Molini, W. A.	1976	Chukar Partridge, Species Management Plan, Montana Fish, Wildlife & Parks.
	Greater Sage-Grouse	Braun, C.E.	1999b	Conservation plans. Presentation given to the Western Greater Sage-Grouse Status Conference, January 14_15, 1999, Boise, ID. Online. Available at http://www.rangenet.org/projects/grouse.html.

		Montana Greater Sage-Grouse Work Group	2004	Management plan and conservation strategies for greater sage-grouse in Montana.
	Columbian Sharp-tailed Grous	Wood, M	1991	Management Plan for Columbian Sharp-tailed grouse in Western Montana.
	Whooping Crane	Olsen, David L.	1980	Whooping Crane Recovery Plan. Whooping Crane Recovery Team (USFWS, Nebraska Game and Parks Commission, Texas Parks & Wildlife Department, National Audubon Society). 206 pp.
	Piping Plover	Montana Piping Plover Working Group	2003	Montana Piping Plover Management Plan. Unpublished report. 35 pp.
		U.S. Fish and Wildlife Service	1994	Revised recovery plan for piping plovers (*Charadrius melodus*) breeding on the Great Lakes and northern Great Plains. 121 pp.
		U.S. Fish and Wildlife Services. Haig, S., et al. (eds.)	1988	Recovery plan for piping plovers (*Charadrius melodus*) of the Great Lakes and northern great plains. U.S. Fish and Wildlife Service. 160 pp.
	Interior Least Tern	Sidle, J. G. and W. F. Harrison	1990	Recovery plan for the interior population of the least tern (*Sterna antillarum*). U.S. Fish and Wildlife Service. 90 pp.
	Burrowing Owl	Klute, D. S., L.W. Ayers, M.T. Green, W.H. Howe, S.L. Jones, J.A. Shaffer, S.R. Sheffield, and T.S. Zimmerman	2003	Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. U.S. Department of the Interior, Fish and Wildlife Service, Biological Technical Publication FWS/BTP-R6001-2003, Washington, DC.
Mammals	Bats	Altenbach, J. S., W. Amy, P. V. Bradley, P. E. Brown, K. Dewberry, D. B. Hall, J. Jeffers, B. Lund, J. E. Newmark, M. J. O'Farrell, M. Rahn, R. E. Sherwin, C. R. Tomlinson, J. A. Williams	2002	Nevada Bat Conservation Plan. Nevada Bat Working Group. Austin, NV. 188 pp.
		Ellison, L. E., M. B. Wunder, C. A. Jones, C. Mosch, K. W. Navo, K. Peckham, J. E. Burghardt, J. Annear, R. West, J. Siemers, R. A. Adams, and E. Brekke	2003	Colorado bat conservation plan. Colorado Committee of the Western Bat Working Group. Available at http://www.wbwg.org/colorado/colorado.htm
		Hinman, K.E. and T.K. Snow, eds.	2003	Arizona Bat Conservation Strategic Plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report. (In progress.) Arizona Game and Fish Department, Phoenix, AZ.

	Townsend's Big-eared Bat	Pierson, E.D., M.C. Wackenhut, J.S. Altenbach, P. Bradley, P. Call, D.L. Genter, C. E. Harris, B. L. Keller, B. Lengus, L. Lewis, B. Luce, K. W. Navo, J. M. Perkins, S. Smith, and L. Welch	1999	Species conservation assessment and strategy for Townsend's big-eared bat (*Corynorhinus townsendii townsendii* and *Coynorhinus townsendii pallescens*). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, ID.
	Prairie Dogs (Black-tailed & White-tailed)	Bureau of Land Management.	1979	Habitat management plan prairie dog ecotypes. USDI, Bureau of Land Management, Montana State Office. Wildlife Habitat Area MT-02-06-07-S1. 61 pp.
		Montana Prairie Dog Working Group	2002	Conservation plan for black-tailed and white-tailed prairie dogs in Montana.
	Gray Wolf	Montana Fish, Wildlife & Parks	2003	Montana Gray Wolf Conservation and Management Plan.
		Northern Rocky Mountain Wolf Recovery Team	1980	Northern Rocky Mountain wolf recovery plan interagency report. 67 pp.
		U.S. Fish and Wildlife Service	1987	Northern Rocky Mountain wolf recovery plan. U.S. Fish and Wildlife Service, Denver CO. 119 pp.
		U.S. Fish and Wildlife Service	1970	A summary of the Northern Rocky Mountain wolf recovery plan.
	Grizzly Bear	Dood, A.R., Brannon R.D., Mace, R.D.	1986	Final Programmatic Environmental Impact Statement, the Grizzly Bear in Northwestern Montana. Montana Department of Fish, Wildlife & Parks.
		Montana Fish, Wildlife & Parks	2002	Grizzly bear management plan for southwestern Montana 2002–2012.
		Montana Fish, Wildlife & Parks	2001	Montana Fish, Wildlife & Parks. 2001. Conservation Plan for Grizzly Bear in Montana. Pursuant to Section 6(C)(1) of the Endangered Species Act and Montana Fish, Wildlife & Parks Endangered Wildlife Program E-6. Montana Department of Fish, Wildlife & Parks, 1420 East Sixth Avenue, P.O. Box 200701, Helena, MT 59620
		Servheen, C.	1993	Grizzly bear recovery plan. Unpublished report to U.S. Fish and Wildlife Service. University of Montana, Missoula, MT. 181 pp.
		Shaffer, M.	1992	Keeping the grizzly bear in the American West: an alternative recovery plan. The Wilderness Society, Washington, DC.

		U.S. Fish and Wildlife Service	1982	Grizzly bear recovery plan. Unpublished report prepared in cooperation with recovery team leader Don L. Brown of the Montana Department of Fish, Wildlife & Parks. 195 pp.
	Black-footed Ferret	Christopherson, D., Stoneberg, R., Matchett, R., Biggins, D., Grensten, J., Dood, A., Haglan, B.	1994	Black-footed ferret reintroduction in Montana: project description and 1994 protocol. 31 pp. + appendix.
		Montana Fish, Wildlife & Parks	1992	North-central Montana black-footed ferret reintroduction and management plan. Prepared by North Central Montana Working Group. 59 pp.
		U.S. Fish and Wildlife Service	1994	Endangered and threatened wildlife and plants: establishment of a nonessential experimental population of black-footed ferrets in north-central Montana; final rule. Federal Register 59:42696–42715.
		U.S. Fish and Wildlife Service	1988	Black-footed ferret recovery plan. Denver, CO. 154 pp.
		U.S. Fish and Wildlife Service. Anderson, M. E., Greenwalt, L. A. , et al. (eds.)	1978	Black-footed ferret recovery plan. U.S. Fish and Wildlife Service Black-footed ferret Recovery Team. 150 pp.
	Canada Lynx	Ruediger, Bill & 14 others on Lynx Biology Team	2000	Canada Lynx Conservation Assessment and Strategy. 120 pp.
	Mountain Lion	Montana Fish, Wildlife & Parks	1996	Management of Mountain Lions in Montana: Final EIS
		Riley, Shawn J.		Cougars in Montana: a review of biology and management and a plan for the future.
	Elk & Mule Deer	Casey, D., and P. Malta	1990	Long-term habitat management plan for elk and mule deer winter range enhancement on Firefighter Mountain and Spotted Bear winter ranges.
	Caribou	U.S. Fish and Wildlife Service	1984	Selkirk mountain caribou management/recovery plan. U.S. Fish Wildlife Service, Portland, OR. 121 pp.
	Pronghorn	McGowan, T. A.	1970	Antelope management and BLM's wildlife habitat management planning system.
		Tsukamoto, G.K.	1983	Pronghorn antelope species management plan.
	Bison	Montana Department of Livestock and Montana Fish, Wildlife & Parks	1996	Interim bison management plan. 70 pp.

		USDI National Park Service	2000	Bison Management for the State of Montana and Yellowstone National Park. Final Environmental Impact Statement for the Interagency Bison Management Plan for the State of Montana and Yellowstone National Park. Vol. I.
	Mountain Goat	Joslin, G.	1980	Mountain goat habitat management plan for the Cabinet Mountains, Montana. Montana Fish, Wildlife & Parks and Kootenai National Forest.
	Bighorn Sheep	Parker, T. and M. Scott	1985	Bighorn Sheep Management Plan.
Resource Areas, Communities, Habitats and Landscape Level Conservation Plans		Aldrich, D. F.	1972	Wilderness fire management planning guidelines and inventory procedures.
		Bissell, G. and C. A. Yde.	1985	Wildlife and wildlife habitat mitigation plan for Hungry Horse hydroelectric project. Final report. Montana Department of Fish, Wildlife & Parks.
		Bissell, G. and C. A. Yde.	1985	Wildlife and wildlife habitat mitigation plan for the Noxon Rapids and Cabinet Gorge hydroelectric. Montana Department of Fish, Wildlife & Parks.
		Brown, D. L., T. Musshel, and J. Gaffney	1977	A strategic plan for the protection, perpetuation and recreational use of the fish and wildlife resources in Montana.
		Bureau of Land Management, Big Dry Resource Area	1993	Draft—Resource management plan and environmental impact statement for the Big Dry Resource Area, Miles City District. U.S. Department of the Interior.
		Bureau of Land Management	1991	Rangeland program summary update: Missouri Breaks grazing EIS, prairie potholes grazing EIS, Headwaters resource management plan (Great Falls Resource Area portion). 102 pp.
		Bureau of Reclamation	1993	Canyon Ferry Reservoir noxious weed management plan.
		Carlsen, Tom, and Rick Northrup	1992	Canyon Ferry Wildlife Management Area Final Draft Management Plan.

		Confederated Salish and Kootenai Tribes and Montana Fish, Wildlife & Parks	2003	Flathead Subbasin Plan Assessment: Executive Summary. NWPCC. Portland, OR.
		Elis, Janet H., Richard, Jim		A planning guide for protecting Montana's wetlands and riparian areas. Montana Watercourse, Montana Department of Environmental Quality and Montana Audubon Society.
		Frisina, Michael R., McCarthy, John, J.	2001	Montana Sagebrush Bibliography. Montana Fish, Wildlife & Parks. 69 pp.
		Gibson, R. S.	1986	Environmental impact statement for the Helena National Forest, land and resource management plan. U.S.D.A. Forest Service.
		Gorman, J. D.	1984	Interagency Rocky Mountain Front Wildlife Monitoring/Evaluation Program.
		Helena National Forest, Townsend Ranger District and Bureau of Land Management, Headwaters Resource Area	1993	Environmental assessment of vegetation treatment and allotment management plan revisions for the Greater Crow Creek and Indian Creek watershed.
		Kootenai Tribe of Idaho and Montana Fish, Wildlife & Parks	2004	Public Review Draft Kootenai Subbasin Plan. Executive Summary. Report prepared for the Northwest Power and Conservation Council. Portland, OR.
		Lehmkuhl, J. F.	1984	Determining size and dispersion of minimum viable populations for land management planning and species conservation. Environmental Management 8(2):167–176.
		Molini, W. A., and G. K. Tsukamoto	1979	Individual species management plans.
		Montana Department of State Lands. Flathead County Park Board.	1988	Proposed Master Plan for Owen Sowerwine State Natural Area.
		Montana Fish, Wildlife & Parks and Confederated Salish and Kootenai Tribes	2000	Flathead Lake and River Co-Management Plan, 2001–2010.
		Montana Fish, Wildlife & Parks	1994	Statewide Habitat Plan. Implementation of Fish, Wildlife & Parks Commission. Habitat Montana Policy.
		National Wildlife Federation and the Natural Resources Defense Council	2001	Conservation Management of America's Public Lands: An Assessment and Recommendations for Progress 25 Years after FLPMA.
		The Nature Conservancy	2005	Unpublished report.

		The Nature Conservancy	2004	Canadian Rocky Mountains Ecoregional Assessment. Four volumes, including Report, Appendices, Conservation Area Descriptions and Maps.
		The Nature Conservancy	2000	Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.
		The Nature Conservancy	1999	Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.
		The Nature Conservancy	1996	Statewide conservation plan. Prepared by The Nature Conservancy of Montana, Montana Natural Heritage Program. 48pp.
		Noss, R., G. Wuerthner, K. Vance-Borland, and C. Carroll	2001	A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountain Ecoregion: Report to The Nature Conservancy. Conservation Science, Inc. 125 pp. + Executive Summary and Appendix D.
		Ormiston, J. H.	1973	Fleecer Mountain game range. Game management plan. Montana Fish and Game.
		Ostlie, W.R, R. E. Schneider, J. M. Aldrich, T. M. Faust, R. L. B. McKim and S. J. Chaplin	1997	The status of biodiversity in the Great Plains. The Nature Conservancy, Arlington, VA. 326 pp. + xii.
		Platts, W. S.	1989	Compatibility of livestock grazing strategies with fisheries, pp. 103–110. R. E. Gresswell, B. A. Barton, J. L. Kershner, eds. Practical approaches to riparian resource management. U.S. Bureau of Land Management, P.O. Box 36800, Billings, MT.
		Platts, W.S.	1981	Influence of forest and rangeland management on anadromous fish habitat in western North America: 7. Effects of livestock grazing. U.S.D.A. Forest Service General Technical Report PNW-124.
		Smith, C. A., and G. N. Boz	1977	Management plans for alternative uses of wildlife.
		Stagliano, D.M	2005	Aquatic Ecotype Diversity in Montana's Missouri River Drainages: A Community Classification Project. Montana Natural Heritage Program: A report to the BLM and The Nature Conservancy. 98 pp.

		Tennant, Donald	1975	Instream Flow Regimes for Fish, Wildlife, Recreation, and Related Environmental Resources (Billings, Mont.: U.S. Fish and Wildlife Service).
		U. S. Fish and Wildlife Service	2004	Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and Upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77pgs.
		U. S. Fish and Wildlife Service	1985	Charles M. Russell National Wildlife Refuge, Montana: Final Environmental Impact Statement.
		U. S. Fish & Wildlife Service- Missouri River basin studies	1955	A preliminary report on fish and wildlife resources in relation to the water development plan for the Sun-Teton division Missouri River basin project, Montana.
		U.S. Forest Service	1977	Western spruce budworm management plan.
		USDI National Park Service, Yellowstone National Park	1963	1963–1964 northern Yellowstone wildlife and range management plan.
		Vashro, J., et al.	1989	Upper Flathead system fisheries management plan: 1989–1994. Unpublished report. Montana Department of Fish, Wildlife & Parks and the Confederated Salish and Kootenai Tribes. 47 pp.
		Wikstrom, J. H., and S. B. Hutchison	1971	Stratification of forest land for timber management planning on the western national forests.

Table 2. Species Tier Assignments
This list is subject to change as information and understanding increases for each species biological needs. (Refer to page 413 for header definitions)

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Western Pearlshell	0	0	0	3					1
White Sturgeon	0	0	1	1					1
Pallid Sturgeon	1	1	2	1					1
Paddlefish	1	0	1	1					1
Shortnose Gar	0	0	1	1	1	1			1
Yellowstone Cutthroat Trout	1	1	2	2		1			1
Westslope Cutthroat Trout	1	1	2	2		1			1
Columbia Basin Redband Trout	0	0	1	1					1
Bull Trout	1	1	2	2		1			1
Lake Trout (native lakes)	0	0	1	2					1
Arctic Grayling	1	1	2	1		1			1
Sturgeon Chub	0	0	1	2					1
Sicklefin Chub	0	0	1	1					1
Pearl Dace	0	0	1	2					1
Blue Sucker	0	0	1	2					1
Trout-perch	0	0	1	2	1				1
Burbot	0	0	1	3		1			1
Sauger	0	0	1	2					1
Coeur d' Alene Salamander	0	0	0	2	1				1
Western Toad	0	0	1	3					1
Northern Leopard Frog	0	0	1	3	1	1			1
Snapping Turtle	0	0	0	3					1
Spiny Softshell	0	0	0	3		1			1
Western Hog-nosed Snake	0	0	0	3		1			1
Milksnake	0	0	0	2					1
Smooth Greensnake	0	0	0	2					1
Common Loon	1	1	2	2		1			1
Trumpeter Swan	1	0	2	2		1			1
Harlequin Duck	1	0	1	2					1
Bald Eagle	1	1	2	3					1
Greater Sage-Grouse	1	0	2	4		1			1
Columbian Sharp-tailed Grouse	0	0	1	4					1
Yellow Rail	0	0	0	1					1
Whooping Crane	1	0	2	1	1				1

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Piping Plover	1	0	2	2		1			1
Mountain Plover	0	0	2	2					1
Long-billed Curlew	0	0	0	4		1			1
Interior Least Tern	1	0	0	1					1
Black Tern	0	0	0	3		1			1
Flammulated Owl	0	0	0	3					1
Burrowing Owl	0	0	1	3		1			1
Black-backed Woodpecker	0	0	2	3		1			1
Olive-sided Flycatcher	0	0	1	3					1
Sedge Wren	0	0	1	1					1
Nelson’s Sharp-tailed Sparrow	0	0	1	1					1
Spotted Bat	0	0	1	1					1
Townsend’s Big-eared Bat	1	0	1	2					1
Pallid Bat	0	0	1	1					1
Pygmy Rabbit	0	0	0	3	1	1			1
Hoary Marmot	0	0	0	4		1			1
Black-tailed Prairie Dog	1	0	2	3		1			1
White-tailed Prairie Dog	1	0	2	1					1
Great Basin Pocket Mouse	0	0	0	2	1				1
Northern Bog Lemming	0	0	0	2					1
Meadow Jumping Mouse	0	0	1	2					1
Gray Wolf	1	1	2	3					1
Grizzly Bear	1	1	2	3		1			1
Black-footed Ferret	1	2	2	1					1
Canada Lynx	1	0	2	3		1			1
American Bison	1	0	2	2	1				1
Black Sandshell	0	0	0	5					2
Torrent Sculpin	0	0	1	3					2
Spoonhead Sculpin	0	0	1	3					2
Northern Redbelly X Finescale Dace	0	0	1	3					2
Bigmouth Buffalo	0	0	1	4		1			2
Freshwater Drum	0	0	1	4					2
Long-toed Salamander	0	0	0	5					2
Tiger Salamander	0	0	0	5		1			2
Tailed Frog	0	0	1	4					2
Great Plains Toad	0	0	1	3					2
Woodhouse's Toad	0	0	1	4					2
Pacific Treefrog	0	0	1	4					2
Plains Spadefoot	0	0	1	3					2
Columbia Spotted Frog	0	0	1	4					2

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Northern Alligator Lizard	0	0	0	3					2
Short-horned Lizard	0	0	0	3					2
Sagebrush Lizard	0	0	0	3					2
Western Skink	0	0	0	3					2
Rubber Boa	0	0	0	4					2
Common Garter Snake	0	0	0	4					2
Western Rattlesnake	0	0	0	4					2
Horned Grebe	0	0	0	4					2
Red-necked Grebe	0	0	0	4					2
Western Grebe	0	0	0	4					2
American Bittern	0	0	0	4					2
Black-crowned Night-heron	0	0	0	3					2
White-faced Ibis	0	0	0	1					2
Canvasback	1	0	1	5					2
Redhead	1	0	1	5					2
Hooded Merganser	1	0	1	4					2
Turkey Vulture	0	0	1	4					2
Northern Harrier	0	0	1	4					2
Sharp-shinned Hawk	0	0	1	4					2
Cooper’s Hawk	0	0	1	4					2
Northern Goshawk	0	0	1	3					2
Swainson’s Hawk	0	0	1	4					2
Ferruginous Hawk	0	0	1	3					2
Golden Eagle	1	0	0	4					2
Merlin	0	0	1	4					2
Peregrine Falcon	0	0	2	2					2
Prairie Falcon	0	0	1	4					2
Blue Grouse	0	0	1	5		1			2
White-tailed Ptarmigan	0	0	0	3					2
Greater Sandhill Crane	1	0	2	2					2
Upland Sandpiper	0	0	0	4					2
Marbled Godwit	0	0	0	4					2
Franklin’s Gull	0	0	0	3					2
Caspian Tern	0	0	0	2	1				2
Common Tern	0	0	0	3					2
Forster's Tern	0	0	0	2	1				2
Black-billed Cuckoo	0	0	0	4					2
Yellow-billed Cuckoo	0	0	0	3					2
Northern Pygmy-owl	0	0	0	4					2
Barred Owl	0	0	0	4					2

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Great Gray Owl	0	0	0	3					2
Boreal Owl	0	0	0	4					2
Northern Saw-whet Owl	0	0	0	4					2
Black Swift	0	0	0	3					2
Vaux's Swift	0	0	0	4					2
Black-chinned Hummingbird	0	0	0	4					2
Broad-tailed Hummingbird	0	0	0	1	1				2
Lewis' Woodpecker	0	0	1	3		1			2
Red-headed Woodpecker	0	0	1	3					2
Williamson's Sapsucker	0	0	1	4					2
Three-toed Woodpecker	0	0	1	4					2
Pileated Woodpecker	0	0	1	4					2
Alder Flycatcher	0	0	1	1	1				2
Hammond's Flycatcher	0	0	1	4					2
Cassin's Kingbird	0	0	1	2	1				2
Pinyon Jay	0	0	1	4					2
Boreal Chickadee	0	0	1	1	1				2
Chestnut-backed Chickadee	0	0	1	4					2
White-breasted Nuthatch	0	0	1	4					2
Pygmy Nuthatch	0	0	1	4					2
Brown Creeper	0	0	1	4					2
Canyon Wren	0	0	1	4					2
Winter Wren	0	0	1	4					2
Blue-gray Gnatcatcher	0	0	1	1	1				2
Eastern Bluebird	0	0	1	2	1				2
Western Bluebird	0	0	1	4					2
Veery	0	0	1	4					2
Sprague's Pipit	0	0	1	3					2
Loggerhead Shrike	0	0	1	4					2
Black-and-white Warbler	0	0	1	2	1				2
American Redstart	0	0	1	5		1			2
Yellow-breasted Chat	0	0	1	5		1			2
Indigo Bunting	0	0	1	2	1				2
Dickcissel	0	0	1	1	1				2
Green-tailed Towhee	0	0	1	4					2
Clay-colored Sparrow	0	0	1	4					2
Brewer's Sparrow	0	0	1	4					2
Field Sparrow	0	0	1	4					2
Lark Bunting	0	0	1	4					2
Baird's Sparrow	0	0	1	3					2

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Grasshopper Sparrow	0	0	1	4					2
Le Conte's Sparrow	0	0	1	1	1				2
Mccown's Longspur	0	0	1	4					2
Baltimore Oriole	0	0	1	3					2
Bullock's Oriole	0	0	1	5		1			2
Black Rosy-finch	0	0	1	3					2
Gray-crowned Rosy-finch	0	0	1	3					2
White-winged Crossbill	0	0	1	4					2
Preble's Shrew	0	0	0	3		1			2
Vagrant Shrew	0	0	0	4					2
Dwarf Shrew	0	0	0	3					2
Arctic Shrew	0	0	0	1					2
Merriam's Shrew	0	0	0	3					2
Pygmy Shrew	0	0	0	3					2
Hayden's Shrew	0	0	0	4					2
Yuma Myotis	0	0	1	4					2
Long-eared Myotis	0	0	1	4					2
Fringed Myotis	0	0	1	3					2
Long-legged Myotis	0	0	1	4					2
California Myotis	0	0	1	4					2
Western Small-footed Myotis	0	0	1	4					2
Northern Myotis	0	0	1	4					2
Silver-haired Bat	0	0	1	4					2
Big Brown Bat	0	0	1	4					2
Eastern Red Bat	0	0	1	4					2
Hoary Bat	0	0	1	4					2
Eastern Cottontail	0	0	0	4					2
Mountain Cottontail	0	0	0	4					2
White-tailed Jackrabbit	0	0	0	4					2
Black-tailed Jackrabbit	0	0	0	2					2
Uinta Chipmunk	0	0	0	3					2
Uinta Ground Squirrel	0	0	0	4					2
Wyoming Ground Squirrel	0	0	0	3					2
Northern Flying Squirrel	0	0	0	4					2
Idaho Pocket Gopher	0	0	0	3					2
Olive-backed Pocket Mouse	0	0	0	4					2
Ord's Kangaroo Rat	0	0	0	4					2
Hispid Pocket Mouse	0	0	0	1	1		1		2
White-footed Mouse	0	0	0	4					2
Water Vole	0	0	0	4					2

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Sagebrush Vole	0	0	0	4					2
Swift Fox	1	0	2	3					2
American Marten	0	0	1	4		1			2
Fisher	0	0	1	3					2
Least Weasel	0	0	1	4					2
Wolverine	0	0	2	2		1			2
American Badger	0	0	1	4					2
Western Spotted Skunk	0	0	1	1					2
Northern River Otter	0	0	1	4					2
Calico Crayfish	0	0	0	5					3
Virile Crayfish	0	0	0	4					3
A Crayfish	0	0	0	4					3
Signal Crayfish	0	0	0	5					3
Fatmucket	0	0	0	5					3
Giant Floater	0	0	0	5					3
Mottled Sculpin	0	0	1	5					3
Slimy Sculpin	0	0	1	5					3
Shovelnose Sturgeon	0	0	1	4					3
Goldeye	0	0	1	5					3
Lake Whitefish	0	0	1	4					3
Pygmy Whitefish	0	0	1	5					3
Mountain Whitefish	0	0	1	5					3
Lake Chub	0	0	1	5					3
Western Silvery Minnow	0	0	1	4					3
Brassy Minnow	0	0	1	5					3
Plains Minnow	0	0	1	5		1			3
Peamouth	0	0		5					3
Emerald Shiner	0	0	1	5					3
Sand Shiner	0	0	1	4					3
Northern Redbelly Dace	0	0	1	5		1			3
Fathead Minnow	0	0	1	4					3
Northern Pikeminnow	0	0	1	5					3
Longnose Dace	0	0	1	5					3
Redside Shiner	0	0	1	5					3
Creek Chub	0	0	1	5					3
Flathead Chub	0	0	1	5					3
River Carpsucker	0	0	1	5					3
Longnose Sucker	0	0	1	5					3
White Sucker	0	0	1	5					3
Largescale Sucker	0	0	1	5					3

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Mountain Sucker	0	0	1	5		1			3
Smallmouth Buffalo	0	0	1	5		1			3
Shorthead Redhorse	0	0	1	5					3
Channel Catfish	0	0	1	5					3
Stonecat	0	0	1	5					3
Brook Stickleback	0	0	1	5					3
Iowa Darter	0	0	1	5					3
Boreal Chorus Frog	0	0	1	5					3
Great Basin Spadefoot	0	0	1	5					3
Painted Turtle	0	0	0	5					3
Racer	0	0	0	5					3
Gopher Snake	0	0	0	5					3
Western Terrestrial Garter Snake	0	0	0	5					3
Plains Garter Snake	0	0	0	5					3
Pied-billed Grebe	0	0	0	5					3
Eared Grebe	0	0	0	5					3
Clark's Grebe	0	0	0	5					3
American White Pelican	0	0	1	3					3
Double-crested Cormorant	0	0	0	5					3
Great Blue Heron	0	0	0	5					3
Cattle Egret	0	0	0	5					3
Tundra Swan	0	0	1	5					3
Snow Goose	1	0	1	4					3
Ross' Goose	1	0	1	4					3
Canada Goose	0	0	1	5					3
Wood Duck	1	0	1	5					3
Green-winged Teal	1	0	1	5					3
Mallard	1	0	1	5					3
Northern Pintail	1	0	1	5					3
Blue-winged Teal	1	0	1	5					3
Cinnamon Teal	1	0	1	5					3
Northern Shoveler	1	0	1	5					3
Gadwall	1	0	1	5					3
American Wigeon	1	0	1	5					3
Ring-necked Duck	1	0	1	5					3
Greater Scaup	1	0	1	5					3
Lesser Scaup	1	0	1	5					3
White-winged Scoter	1	0	1	5					3
Common Goldeneye	1	0	1	5					3
Barrow's Goldeneye	1	0	1	5					3

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Bufflehead	1	0	1	5					3
Common Merganser	1	0	1	5					3
Red-breasted Merganser	1	0	1	5					3
Ruddy Duck	1	0	1	5					3
Osprey	0	0	1	5					3
Red-tailed Hawk	0	0	1	5					3
Rough-legged Hawk	0	0	1	5					3
American Kestrel	0	0	1	5					3
Gyrfalcon	0	0	1	5					3
Spruce Grouse	0	0	1	4					3
Ruffed Grouse	0	0	1	5					3
Sharp-tailed Grouse	0	0	1	4					3
Virginia Rail	0	0	0	5					3
Sora	0	0	0	5					3
American Coot	0	0	0	5					3
Lesser Sandhill Crane	1	0	2	2					3
Killdeer	0	0	0	5					3
Black-necked Stilt	0	0	0	5					3
American Avocet	0	0	0	5					3
Greater Yellowlegs	0	0	0	5					3
Lesser Yellowlegs	0	0	0	5					3
Solitary Sandpiper	0	0	0	5					3
Willet	0	0	0	5					3
Spotted Sandpiper	0	0	0	5					3
Semipalmated Sandpiper	0	0	0	5					3
Western Sandpiper	0	0	0	5					3
Least Sandpiper	0	0	0	5					3
White-rumped Sandpiper	0	0	0	5					3
Baird’s Sandpiper	0	0	0	5					3
Pectoral Sandpiper	0	0	0	5					3
Dunlin	0	0	0	5					3
Long-billed Dowitcher	0	0	0	5					3
Common Snipe	0	0	0	5					3
Wilson’s Phalarope	0	0	0	5					3
Red-necked Phalarope	0	0	0	5			1		3
Ring-billed Gull	0	0	0	5					3
California Gull	0	0	0	5					3
Herring Gull	0	0	0	5					3
Mourning Dove	0	0	0	5					3
Eastern Screech-owl	0	0	0	5					3

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Western Screech-owl	0	0	0	5					3
Great Horned Owl	0	0	0	5					3
Snowy Owl	0	0	0	5					3
Northern Hawk Owl	0	0	0	1	1		1		3
Long-eared Owl	0	0	0	5					3
Short-eared Owl	0	0	0	5					3
Common Nighthawk	0	0	0	5					3
Common Poorwill	0	0	0	5					3
Chimney Swift	0	0	0	5					3
White-throated Swift	0	0	0	5					3
Calliope Hummingbird	0	0	0	5					3
Rufous Hummingbird	0	0	0	5					3
Belted Kingfisher	0	0	0	5					3
Red-naped Sapsucker	0	0	1	5					3
Downy Woodpecker	0	0	1	5					3
Hairy Woodpecker	0	0	1	5					3
Northern Flicker	0	0	1	5					3
Western Wood-pewee	0	0	1	5					3
Willow Flycatcher	0	0	1	5					3
Least Flycatcher	0	0	1	5					3
Dusky Flycatcher	0	0	1	5					3
Cordilleran Flycatcher	0	0	1	5					3
Say’s Phoebe	0	0	1	5					3
Western Kingbird	0	0	1	5					3
Eastern Kingbird	0	0	1	5					3
Horned Lark	0	0	1	5					3
Tree Swallow	0	0	1	5					3
Violet-green Swallow	0	0	1	5					3
Northern Rough-winged Swallow	0	0	1	5					3
Bank Swallow	0	0	1	5					3
Cliff Swallow	0	0	1	5					3
Barn Swallow	0	0	1	5					3
Gray Jay	0	0	1	5					3
Steller’s Jay	0	0	1	5					3
Blue Jay	0	0	1	5					3
Clark’s Nutcracker	0	0	1	5					3
Black-billed Magpie	0	0	1	5					3
American Crow	0	0	1	5					3
Common Raven	0	0	1	5					3
Black-capped Chickadee	0	0	1	5					3

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Mountain Chickadee	0	0	1	5					3
Red-breasted Nuthatch	0	0	1	5					3
Rock Wren	0	0	1	5					3
House Wren	0	0	1	5					3
Marsh Wren	0	0	1	5					3
American Dipper	0	0	1	5					3
Golden-crowned Kinglet	0	0	1	5					3
Ruby-crowned Kinglet	0	0	1	5					3
Mountain Bluebird	0	0	1	5					3
Townsend’s Solitaire	0	0	1	5					3
Swainson’s Thrush	0	0	1	5					3
Hermit Thrush	0	0	1	5					3
American Robin	0	0	1	5					3
Varied Thrush	0	0	1	5					3
Gray Catbird	0	0	1	5					3
Sage Thrasher	0	0	1	5					3
Brown Thrasher	0	0	1	5					3
American Pipit	0	0	1	5					3
Bohemian Waxwing	0	0	1	5					3
Cedar Waxwing	0	0	1	5					3
Northern Shrike	0	0	1	5					3
Warbling Vireo	0	0	1	5					3
Red-eyed Vireo	0	0	1	5					3
Cassin’s Vireo	0	0	1	5					3
Tennessee Warbler	0	0	1	5					3
Orange-crowned Warbler	0	0	1	5					3
Nashville Warbler	0	0	1	5					3
Yellow Warbler	0	0	1	5					3
Yellow-rumped Warbler	0	0	1	5					3
Black-throated Gray Warbler	0	0	1	5					3
Townsend’s Warbler	0	0	1	5					3
Ovenbird	0	0	1	5					3
Northern Waterthrush	0	0	1	5					3
Macgillivray’s Warbler	0	0	1	5					3
Common Yellowthroat	0	0	1	5					3
Wilson’s Warbler	0	0	1	5					3
Western Tanager	0	0	1	5					3
Black-headed Grosbeak	0	0	1	5					3
Lazuli Bunting	0	0	1	5					3
Spotted Towhee	0	0	1	5					3

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
American Tree Sparrow	0	0	1	5					3
Chipping Sparrow	0	0	1	5					3
Vesper Sparrow	0	0	1	5					3
Lark Sparrow	0	0	1	5					3
Sage Sparrow	0	0	1	5					3
Savannah Sparrow	0	0	1	5					3
Fox Sparrow	0	0	1	5					3
Song Sparrow	0	0	1	5					3
Lincoln's Sparrow	0	0	1	5					3
Swamp Sparrow	0	0	1	5					3
White-throated Sparrow	0	0	1	5					3
White-crowned Sparrow	0	0	1	5					3
Harris' Sparrow	0	0	1	5					3
Dark-eyed Junco	0	0	1	5					3
Lapland Longspur	0	0	1	5					3
Chestnut-collared Longspur	0	0	1	5					3
Snow Bunting	0	0	1	5					3
Bobolink	0	0	1	5					3
Red-winged Blackbird	0	0	1	5					3
Western Meadowlark	0	0	1	5					3
Yellow-headed Blackbird	0	0	1	5					3
Rusty Blackbird	0	0	1	5					3
Brewer's Blackbird	0	0	1	5					3
Common Grackle	0	0	1	5					3
Brown-headed Cowbird	0	0	1	5					3
Orchard Oriole	0	0	1	5					3
Pine Grosbeak	0	0	1	5					3
Cassin's Finch	0	0	1	5					3
House Finch	0	0	1	5					3
Red Crossbill	0	0	1	5					3
Common Redpoll	0	0	1	5					3
Pine Siskin	0	0	1	5					3
American Goldfinch	0	0	1	5					3
Evening Grosbeak	0	0	1	5					3
Masked Shrew	0	0	0	5					3
Dusky or Montane Shrew	0	0	0	5					3
Water Shrew	0	0	0	5					3
Little Brown Myotis	0	0	1	5					3
American Pika	0	0	0	5					3
Desert Cottontail	0	0	0	5					3

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Snowshoe Hare	0	0	0	5					3
Least Chipmunk	0	0	0	5					3
Yellow-pine Chipmunk	0	0	0	5					3
Red-tailed Chipmunk	0	0	0	5					3
Yellow-bellied Marmot	0	0	0	5					3
Richardson’s Ground Squirrel	0	0	0	5					3
Columbian Ground Squirrel	0	0	0	5					3
Thirteen-lined Ground Squirrel	0	0	0	5					3
Franklin’s Ground Squirrel	0	0	0	5					3
Golden-mantled Ground Squirrel	0	0	0	5					3
Townsend’s Ground Squirrel	0	0	0	5					3
Eastern Fox Squirrel	0	0	0	5					3
Red Squirrel	0	0	0	5					3
Northern Pocket Gopher	0	0	0	5					3
American Beaver	0	0	0	5					3
Western Harvest Mouse	0	0	0	5					3
Deer Mouse	0	0	0	5					3
Northern Grasshopper Mouse	0	0	0	5					3
Bushy-tailed Woodrat	0	0	0	5					3
Southern Red-backed Vole	0	0	0	5					3
Heather Vole	0	0	0	5					3
Meadow Vole	0	0	0	5					3
Montane Vole	0	0	0	5					3
Long-tailed Vole	0	0	0	5					3
Prairie Vole	0	0	0	5					3
Muskrat	0	0	0	5					3
Western Jumping Mouse	0	0	0	5					3
Common Porcupine	0	0	0	5					3
Coyote	0	0	1	5					3
Red Fox	0	0	1	5					3
Black Bear	1	0	1	5					3
Ermine	0	0	1	5					3
Long-tailed Weasel	0	0	1	5					3
Mink	0	0	1	5					3
Striped Skunk	0	0	1	5					3
Bobcat	0	0	1	5					3
Mountain Lion	1	0	2	4					3
Wapiti Or Elk	1	0	2	5					3
Mule Deer	1	0	2	5					3
White-tailed Deer	0	0	2	5					3

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Moose	0	0	2	5					3
Pronghorn	1	0	2	5					3
Mountain Goat	1	0	1	5					3
Bighorn Sheep	1	0	1	4	1	1			3
White Heelsplitter	0	0	0	5				1	4
Cisco	0	0	1	5				1	4
Kokanee Salmon	0	0	1	5				1	4
Chinook Salmon	0	0	1	5				1	4
Rainbow Trout	0	0	1	5				1	4
Golden Trout	0	0	1	5				1	4
Brown Trout	0	0	1	5				1	4
Brook Trout	0	0	1	5				1	4
Rainbow Smelt	0	0	1	5				1	4
Northern Pike	0	0	1	5				1	4
Goldfish	0	0	1	5				1	4
Common Carp	0	0	1	5				1	4
Utah Chub	0	0	1	5				1	4
Golden Shiner	0	0	1	5				1	4
Spottail Shiner	0	0	1	5				1	4
Black Bullhead	0	0	1	5				1	4
Yellow Bullhead	0	0	1	5				1	4
Plains Killifish	0	0	1	4				1	4
Western Mosquitofish	0	0	1	5				1	4
Sailfin Molly	0	0	1	5				1	4
Shortfin Molly	0	0	1	5				1	4
Green Swordtail	0	0	1	5				1	4
Variable Platyfish	0	0	1	5				1	4
White Bass	0	0	1	5				1	4
Rock Bass	0	0	1	5				1	4
Green Sunfish	0	0	1	5				1	4
Pumpkinseed	0	0	1	5				1	4
Bluegill	0	0	1	5				1	4
Smallmouth Bass	0	0	1	5				1	4
Largemouth Bass	0	0	1	5				1	4
White Crappie	0	0	1	5				1	4
Black Crappie	0	0	1	5				1	4
Yellow Perch	0	0	1	5				1	4
Walleye	0	0	1	5				1	4
Roughskin Newt	0	0	0	5				1	4
Idaho Giant Salamander	0	0	0	5			1		4

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Canadian Toad	0	0	1	5			1		4
Bullfrog	0	0	1	5				1	4
Wood Frog	0	0	1	5					4
Red-throated Loon	0	0	0	5			1		4
Pacific Loon	0	0	0	5			1		4
Yellow-billed Loon	0	0	0	5			1		4
Least Bittern	0	0	0	5			1		4
Great Egret	0	0	0	5			1		4
Snowy Egret	0	0	0	5			1		4
Little Blue Heron	0	0	0	5			1		4
Green Heron	0	0	0	5			1		4
Yellow-crowned Night-heron	0	0	0	5			1		4
Wood Stork	0	0	0	5			1		4
Mute Swan	0	0	1	5				1	4
Greater White-fronted Goose	0	0	1	5			1		4
Brant	0	0	1	5			1		4
American Black Duck	1	0	1	5			1		4
Garganey	0	0	1	5			1		4
Eurasian Wigeon	0	0	1	5			1		4
Long Tailed Duck	1	0	1	5			1		4
Black Scoter	0	0	1	5			1		4
Surf Scoter	0	0	1	5			1		4
Red-shouldered Hawk	0	0	1	5			1		4
Broad-winged Hawk	0	0	1	5			1		4
Gray Partridge	0	0	1	5				1	4
Chukar	0	0	1	5				1	4
Ring-necked Pheasant	0	0	1	5				1	4
Willow Ptarmigan	0	0	0	5			1		4
Wild Turkey	0	0	1	5				1	4
Common Moorhen	0	0	0	5			1		4
Black-bellied Plover	0	0	0	5			1		4
American Golden-plover	0	0	0	5			1		4
Snowy Plover	0	0	0	5			1		4
Semipalmated Plover	0	0	0	5			1		4
Whimbrel	0	0	0	5			1		4
Hudsonian Godwit	0	0	0	5			1		4
Ruddy Turnstone	0	0	0	5			1		4
Black Turnstone	0	0	0	5			1		4
Red Knot	0	0	0	5			1		4
Sanderling	0	0	0	5			1		4

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Curlew Sandpiper	0	0	0	5			1		4
Stilt Sandpiper	0	0	0	5			1		4
Buff-breasted Sandpiper	0	0	0	5			1		4
Short-billed Dowitcher	0	0	0	5			1		4
American Woodcock	0	0	0	5			1		4
Red Phalarope	0	0	0	5			1		4
Pomarine Jaeger	0	0	0	5			1		4
Parasitic Jaeger	0	0	0	5			1		4
Long-tailed Jaeger	0	0	0	5			1		4
Laughing Gull	0	0	0	5			1		4
Bonaparte’s Gull	0	0	0	5			1		4
Mew Gull	0	0	0	5			1		4
Thayer’s Gull	0	0	0	5			1		4
Glaucous-winged Gull	0	0	0	5			1		4
Glaucous Gull	0	0	0	5			1		4
Great Black-backed Gull	0	0	0	5			1		4
Black-legged Kittiwake	0	0	0	5			1		4
Sabine’s Gull	0	0	0	5			1		4
Ivory Gull	0	0	0	5			1		4
Arctic Tern	0	0	0	5			1		4
Marbled Murrelet	0	0	0	5			1		4
Ancient Murrelet	0	0	0	5			1		4
Rock Dove	0	0	0	5				1	4
Band-tailed Pigeon	0	0	0	5			1		4
Eurasian Collared-dove	0	0	0	5			1		4
White-winged Dove	0	0	0	5			1		4
Barn Owl	0	0	0	1	1		1		4
Whip-poor-will	0	0	0	5			1		4
Anna’s Hummingbird	0	0	0	5		1			4
Ruby-throated Hummingbird	0	0	0	5			1		4
Red-bellied Woodpecker	0	0	1	5			1		4
Yellow-bellied Sapsucker	0	0	1	5			1		4
White-headed Woodpecker	0	0	1	5			1		4
Eastern Wood-pewee	0	0	1	5			1		4
Yellow-bellied Flycatcher	0	0	1	5			1		4
Eastern Phoebe	0	0	1	5			1		4
Ash-throated Flycatcher	0	0	1	5			1		4
Great Crested Flycatcher	0	0	1	5			1		4
Scissor-tailed Flycatcher	0	0	1	5			1		4
Purple Martin	0	0	1	5			1		4

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Bewick’s Wren	0	0	1	5			1		4
Gray-cheeked Thrush	0	0	1	5			1		4
Wood Thrush	0	0	1	5			1		4
Northern Mockingbird	0	0	1	5			1		4
European Starling	0	0	1	5				1	4
Philadelphia Vireo	0	0	1	5			1		4
Golden-winged Warbler	0	0	1	5			1		4
Northern Parula	0	0	1	5			1		4
Chestnut-sided Warbler	0	0	1	5			1		4
Magnolia Warbler	0	0	1	5			1		4
Cape May Warbler	0	0	1	5			1		4
Black-throated Blue Warbler	0	0	1	5			1		4
Black-throated Green Warbler	0	0	1	5			1		4
Blackburnian Warbler	0	0	1	5			1		4
Yellow-throated Warbler	0	0	1	5			1		4
Pine Warbler	0	0	1	5			1		4
Prairie Warbler	0	0	1	5			1		4
Palm Warbler	0	0	1	5			1		4
Bay-breasted Warbler	0	0	1	5			1		4
Blackpoll Warbler	0	0	1	5			1		4
Prothonotary Warbler	0	0	1	5			1		4
Kentucky Warbler	0	0	1	5			1		4
Connecticut Warbler	0	0	1	5			1		4
Mourning Warbler	0	0	1	5			1		4
Hooded Warbler	0	0	1	5			1		4
Canada Warbler	0	0	1	5			1		4
Painted Redstart	0	0	1	5			1		4
Summer Tanager	0	0	1	5			1		4
Scarlet Tanager	0	0	1	5			1		4
Northern Cardinal	0	0	1	5			1		4
Brambling	0	0	1	5					4
Rose-breasted Grosbeak	0	0	1	5			1		4
Painted Bunting	0	0	1	5			1		4
Black-throated Sparrow	0	0	1	5			1		4
Golden-crowned Sparrow	0	0	1	5			1		4
Smith's Longspur	0	0	1	5			1		4
Great-tailed Grackle	0	0	1	5			1		4
Hooded Oriole	0	0	1	5			1		4
Purple Finch	0	0	1	5			1		4
Hoary Redpoll	0	0	1	5			1		4

Species	Management Plan	Alternate Funding	Current Effort	Species of Concern Rank	Limited MT Range	Local Threats	Incidental/ Peripheral	Non-Native	Tier
Lesser Goldfinch	0	0	1	5			1		4
House Sparrow	0	0	1	5				1	4
Northern Short-tailed Shrew	0	0	0	5			1		4
Eastern Gray Squirrel	0	0	0	5				1	4
Plains Pocket Mouse	0	0	0	5			1		4
Norway Rat	0	0	0	5				1	4
House Mouse	0	0	0	5				1	4
Common Raccoon	0	0	1	5				1	4
Caribou	0	0	0	5	1	1	1		4
Feral Horse	0	0	0	5				1	4

Table 3. Terrestrial Community Tiers

Community / Habitat	Tier	Status
Grassland Complexes	1	Declining
Mixed Broadleaf Forests	1	Declining
Mixed Shrub/Grass Associations	1	Declining
Riparian and Wetlands	1	Declining
Sagebrush and Salt Flats	1	Declining
Alpine Meadows	2	Stable/Declining
Altered Herbaceous	2	Stable/Declining
Badlands	2	Stable
Douglas Fir	2	Stable/Declining
Low Density Xeric Forest	2	Stable/Declining
Mixed Mesic Forest	2	Stable/Declining
Mixed Mesic Shrubs	2	Stable/Declining
Mixed Whitebark Pine Forests	2	Declining
Ponderosa Pine	2	Stable
Western Red Cedar	2	Stable/Declining
Western Larch	2	Stable/Declining
Standing Burnt Forest	2	Stable
Rocky Mountain Juniper	2	Stable
Snowfields or Ice	2	Stable/Declining
Agricultural Lands - Dry	3	Stable
Agricultural Lands - Irrigated	3	Stable
Douglas Fir/Lodgepole Pine	3	Stable
Grand Fir	3	Stable

Limber Pine	3	Stable
Lodgepole Pine	3	Stable
Mines, Quarries, Gravel Pits	3	Stable
Missouri Breaks	3	Stable
Mixed Barren Sites	3	Stable
Mixed Broadleaf and Conifer Forest	3	Stable
Mixed Subalpine Forest	3	Stable
Mixed Xeric Forest	3	Stable
Montane Parklands and Subalpine Meadows	3	Stable
Rock	3	Stable
Utah Juniper	3	Stable
Western Hemlock	3	Stable
Urban	4	Stable
Water	4	Stable

Table 4. Aquatic Community Tiers

Community	Tier	Status
Mountain Streams	1	Stable/Declining
Prairie Streams	1	Declining
Intermountain Valley Rivers	2	Stable/Declining
Intermountain Valley Streams	2	Stable/Declining
Mixed Source Rivers (Intermountain and Prairie Flow)	2	Stable/Declining
Prairie Rivers	2	Stable/Declining
Lowland Lakes	3	Stable
Lowland Reservoirs	3	Stable
Mountain Lakes	3	Stable
Mountain Reservoirs	3	Stable

Table 5. Terrestrial Focus Area Rankings based on USFS Subsections

USFS Subsection	Ecotype	Tier
Bitterroot/Frenchtown Valleys	Intermountain/Foothill Grassland	1
Central Montana Broad Valleys	Intermountain/Foothill Grassland	1
Deerlodge Valley	Intermountain/Foothill Grassland	1
Flathead River Valley	Intermountain/Foothill Grassland	1
Little Belt Foothills	Intermountain/Foothill Grassland	1
North Tobacco Root Mountains and Foothills	Intermountain/Foothill Grassland	1
Rocky Mountain Front Foothills	Intermountain/Foothill Grassland	1

South Elkhorn Mountains	Intermountain/Foothill Grassland	1
Southwest Montana Intermontane Basins and Valleys	Intermountain/Foothill Grassland	1
Upper Yellowstone Valley	Intermountain/Foothill Grassland	1
Mission/Swan Valley and Mountains	Montane Forest	1
Missouri Coteau	Plains Grassland and Plains Forest	1
Montana Sedimentary Plains	Plains Grassland and Plains Forest	1
Bighorn Intermontane Basin	Shrub Grassland	1
Montana Glaciated Plains	Shrub Grassland	1
Montana Shale Plains	Shrub Grassland	1
Powder River Basin/Breaks/Scoria Hills	Shrub Grassland	1
Shale Scablands	Shrub Grassland	1
Avon/Nevada Valleys	Intermountain/Foothill Grassland	2
Belt Mountain Foothills	Intermountain/Foothill Grassland	2
Bighorn Sedimentary Mountains	Intermountain/Foothill Grassland	2
Flint Creek/Upper Willow Creek Basins	Intermountain/Foothill Grassland	2
Snowy Foothills	Intermountain/Foothill Grassland	2
Beartooth Front	Montane Forest	2
Big Belt Foothills	Montane Forest	2
East Pioneer Mountains	Montane Forest	2
Gallatin Foothills/Spanish Peaks	Montane Forest	2
Little Belt/Snowy/Judith/Mountains	Montane Forest	2
Madison Mountains	Montane Forest	2
Ruby/Tobacco Root Mountains	Montane Forest	2
Missouri Plateau	Plains Grassland and Plains Forest	2
Missouri River Breaks	Plains Grassland and Plains Forest	2
Montana High Plains and Foothills	Plains Grassland and Plains Forest	2
Pierre Shale Plains	Plains Grassland and Plains Forest	2
Blacktail Mountains	Shrub Grassland	2
Gravelly/Snowcrest Mountains	Shrub Grassland	2
Montana Isolated Mountain Ranges	Intermountain/Foothill Grassland	3
Absaroka/Gallatin Mountains	Montane Forest	3
Anaconda Mountains	Montane Forest	3
Anaconda/Flint Creek Mountains	Montane Forest	3
Beartooth Mountains	Montane Forest	3
Beaverhead Mountains	Montane Forest	3
Big Belt Mountains	Montane Forest	3
Bitterroot Glaciated Canyons	Montane Forest	3
Boulder/Elkhorn Mountains	Montane Forest	3
Bridger Mountains and Foothills	Montane Forest	3
Cabinet Mountains	Montane Forest	3
Clark Fork Valley and Mountains	Montane Forest	3

Coeur d' Alene Mountains	Montane Forest	3
Continental Divide Foothills	Montane Forest	3
Continental Divide Uplands	Montane Forest	3
Crazy Mountains	Montane Forest	3
Flathead Thrust-faulted Mountains	Montane Forest	3
Garnet/Sapphire Mountains	Montane Forest	3
Livingston Mountains	Montane Forest	3
Middle Rocky Mountain Front	Montane Forest	3
North Rocky Mountain Front	Montane Forest	3
Northern Absaroka Volcanic Mountains	Montane Forest	3
Purcell/North Cabinet Mountains	Montane Forest	3
Rattlesnake/Blackfoot/South Swan Mountains	Montane Forest	3
Salish Mountains	Montane Forest	3
South Anaconda/Bitterroot Mountains	Montane Forest	3
South Rocky Mountain Front	Montane Forest	3
Southern Beaverhead Mountains	Montane Forest	3
St.Joe/Bitterroot Mountains	Montane Forest	3
West Pioneer Mountains	Montane Forest	3
West Yellowstone Valley	Montane Forest	3
Whitefish/Swan Mountains	Montane Forest	3
Yellowstone Volcanic Plateau	Montane Forest	3
Wolf Mountains	Plains Grassland and Plains Forest	3

Table 6. Aquatic Focus Area Rankings based on Fourth Code HUCs

4th Code HUC	Ecotype	Tier
Big Hole	Intermountain/Foothill Grassland	1
Bitterroot	Intermountain/Foothill Grassland	1
Blackfoot	Intermountain/Foothill Grassland	1
Jefferson	Intermountain/Foothill Grassland	1
Upper Yellowstone and Tributaries	Intermountain/Foothill Grassland	1
Lower Clark Fork	Montane Forest	1
Middle Clark Fork	Montane Forest	1
Lower Missouri	Plains Grassland and Plains Forest	1
Lower Yellowstone	Plains Grassland and Plains Forest	1
Powder	Plains Grassland and Plains Forest	1
Tongue	Plains Grassland and Plains Forest	1
Middle Missouri and Tributaries	Shrub Grassland	1
Lower Musselshell	Intermountain/Foothill Grassland	2
Madison	Intermountain/Foothill Grassland	2
Middle Musselshell	Intermountain/Foothill Grassland	2
Teton	Intermountain/Foothill Grassland	2

Upper Musselshell	Intermountain/Foothill Grassland	2
Lower Milk	Shrub Grassland	2
Middle Milk	Shrub Grassland	2
Ruby	Shrub Grassland	2
Upper Milk	Shrub Grassland	2
Arrow	Intermountain/Foothill Grassland	3
Beaverhead	Intermountain/Foothill Grassland	3
Belt	Intermountain/Foothill Grassland	3
Boulder	Intermountain/Foothill Grassland	3
Box Elder	Intermountain/Foothill Grassland	3
Flathead Lake	Intermountain/Foothill Grassland	3
Flatwillow	Intermountain/Foothill Grassland	3
Gallatin	Intermountain/Foothill Grassland	3
Judith	Intermountain/Foothill Grassland	3
Lower Flathead	Intermountain/Foothill Grassland	3
Milk Headwaters	Intermountain/Foothill Grassland	3
Red Rock	Intermountain/Foothill Grassland	3
Upper Missouri	Intermountain/Foothill Grassland	3
Belly	Montane Forest	3
Clarks Fork Yellowstone	Montane Forest	3
Cut Bank	Montane Forest	3
Fisher	Montane Forest	3
Flint - Rock	Montane Forest	3
Lower Kootenai	Montane Forest	3
Middle Fork Flathead	Montane Forest	3
Moyie	Montane Forest	3
North Fork Flathead	Montane Forest	3
Shoshone	Montane Forest	3
Smith	Montane Forest	3
South Fork Flathead	Montane Forest	3
St. Mary	Montane Forest	3
Stillwater in Pend Oreille Catalog	Montane Forest	3
Stillwater in Upper Yellowstone	Montane Forest	3
Swan	Montane Forest	3
Two Medicine	Montane Forest	3
Upper Clark Fork	Montane Forest	3
Upper Kootenai	Montane Forest	3
Yaak	Montane Forest	3
Yellowstone Headwaters	Montane Forest	3
Big Dry	Plains Grassland and Plains Forest	3
Big Muddy	Plains Grassland and Plains Forest	3
Boxelder	Plains Grassland and Plains Forest	3
Brush Lake Closed Basin	Plains Grassland and Plains Forest	3
Little Dry	Plains Grassland and Plains Forest	3

Lower Bighorn	Plains Grassland and Plains Forest	3
Mizpah	Plains Grassland and Plains Forest	3
O'Fallon	Plains Grassland and Plains Forest	3
Poplar	Plains Grassland and Plains Forest	3
Pryor	Plains Grassland and Plains Forest	3
Redwater	Plains Grassland and Plains Forest	3
Rosebud	Plains Grassland and Plains Forest	3
West Fork Poplar	Plains Grassland and Plains Forest	3
Battle	Shrub Grassland	3
Beaver in Little Missouri Catalog	Shrub Grassland	3
Beaver in Milk River Catalog Unit	Shrub Grassland	3
Big Horn Lake	Shrub Grassland	3
Big Porcupine	Shrub Grassland	3
Big Sandy	Shrub Grassland	3
Cottonwood	Shrub Grassland	3
Frenchman	Shrub Grassland	3
Little Bighorn	Shrub Grassland	3
Little Powder	Shrub Grassland	3
Lodge	Shrub Grassland	3
Lower Belle Fourche	Shrub Grassland	3
Marias	Shrub Grassland	3
Middle Little Missouri	Shrub Grassland	3
Peoples	Shrub Grassland	3
Porcupine	Shrub Grassland	3
Rock	Shrub Grassland	3
Sage	Shrub Grassland	3
Upper Little Missouri	Shrub Grassland	3
Whitewater	Shrub Grassland	3
Wild Horse Lake	Shrub Grassland	3
Willow	Shrub Grassland	3

Table 7. Group Inventory Tier Assignments

Taxonomic Group	Calculated Inventory	Tier	I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2
Invertebrate Group	1.00	1	X			X		X				
Crayfish Group	1.00	1	X			X		X				
Mammals, Bats Group	1.67	1	X			X		X				
Reptiles Group	1.71	1	X			X		X				
Mussels Group	1.80	1	X			X		X				
Mammals, Small Group	1.92	1	X			X		X				
Birds, Shorebird/Waterbird Group	2.33	1	X			X		X			X	
Birds, Nocturnal Group	2.33	1	X			X		X			X	
Fish, Prairie Group	2.39	1	X			X		X				
Birds, Raptors Group	2.42	2	X	X	X					X		X
Fish, Montane Group	2.57	2					X			X	X	
Mammals, Furbearers Group	2.57	2	X		X	X				X		X
Birds, Passerine Group	2.68	2					X		X	X	X	
Birds, Waterfowl Group	2.75	3								X	X	
Mammals, Predators Group	2.83	3	X			X				X		X
Amphibians Group	2.83	3				X			X	X	X	
Birds, Upland Game Group	2.86	3								X	X	
Fish, Non-native Group	3.00	3								X		X
Mammals, Big Game Group	3.00	3								X		X

Table 8. Species Inventory Tier Assignments

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Calico Crayfish	1	X			X		X		X			
Virile Crayfish	1	X			X		X		X			
A Crayfish	1	X			X		X		X			
Signal Crayfish	1	X			X		X		X			
Black Sandshell	1	X			X							

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Western Pearlshell	1	X			X							X
Torrent Sculpin	1	X			X							
Spoonhead Sculpin	1	X			X							
Shortnose Gar	1	X				X						X
Lake Trout (native lakes)	1	X					X		X		X	X
Western Silvery Minnow	1	X			X		X		X			
Brassy Minnow	1	X			X		X		X			
Plains Minnow	1	X			X		X		X			
Pearl Dace	1	X			X							X
Trout-perch	1	X			X							X
Iowa Darter	1	X			X							
Coeur d' Alene Salamander	1	X						X	X			X
Plains Spadefoot	1	X			X				X			
Western Toad	1								X			X
Great Plains Toad	1	X						X	X			
Northern Leopard Frog	1								X			X
Snapping Turtle	1	X			X		X		X			X
Spiny Softshell	1	X			X		X		X			X
Northern Alligator Lizard	1	X			X		X		X			
Western Skink	1	X			X		X		X			
Rubber Boa	1	X			X		X		X			
Western Hog-nosed Snake	1	X			X		X		X			X
Milksnake	1	X			X		X		X	X		X
Smooth Greensnake	1	X				X	X	X	X			X
American Bittern	1	X			X					X		
Black-crowned Night-heron	1	X			X					X		
White-faced Ibis	1	X			X					X		
Northern Goshawk	1	X					X		X			
Columbia Sharp-tailed Grouse	1	X					X		X			X
Yellow Rail	1	X			X			X				X

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Greater Yellowlegs	1	X			X			X				
Solitary Sandpiper	1	X			X			X				
Semipalmated Sandpiper	1	X			X			X				
Western Sandpiper	1	X			X			X				
Least Sandpiper	1	X			X			X				
White-rumped Sandpiper	1	X			X			X				
Baird's Sandpiper	1	X			X			X				
Pectoral Sandpiper	1	X			X			X				
Dunlin	1	X			X			X				
Long-billed Dowitcher	1	X			X			X				
Glaucous-winged Gull	1	X			X			X				
Glaucous Gull	1	X			X			X				
Arctic Tern	1	X			X			X				
Black-billed Cuckoo	1	X			X					X		
Yellow-billed Cuckoo	1	X			X			X		X		
Barn Owl	1	X			X			X		X		
Snowy Owl	1	X			X		X	X				
Northern Hawk Owl	1	X			X		X					
Common Nighthawk	1	X			X		X		X			
Common Poorwill	1	X			X		X		X			
Black Swift	1	X				X	X		X	X		
Chimney Swift	1	X			X		X			X		
White-throated Swift	1	X			X		X	X	X			
Black-chinned Hummingbird	1	X			X					X		
Alder Flycatcher	1	X			X		X		X			
Purple Martin	1	X			X		X	X				
Canyon Wren	1	X			X		X		X	X		
Sedge Wren	1	X			X			X				X
American Dipper	1	X	X		X		X		X			
Blue-gray Gnatcatcher	1	X				X	X	X				

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Eastern Bluebird	1	X			X			X				
Western Bluebird	1	X			X		X		X			
Black-and-white Warbler	1	X			X		X		X	X		
Indigo Bunting	1	X			X		X		X	X		
Green-tailed Towhee	1	X			X		X		X	X		
Field Sparrow	1	X				X	X	X	X			
Le Conte's Sparrow	1	X			X			X				
Nelson's Sharp-tailed Sparrow	1	X			X			X				X
Black Rosy-finch	1	X			X			X				
Arctic Shrew	1	X				X		X				
Northern Myotis	1	X			X			X				
Eastern Red Bat	1	X			X			X				
Spotted Bat	1	X			X		X		X			X
Townsend's Big-eared Bat	1	X			X		X		X	X		X
Pallid Bat	1	X			X			X				X
American Pika	1	X			X			X	X	X		
Eastern Cottontail	1	X			X			X				
Black-tailed Jackrabbit	1	X				X	X		X			
Uinta Chipmunk	1	X				X	X					
Hoary Marmot	1	X				X	X		X	X		X
Uinta Ground Squirrel	1	X				X	X		X			
Wyoming Ground Squirrel	1	X				X	X		X			
Northern Flying Squirrel	1	X				X	X		X			
Idaho Pocket Gopher	1	X				X	X		X			
Hispid Pocket Mouse	1	X				X		X				
Water Vole	1	X			X		X		X			
Sagebrush Vole	1	X			X		X		X			
Northern Bog Lemming	1	X				X	X		X	X		X
Meadow Jumping Mouse	1	X			X		X		X			X
Common Porcupine	1	X	X		X		X		X		X	

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Western Spotted Skunk	1	X			X			X		X	X	
Fatmucket	2	X			X							
Giant Floater	2	X			X							
Mottled Sculpin	2	X			X							
Slimy Sculpin	2	X			X							
Pallid Sturgeon	2	X			X						X	X
Northern Redbelly Dace	2	X										
Northern Redbelly X Finescale Dace	2	X										
Longnose Dace	2	X										
Redside Shiner	2	X										
Creek Chub	2	X										
Sturgeon Chub	2								X			X
Sicklefin Chub	2								X			X
Burbot	2								X			X
Pacific Treefrog	2				X				X			
Great Basin Spadefoot	2	X			X				X			
Short-horned Lizard	2	X			X							
Sagebrush Lizard	2	X			X							
Racer	2	X			X							
Gopher Snake	2	X			X							
Plains Garter Snake	2	X			X							
Western Rattlesnake	2	X			X							
Pied-billed Grebe	2	X			X					X		
Horned Grebe	2	X			X		X			X		
Red-necked Grebe	2	X			X		X			X		
Eared Grebe	2	X			X					X		
Western Grebe	2	X			X		X			X		
Clark’s Grebe	2	X			X					X		
Double-crested Cormorant	2	X			X							
Snowy Egret	2	X			X							

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Cattle Egret	2	X			X							
Northern Harrier	2		X									
Sharp-shinned Hawk	2		X				X					
Cooper's Hawk	2		X				X					
Swainson's Hawk	2		X									
Rough-legged Hawk	2		X									
American Kestrel	2		X									
Merlin	2		X				X					
Gyrfalcon	2	X				X						
Prairie Falcon	2		X				X					
Virginia Rail	2	X			X							
Sora	2	X			X							
American Coot	2	X			X							
Black-necked Stilt	2	X			X							
American Avocet	2	X			X							
Lesser Yellowlegs	2	X			X							
Willet	2	X			X							
Spotted Sandpiper	2	X			X							
Upland Sandpiper	2	X			X		X					
Long-billed Curlew	2	X			X		X					X
Marbled Godwit	2	X			X		X					
Common Snipe	2	X			X							
Wilson's Phalarope	2	X			X							
Franklin's Gull	2	X			X		X			X		
Ring-billed Gull	2	X			X							
California Gull	2	X			X							
Herring Gull	2	X			X							
Caspian Tern	2	X			X		X			X		
Common Tern	2	X			X		X			X		
Forster's Tern	2	X			X		X			X		

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Black Tern	2	X			X		X			X		X
Eastern Screech-owl	2	X			X							
Great Horned Owl	2	X			X							
Northern Pygmy-owl	2	X			X							
Short-eared Owl	2	X			X							
Vaux's Swift	2	X			X		X					
Calliope Hummingbird	2	X			X							
Broad-tailed Hummingbird	2	X			X		X	X				
Rufous Hummingbird	2	X			X							
Belted Kingfisher	2	X			X							
Lewis' Woodpecker	2	X			X		X					
Red-headed Woodpecker	2	X			X		X					
Cassin's Kingbird	2	X			X		X					
Boreal Chickadee	2	X			X		X					
Chestnut-backed Chickadee	2	X			X		X					
Brown Creeper	2	X			X		X					
Rock Wren	2	X			X							
Marsh Wren	2	X			X		X					
American Pipit	2	X			X		X					
Loggerhead Shrike	2	X			X		X					
Yellow-breasted Chat	2	X			X		X					
Dickcissel	2	X			X							
Snow Bunting	2	X			X							
Orchard Oriole	2	X			X		X					
Baltimore Oriole	2	X			X		X					
Gray-crowned Rosy-finch	2	X			X		X					
White-winged Crossbill	2	X			X		X					
Masked Shrew	2	X			X							
Preble's Shrew	2	X			X							
Vagrant Shrew	2	X			X							

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Dusky or Montane Shrew	2	X			X							
Dwarf Shrew	2	X			X							
Water Shrew	2	X			X							
Merriam's Shrew	2	X			X							
Pygmy Shrew	2	X			X							
Hayden's Shrew	2	X			X							
Little Brown Myotis	2	X			X							
Yuma Myotis	2	X			X							
Long-eared Myotis	2	X			X							
Fringed Myotis	2	X			X							
Long-legged Myotis	2	X			X							
California Myotis	2	X			X							
Western Small-footed Myotis	2	X			X							
Silver-haired Bat	2	X			X							
Big Brown Bat	2	X			X							
Hoary Bat	2	X			X							
Mountain Cottontail	2								X			
Desert Cottontail	2								X			
Snowshoe Hare	2								X			
White-tailed Jackrabbit	2								X			
Pygmy Rabbit	2								X			X
Least Chipmunk	2								X			
Yellow-pine Chipmunk	2								X			
Red-tailed Chipmunk	2								X			
Yellow-bellied Marmot	2								X			
Richardson's Ground Squirrel	2								X			
Columbian Ground Squirrel	2								X			
Thirteen-lined Ground Squirrel	2								X			
Franklin's Ground Squirrel	2								X			
Golden-mantled Ground Squirrel	2								X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Townsend's Ground Squirrel	2								X			
Eastern Fox Squirrel	2								X			
Northern Pocket Gopher	2	X			X							
Olive-backed Pocket Mouse	2	X			X							
Great Basin Pocket Mouse	2	X			X							X
Ord's Kangaroo Rat	2	X			X							
American Beaver	2								X			
Western Harvest Mouse	2	X			X							
White-footed Mouse	2	X			X							
Northern Grasshopper Mouse	2	X			X							
Bushy-tailed Woodrat	2	X			X							
Southern Red-backed Vole	2	X			X							
Heather Vole	2	X			X							
Montane Vole	2	X			X							
Long-tailed Vole	2	X			X							
Prairie Vole	2	X			X							
Western Jumping Mouse	2	X			X							
Swift Fox	2								X			
Fisher	2								X			
Least Weasel	2	X			X							
American Badger	2					X						
White Heelsplitter	3	X			X							
White Sturgeon	3	X			X							X
Shovelnose Sturgeon	3								X			
Paddlefish	3								X		X	X
Goldeye	3								X			
Cisco	3								X			
Lake Whitefish	3								X			
Kokanee Salmon	3								X			
Chinook Salmon	3								X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Yellowstone Cutthroat Trout	3								X			X
Westslope Cutthroat Trout	3								X		X	X
Rainbow Trout	3								X			
Columbia Basin Redband Trout	3								X			X
Golden Trout	3								X			
Pygmy Whitefish	3	X			X							
Mountain Whitefish	3								X			
Brown Trout	3								X			
Bull Trout	3								X		X	X
Brook Trout	3								X			
Arctic Grayling	3								X			X
Rainbow Smelt	3								X			
Northern Pike	3								X			
Goldfish	3	X			X							
Lake Chub	3	X			X							
Common Carp	3								X			
Utah Chub	3	X			X							
Peamouth	3	X			X							
Golden Shiner	3	X			X							
Emerald Shiner	3	X			X							
Spottail Shiner	3	X			X							
Sand Shiner	3	X			X							
Fathead Minnow	3	X			X							
Northern Pikeminnow	3	X			X							
Flathead Chub	3								X			
River Carpsucker	3								X			
Longnose Sucker	3								X			
White Sucker	3								X			
Largescale Sucker	3	X			X							
Mountain Sucker	3								X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Blue Sucker	3								X			X
Smallmouth Buffalo	3								X			
Bigmouth Buffalo	3								X			
Shorthead Redhorse	3								X			
Channel Catfish	3								X			
Stonecat	3								X			
Black Bullhead	3	X			X							
Yellow Bullhead	3	X			X							
Plains Killifish	3	X			X							
Western Mosquitofish	3	X			X							
Sailfin Molly	3	X						X				
Shortfin Molly	3	X						X				
Green Swordtail	3	X						X				
Variable Platyfish	3	X						X				
Brook Stickleback	3	X			X							
White Bass	3	X			X							
Rock Bass	3	X			X							
Green Sunfish	3	X			X							
Pumpkinseed	3	X			X							
Bluegill	3	X			X							
Smallmouth Bass	3								X			
Largemouth Bass	3								X			
White Crappie	3								X			
Black Crappie	3								X			
Yellow Perch	3								X			
Sauger	3								X		X	X
Walleye	3								X			
Freshwater Drum	3								X			
Painted Turtle	3								X			
Western Terrestrial Garter Snake	3								X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Common Garter Snake	3								X			
Long-toed Salamander	3								X			
Tiger Salamander	3								X			
Roughskin Newt	3	X						X	X			
Idaho Giant Salamander	3	X						X				
Rocky Mountain Tailed Frog	3								X			
Canadian Toad	3	X						X				
Woodhouse's Toad	3								X			
Boreal Chorus Frog	3								X			
Bullfrog	3	X							X			
Wood Frog	3	X						X				
Columbia Spotted Frog	3	X						X	X			
Red-throated Loon	3	X			X			X			X	
Pacific Loon	3	X			X			X			X	
Common Loon	3										X	X
Yellow-billed Loon	3	X			X			X			X	
American White Pelican	3	X			X						X	
Least Bittern	3	X			X			X				
Great Blue Heron	3								X		X	
Great Egret	3	X			X			X				
Little Blue Heron	3	X			X			X				
Green Heron	3	X			X			X				
Yellow-crowned Night-heron	3	X			X			X				
Wood Stork	3	X			X			X				
Tundra Swan	3	X			X						X	
Trumpeter Swan	3	X			X						X	X
Mute Swan	3	X			X			X			X	
Greater White-fronted Goose	3	X			X			X				
Snow Goose	3	X								X	X	
Ross' Goose	3	X								X	X	

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Brant	3	X			X			X				
Canada Goose	3									X	X	
Wood Duck	3	X								X	X	
Green-winged Teal	3	X								X	X	
American Black Duck	3	X								X	X	
Mallard	3									X	X	
Northern Pintail	3	X								X	X	
Garganey	3	X			X			X				
Blue-winged Teal	3	X								X	X	
Cinnamon Teal	3	X								X	X	
Northern Shoveler	3	X								X	X	
Gadwall	3	X								X	X	
Eurasian Wigeon	3	X			X			X				
American Wigeon	3	X								X	X	
Canvasback	3	X								X	X	
Redhead	3	X								X	X	
Ring-necked Duck	3	X								X	X	
Greater Scaup	3	X								X	X	
Lesser Scaup	3	X								X	X	
Harlequin Duck	3								X	X	X	X
Long Tailed Duck	3	X								X	X	
Black Scoter	3	X			X			X				
Surf Scoter	3	X			X			X				
White-winged Scoter	3	X								X	X	
Common Goldeneye	3	X								X	X	
Barrow's Goldeneye	3	X								X	X	
Bufflehead	3	X								X	X	
Hooded Merganser	3	X								X	X	
Common Merganser	3									X	X	
Red-breasted Merganser	3	X								X	X	

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Ruddy Duck	3	X								X	X	
Turkey Vulture	3	X			X							
Osprey	3								X			
Bald Eagle	3								X		X	X
Red-shouldered Hawk	3	X			X			X				
Broad-winged Hawk	3	X			X			X				
Red-tailed Hawk	3								X			
Ferruginous Hawk	3								X			
Golden Eagle	3								X		X	
Peregrine Falcon	3	X										
Gray Partridge	3	X									X	
Chukar	3	X									X	
Ring-necked Pheasant	3	X									X	
Spruce Grouse	3	X									X	
Blue Grouse	3	X									X	
Willow Ptarmigan	3	X			X			X				
White-tailed Ptarmigan	3	X			X			X				
Ruffed Grouse	3								X			
Greater Sage-Grouse	3	X									X	X
Sharp-tailed Grouse	3	X									X	
Wild Turkey	3	X									X	
Common Moorhen	3	X			X			X				
Greater Sandhill Crane	3	X									X	
Lesser Sandhill Crane	3	X									X	
Whooping Crane	3	X									X	X
Black-bellied Plover	3	X			X			X				
American Golden-plover	3	X			X			X				
Snowy Plover	3	X			X			X				
Semipalmated Plover	3	X			X			X				
Piping Plover	3	X			X					X		X

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Killdeer	3								X			
Mountain Plover	3								X			X
Whimbrel	3	X			X			X				
Hudsonian Godwit	3	X			X			X				
Ruddy Turnstone	3	X			X			X				
Black Turnstone	3	X			X			X				
Red Knot	3	X			X			X				
Sanderling	3	X			X			X				
Curlew Sandpiper	3	X			X			X				
Stilt Sandpiper	3	X			X			X				
Buff-breasted Sandpiper	3	X			X			X				
Short-billed Dowitcher	3	X			X			X				
American Woodcock	3	X			X			X				
Red-necked Phalarope	3	X			X			X				
Red Phalarope	3	X			X			X				
Pomarine Jaeger	3	X			X			X				
Parasitic Jaeger	3	X			X			X				
Long-tailed Jaeger	3	X			X			X				
Laughing Gull	3	X			X			X				
Bonaparte's Gull	3	X			X			X				
Mew Gull	3	X			X			X				
Thayer's Gull	3	X			X			X				
Great Black-backed Gull	3	X			X			X				
Black-legged Kittiwake	3	X			X			X				
Sabine's Gull	3	X			X			X				
Ivory Gull	3	X			X			X				
Interior Least Tern	3	X			X					X		X
Marbled Murrelet	3	X			X			X				
Ancient Murrelet	3	X			X			X				
Rock Dove	3	X						X	X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Band-tailed Pigeon	3	X						X	X			
Eurasian Collared-dove	3	X						X	X			
White-winged Dove	3	X						X	X			
Mourning Dove	3	X			X					X		
Flammulated Owl	3	X			X					X		X
Western Screech-owl	3	X			X							
Burrowing Owl	3								X			X
Barred Owl	3	X			X							
Great Gray Owl	3	X			X							
Long-eared Owl	3	X			X							
Boreal Owl	3	X			X							
Northern Saw-whet Owl	3	X			X							
Whip-poor-will	3	X			X			X				
Ruby-throated Hummingbird	3	X			X			X				
Anna's Hummingbird	3	X			X		X	X				
Red-bellied Woodpecker	3	X			X			X				
Yellow-bellied Sapsucker	3	X			X			X				
Williamson's Sapsucker	3	X			X							
Red-naped Sapsucker	3								X			
Downy Woodpecker	3	X			X							
Hairy Woodpecker	3								X			
White-headed Woodpecker	3	X			X			X				
Three-toed Woodpecker	3	X			X					X		
Black-backed Woodpecker	3	X			X					X		X
Northern Flicker	3								X			
Pileated Woodpecker	3								X			
Olive-sided Flycatcher	3								X			X
Western Wood-pewee	3	X			X							
Eastern Wood-pewee	3	X			X							
Yellow-bellied Flycatcher	3	X			X			X				

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Willow Flycatcher	3	X			X							
Least Flycatcher	3	X			X							
Hammond's Flycatcher	3								X			
Dusky Flycatcher	3								X			
Cordilleran Flycatcher	3	X			X							
Eastern Phoebe	3	X			X			X				
Say's Phoebe	3	X			X							
Ash-throated Flycatcher	3	X			X			X				
Great Crested Flycatcher	3	X			X			X				
Western Kingbird	3	X			X							
Eastern Kingbird	3	X			X							
Scissor-tailed Flycatcher	3	X			X			X				
Horned Lark	3								X			
Tree Swallow	3								X			
Violet-green Swallow	3	X			X							
Northern Rough-winged Swallow	3	X			X							
Bank Swallow	3	X			X							
Cliff Swallow	3	X			X							
Barn Swallow	3	X			X							
Gray Jay	3								X			
Steller's Jay	3								X			
Blue Jay	3	X			X							
Pinyon Jay	3	X			X							
Clark's Nutcracker	3								X			
Black-billed Magpie	3	X			X							
American Crow	3								X			
Common Raven	3								X			
Black-capped Chickadee	3								X			
Mountain Chickadee	3								X			
Red-breasted Nuthatch	3								X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
White-breasted Nuthatch	3	X			X							
Pygmy Nuthatch	3	X			X							
Bewick's Wren	3	X			X			X				
House Wren	3								X			
Winter Wren	3								X			
Golden-crowned Kinglet	3								X			
Ruby-crowned Kinglet	3								X			
Mountain Bluebird	3								X			
Townsend's Solitaire	3								X			
Veery	3	X			X							
Gray-cheeked Thrush	3	X										
Swainson's Thrush	3								X			
Hermit Thrush	3								X			
Wood Thrush	3	X										
American Robin	3								X			
Varied Thrush	3								X			
Gray Catbird	3	X			X							
Northern Mockingbird	3	X			X							
Sage Thrasher	3	X			X							
Brown Thrasher	3	X			X							
Sprague's Pipit	3								X			
Bohemian Waxwing	3	X			X							
Cedar Waxwing	3	X			X							
Northern Shrike	3	X			X							
European Starling	3								X			
Warbling Vireo	3								X			
Philadelphia Vireo	3	X										
Red-eyed Vireo	3	X			X							
Cassin's Vireo	3	X			X							
Golden-winged Warbler	3	X										

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Tennessee Warbler	3	X			X							
Orange-crowned Warbler	3								X			
Nashville Warbler	3	X			X							
Northern Parula	3	X										
Yellow Warbler	3								X			
Chestnut-sided Warbler	3	X										
Magnolia Warbler	3	X										
Cape May Warbler	3	X										
Black-throated Blue Warbler	3	X			X							
Yellow-rumped Warbler	3								X			
Black-throated Gray Warbler	3	X		X								
Townsend's Warbler	3								X			
Black-throated Green Warbler	3	X										
Blackburnian Warbler	3	X										
Yellow-throated Warbler	3	X										
Pine Warbler	3	X										
Prairie Warbler	3	X										
Palm Warbler	3	X										
Bay-breasted Warbler	3	X										
Blackpoll Warbler	3	X										
American Redstart	3	X			X							
Prothonotary Warbler	3	X										
Ovenbird	3	X			X							
Northern Waterthrush	3	X			X							
Kentucky Warbler	3	X										
Connecticut Warbler	3	X										
Mourning Warbler	3	X										
Macgillivray's Warbler	3								X			
Common Yellowthroat	3								X			
Hooded Warbler	3	X										

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Wilson's Warbler	3								X			
Canada Warbler	3	X										
Painted Redstart	3	X										
Summer Tanager	3	X										
Scarlet Tanager	3	X										
Western Tanager	3								X			
Northern Cardinal	3	X										
Rose-breasted Grosbeak	3	X										
Black-headed Grosbeak	3								X			
Lazuli Bunting	3	X			X							
Painted Bunting	3	X										
Spotted Towhee	3	X			X							
American Tree Sparrow	3	X			X							
Chipping Sparrow	3								X			
Clay-colored Sparrow	3	X			X							
Brewer's Sparrow	3	X			X							
Vesper Sparrow	3								X			
Lark Sparrow	3	X			X							
Black-throated Sparrow	3	X										
Sage Sparrow	3	X			X							
Lark Bunting	3	X			X							
Savannah Sparrow	3								X			
Baird's Sparrow	3								X			
Grasshopper Sparrow	3	X			X							
Fox Sparrow	3	X			X							
Song Sparrow	3								X			
Lincoln's Sparrow	3								X			
Swamp Sparrow	3	X			X							
White-throated Sparrow	3	X			X							
Golden-crowned Sparrow	3	X										

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
White-crowned Sparrow	3								X			
Harris' Sparrow	3	X			X							
Dark-eyed Junco	3								X			
Mccown's Longspur	3	X			X							
Lapland Longspur	3	X			X							
Smith's Longspur	3	X										
Chestnut-collared Longspur	3								X			
Bobolink	3	X			X							
Red-winged Blackbird	3								X			
Western Meadowlark	3								X			
Yellow-headed Blackbird	3	X			X							
Rusty Blackbird	3	X			X							
Brewer's Blackbird	3	X			X							
Great-tailed Grackle	3	X										
Common Grackle	3	X			X							
Brown-headed Cowbird	3								X			
Hooded Oriole	3	X										
Bullock's Oriole	3	X			X							
Brambling	3	X			X							
Pine Grosbeak	3	X			X							
Purple Finch	3	X			X							
Cassin's Finch	3								X			
House Finch	3	X			X							
Red Crossbill	3								X			
Common Redpoll	3	X			X							
Hoary Redpoll	3	X			X							
Pine Siskin	3								X			
Lesser Goldfinch	3	X										
American Goldfinch	3	X			X							
Evening Grosbeak	3								X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
House Sparrow	3	X										
Northern Short-tailed Shrew	3	X						X				
Black-tailed Prairie Dog	3								X		X	X
White-tailed Prairie Dog	3								X		X	X
Eastern Gray Squirrel	3	X			X							
Red Squirrel	3								X			
Plains Pocket Mouse	3	X			X							
Deer Mouse	3								X			
Meadow Vole	3								X			
Muskrat	3								X			
Norway Rat	3	X			X				X			
House Mouse	3	X			X				X			
Coyote	3								X			
Gray Wolf	3								X		X	X
Red Fox	3								X			
Black Bear	3								X			
Grizzly Bear	3								X		X	X
Common Raccoon	3								X			
American Marten	3								X			
Ermine	3								X			
Long-tailed Weasel	3								X			
Black-footed Ferret	3								X		X	X
Mink	3								X			
Wolverine	3								X			
Striped Skunk	3								X			
Northern River Otter	3								X			
Canada Lynx	3								X		X	X
Bobcat	3								X		X	
Mountain Lion	3								X			
Wapiti Or Elk	3								X			

Species with Greatest Inventory Needs		I^1	I^2	I^3	I^4	I^5	I^6	I^7	I^M	O^1	O^2	Tier 1 Sp.
Mule Deer	3								X			
White-tailed Deer	3								X			
Moose	3								X			
Caribou	3	X						X				
Pronghorn	3								X			
American Bison	3								X		X	X
Mountain Goat	3								X			
Bighorn Sheep	3								X			
Feral Horse	3								X			

Table 9. Bitterroot/Frenchtown Valleys Focus Area—Species Associations

TOTAL: 340	Tailed Frog	Blue Grouse	Winter Wren	White-tailed Jackrabbit
	Pacific Treefrog	Greater Sandhill Crane	Western Bluebird	Northern Flying Squirrel
Group Breakdown	Columbia Spotted Frog	Upland Sandpiper	Veery	Idaho Pocket Gopher
Amphibians: 8	Northern Alligator Lizard	Marbled Godwit	Loggerhead Shrike	Water Vole
Birds: 251	Western Skink	Franklin's Gull	American Redstart	American Marten
Mammals: 72	Rubber Boa	Caspian Tern	Yellow-breasted Chat	Fisher
Reptiles: 9	Common Garter Snake	Common Tern	Green-tailed Towhee	Wolverine
	Western Rattlesnake	Forster's Tern	Clay-colored Sparrow	American Badger
TIER I: 16	Horned Grebe	Northern Pygmy-owl	Brewer's Sparrow	Western Spotted Skunk
Coeur d' Alene Salamander	Red-necked Grebe	Barred Owl	Baird's Sparrow	Northern River Otter
Western Toad	Western Grebe	Great Gray Owl	Grasshopper Sparrow	
Northern Leopard Frog	American Bittern	Boreal Owl	Le Conte's Sparrow	**TIER III: 206**
Common Loon	Black-crowned Night-heron	Northern Saw-whet Owl	Bullock's Oriole	Painted Turtle
Trumpeter Swan	White-faced Ibis	Black Swift	Gray-crowned Rosy-finch	Racer
Harlequin Duck	Canvasback	Vaux's Swift	White-winged Crossbill	Gopher Snake
Bald Eagle	Redhead	Black-chinned Hummingbird	Preble's Shrew	Western Terrestrial Garter Snake
Long-billed Curlew	Hooded Merganser	Broad-tailed Hummingbird	Vagrant Shrew	Pied-billed Grebe
Black Tern	Turkey Vulture	Lewis' Woodpecker	Pygmy Shrew	Eared Grebe
Flammulated Owl	Northern Harrier	Williamson's Sapsucker	Yuma Myotis	Clark's Grebe
Black-backed Woodpecker	Sharp-shinned Hawk	Three-toed Woodpecker	Long-eared Myotis	American White Pelican
Olive-sided Flycatcher	Cooper's Hawk	Pileated Woodpecker	Fringed Myotis	Double-crested Cormorant
Townsend's Big-eared Bat	Northern Goshawk	Hammond's Flycatcher	Long-legged Myotis	Great Blue Heron
Northern Bog Lemming	Swainson's Hawk	Boreal Chickadee	California Myotis	Cattle Egret
Gray Wolf	Ferruginous Hawk	Chestnut-backed Chickadee	Western Small-footed Myotis	Tundra Swan
Grizzly Bear	Golden Eagle	White-breasted Nuthatch	Silver-haired Bat	Snow Goose
	Merlin	Pygmy Nuthatch	Big Brown Bat	Ross' Goose
TIER II: 95	Peregrine Falcon	Brown Creeper	Hoary Bat	Canada Goose
Long-toed Salamander	Prairie Falcon	Canyon Wren	Mountain Cottontail	Wood Duck

Green-winged Teal	Lesser Yellowlegs	Least Flycatcher	Swainson's Thrush	Savannah Sparrow
Mallard	Willet	Dusky Flycatcher	Hermit Thrush	Fox Sparrow
Northern Pintail	Spotted Sandpiper	Cordilleran Flycatcher	American Robin	Song Sparrow
Blue-winged Teal	Semipalmated Sandpiper	Say's Phoebe	Varied Thrush	Lincoln's Sparrow
Cinnamon Teal	Western Sandpiper	Western Kingbird	Gray Catbird	White-throated Sparrow
Northern Shoveler	Least Sandpiper	Eastern Kingbird	Brown Thrasher	White-crowned Sparrow
Gadwall	Baird's Sandpiper	Horned Lark	American Pipit	Dark-eyed Junco
American Wigeon	Pectoral Sandpiper	Tree Swallow	Bohemian Waxwing	Lapland Longspur
Ring-necked Duck	Dunlin	Violet-green Swallow	Cedar Waxwing	Snow Bunting
Greater Scaup	Long-billed Dowitcher	Northern Rough-winged Swallow	Northern Shrike	Bobolink
Lesser Scaup	Common Snipe	Bank Swallow	Warbling Vireo	Red-winged Blackbird
Common Goldeneye	Wilson's Phalarope	Cliff Swallow	Red-eyed Vireo	Western Meadowlark
Barrow's Goldeneye	Ring-billed Gull	Barn Swallow	Cassin's Vireo	Yellow-headed Blackbird
Bufflehead	California Gull	Gray Jay	Tennessee Warbler	Rusty Blackbird
Common Merganser	Herring Gull	Steller's Jay	Orange-crowned Warbler	Brewer's Blackbird
Red-breasted Merganser	Mourning Dove	Blue Jay	Nashville Warbler	Common Grackle
Ruddy Duck	Western Screech-owl	Clark's Nutcracker	Yellow Warbler	Brown-headed Cowbird
Osprey	Great Horned Owl	Black-billed Magpie	Yellow-rumped Warbler	Pine Grosbeak
Red-tailed Hawk	Snowy Owl	American Crow	Townsend's Warbler	Cassin's Finch
Rough-legged Hawk	Short-eared Owl	Common Raven	Northern Waterthrush	House Finch
American Kestrel	Common Nighthawk	Black-capped Chickadee	Macgillivray's Warbler	Red Crossbill
Gyrfalcon	White-throated Swift	Mountain Chickadee	Common Yellowthroat	Common Redpoll
Spruce Grouse	Calliope Hummingbird	Red-breasted Nuthatch	Wilson's Warbler	Pine Siskin
Ruffed Grouse	Rufous Hummingbird	Rock Wren	Western Tanager	American Goldfinch
Virginia Rail	Belted Kingfisher	House Wren	Black-headed Grosbeak	Evening Grosbeak
Sora	Red-naped Sapsucker	Marsh Wren	Lazuli Bunting	Masked Shrew
American Coot	Downy Woodpecker	American Dipper	Spotted Towhee	Dusky Or Montane Shrew
Killdeer	Hairy Woodpecker	Golden-crowned Kinglet	American Tree Sparrow	Water Shrew
Black-necked Stilt	Northern Flicker	Ruby-crowned Kinglet	Chipping Sparrow	Little Brown Myotis
American Avocet	Western Wood-pewee	Mountain Bluebird	Vesper Sparrow	American Pika
Greater Yellowlegs	Willow Flycatcher	Townsend’s Solitaire	Lark Sparrow	Snowshoe Hare

Least Chipmunk	Mule Deer
Yellow-pine Chipmunk	White-tailed Deer
Red-tailed Chipmunk	Moose
Yellow-bellied Marmot	Mountain Goat
Columbian Ground Squirrel	Bighorn Sheep
Golden-mantled Ground Squirrel	
Eastern Fox Squirrel	**TIER IV: 23**
Red Squirrel	Bullfrog
Northern Pocket Gopher	Snowy Egret
American Beaver	Greater White-fronted Goose
Deer Mouse	Long Tailed Duck
Bushy-tailed Woodrat	Gray Partridge
Southern Red-backed Vole	Chukar
Heather Vole	Ring-necked Pheasant
Meadow Vole	Wild Turkey
Montane Vole	Bonaparte's Gull
Long-tailed Vole	Rock Dove
Muskrat	Anna’s Hummingbird
Western Jumping Mouse	Yellow-bellied Sapsucker
Common Porcupine	European Starling
Coyote	Chestnut-sided Warbler
Red Fox	Black-throated Blue Warbler
Black Bear	Palm Warbler
Ermine	Blackpoll Warbler
Long-tailed Weasel	Rose-breasted Grosbeak
Mink	House Sparrow
Striped Skunk	Eastern Gray Squirrel
Bobcat	Norway Rat
Mountain Lion	House Mouse
Wapiti Or Elk	Common Raccoon

Table 10. Central Montana Broad Valleys Focus Area—Species Associations

TOTAL: 318	Tiger Salamander	Common Tern	Fringed Myotis	Clark's Grebe
	Tailed Frog	Forster's Tern	Long-legged Myotis	American White Pelican
Group Breakdown	Woodhouse's Toad	Northern Saw-whet Owl	Western Small-footed Myotis	Double-crested Cormorant
Amphibians: 9	Plains Spadefoot	Alder Flycatcher	Northern Myotis	Great Blue Heron
Birds: 228	Columbia Spotted Frog	Hammond's Flycatcher	Silver-haired Bat	Cattle Egret
Mammals: 74	Short-horned Lizard	Pinyon Jay	Big Brown Bat	Tundra Swan
Reptiles: 7	Rubber Boa	White-breasted Nuthatch	Hoary Bat	Snow Goose
	Western Rattlesnake	Canyon Wren	Mountain Cottontail	Ross' Goose
TIER I: 15	Horned Grebe	Western Bluebird	White-tailed Jackrabbit	Canada Goose
Western Toad	Western Grebe	Veery	Northern Flying Squirrel	Wood Duck
Northern Leopard Frog	American Bittern	Loggerhead Shrike	Olive-backed Pocket Mouse	Green-winged Teal
Common Loon	Canvasback	American Redstart	White-footed Mouse	Mallard
Bald Eagle	Redhead	Dickcissel	Sagebrush Vole	Northern Pintail
Greater Sage-Grouse	Turkey Vulture	Clay-colored Sparrow	American Marten	Blue-winged Teal
Mountain Plover	Northern Harrier	Brewer's Sparrow	Least Weasel	Cinnamon Teal
Long-billed Curlew	Sharp-shinned Hawk	Field Sparrow	Wolverine	Northern Shoveler
Black Tern	Cooper's Hawk	Lark Bunting	American Badger	Gadwall
Burrowing Owl	Northern Goshawk	Grasshopper Sparrow	Northern River Otter	Ring-necked Duck
Townsend's Big-eared Bat	Swainson's Hawk	Baltimore Oriole		Greater Scaup
Pallid Bat	Ferruginous Hawk	Bullock's Oriole	**TIER III: 196**	Lesser Scaup
Black-tailed Prairie Dog	Golden Eagle	Preble's Shrew	Boreal Chorus Frog	White-winged Scoter
Grizzly Bear	Merlin	Vagrant Shrew	Painted Turtle	Common Goldeneye
Canada Lynx	Prairie Falcon	Merriam's Shrew	Racer	Barrow's Goldeneye
American Bison	Blue Grouse	Pygmy Shrew	Gopher Snake	Bufflehead
	Greater Sandhill Crane	Hayden's Shrew	Western Terrestrial Garter Snake	Common Merganser
TIER II: 73	Upland Sandpiper	Yuma Myotis	Pied-billed Grebe	Red-breasted Merganser
Long-toed Salamander	Franklin's Gull	Long-eared Myotis	Eared Grebe	Ruddy Duck

Osprey	Glaucous Gull	Cliff Swallow	Macgillivray's Warbler	Evening Grosbeak
Red-tailed Hawk	Mourning Dove	Barn Swallow	Common Yellowthroat	Masked Shrew
Rough-legged Hawk	Western Screech-Owl	Gray Jay	Wilson's Warbler	Dusky Or Montane Shrew
American Kestrel	Great Horned Owl	Blue Jay	Western Tanager	Water Shrew
Ruffed Grouse	Snowy Owl	Clark's Nutcracker	Black-headed Grosbeak	Little Brown Myotis
Sharp-tailed Grouse	Long-eared Owl	Black-billed Magpie	Lazuli Bunting	American Pika
Sora	Short-eared Owl	American Crow	Spotted Towhee	Snowshoe Hare
American Coot	Common Nighthawk	Black-capped Chickadee	American Tree Sparrow	Least Chipmunk
Lesser Sandhill Crane	Common Poorwill	Red-breasted Nuthatch	Chipping Sparrow	Yellow-pine Chipmunk
Killdeer	White-throated Swift	Rock Wren	Vesper Sparrow	Yellow-bellied Marmot
Black-necked Stilt	Calliope Hummingbird	House Wren	Sage Sparrow	Richardson's Ground Squirrel
American Avocet	Rufous Hummingbird	Marsh Wren	Savannah Sparrow	Columbian Ground Squirrel
Greater Yellowlegs	Belted Kingfisher	American Dipper	Song Sparrow	Golden-mantled Ground Squirrel
Lesser Yellowlegs	Red-naped Sapsucker	Ruby-crowned Kinglet	White-throated Sparrow	Red Squirrel
Solitary Sandpiper	Downy Woodpecker	Mountain Bluebird	White-crowned Sparrow	Northern Pocket Gopher
Willet	Hairy Woodpecker	Townsend's Solitaire	Harris’ Sparrow	American Beaver
Spotted Sandpiper	Northern Flicker	Swainson's Thrush	Dark-eyed Junco	Deer Mouse
Semipalmated Sandpiper	Western Wood-pewee	Hermit Thrush	Lapland Longspur	Northern Grasshopper Mouse
Western Sandpiper	Willow Flycatcher	American Robin	Chestnut-collared Longspur	Bushy-tailed Woodrat
Least Sandpiper	Least Flycatcher	Gray Catbird	Bobolink	Southern Red-backed Vole
Baird's Sandpiper	Dusky Flycatcher	Sage Thrasher	Red-winged Blackbird	Heather Vole
Pectoral Sandpiper	Cordilleran Flycatcher	American Pipit	Western Meadowlark	Meadow Vole
Dunlin	Say's Phoebe	Bohemian Waxwing	Yellow-headed Blackbird	Montane Vole
Long-billed Dowitcher	Western Kingbird	Cedar Waxwing	Brewer's Blackbird	Long-tailed Vole
Common Snipe	Eastern Kingbird	Northern Shrike	Common Grackle	Prairie Vole
Wilson's Phalarope	Horned Lark	Warbling Vireo	Brown-headed Cowbird	Muskrat
Red-necked Phalarope	Tree Swallow	Red-eyed Vireo	Cassin's Finch	Western Jumping Mouse
Ring-billed Gull	Violet-green Swallow	Yellow Warbler	House Finch	Common Porcupine
California Gull	Northern Rough-winged Swallow	Yellow-rumped Warbler	Common Redpoll	Coyote
Herring Gull	Bank Swallow	Northern Waterthrush	American Goldfinch	Red Fox

Black Bear	Whimbrel
Ermine	Hudsonian Godwit
Long-tailed Weasel	Ruddy Turnstone
Mink	Sanderling
Striped Skunk	Stilt Sandpiper
Bobcat	Buff-breasted Sandpiper
Wapiti Or Elk	Short-billed Dowitcher
Mule Deer	Pomarine Jaeger
White-tailed Deer	Bonaparte's Gull
Moose	Rock Dove
Pronghorn	Band-tailed Pigeon
Mountain Goat	Scissor-tailed Flycatcher
	Gray-cheeked Thrush
TIER IV: 34	Northern Mockingbird
Great Egret	European Starling
Snowy Egret	Scarlet Tanager
Mute Swan	Rose-breasted Grosbeak
Greater White-fronted Goose	House Sparrow
Eurasian Wigeon	House Mouse
Surf Scoter	Common Raccoon
Broad-winged Hawk	
Gray Partridge	
Chukar	
Ring-necked Pheasant	
Wild Turkey	
Black-bellied Plover	
American Golden-plover	
Semipalmated Plover	

Table 11. Deerlodge Valley Focus Area—Species Associations

TOTAL: 259	Red-necked Grebe	White-breasted Nuthatch	American Marten	Lesser Scaup
	Western Grebe	Pygmy Nuthatch	Fisher	Common Goldeneye
Group Breakdown	American Bittern	Brown Creeper	American Badger	Barrow's Goldeneye
Amphibians: 4	Black-crowned Night-heron	Western Bluebird	Northern River Otter	Bufflehead
Birds: 189	White-faced Ibis	Veery		Common Merganser
Mammals: 60	Canvasback	Loggerhead Shrike	**TIER III: 175**	Red-breasted Merganser
Reptiles: 6	Hooded Merganser	Indigo Bunting	Racer	Ruddy Duck
	Turkey Vulture	Green-tailed Towhee	Gopher Snake	Osprey
TIER I: 10	Northern Harrier	Clay-colored Sparrow	Western Terrestrial Garter Snake	Rough-legged Hawk
Western Toad	Sharp-shinned Hawk	Brewer's Sparrow	Pied-billed Grebe	American Kestrel
Northern Leopard Frog	Northern Goshawk	Lark Bunting	Eared Grebe	Ruffed Grouse
Common Loon	Swainson's Hawk	Bullock's Oriole	American White Pelican	Sharp-tailed Grouse
Trumpeter Swan	Ferruginous Hawk	Preble's Shrew	Double-crested Cormorant	Virginia Rail
Harlequin Duck	Golden Eagle	Vagrant Shrew	Great Blue Heron	Sora
Bald Eagle	Blue Grouse	Yuma Myotis	Cattle Egret	American Coot
Long-billed Curlew	Greater Sandhill Crane	Long-eared Myotis	Tundra Swan	Lesser Sandhill Crane
Black Tern	Franklin's Gull	Fringed Myotis	Snow Goose	Killdeer
Townsend's Big-eared Bat	Caspian Tern	Long-legged Myotis	Canada Goose	Black-necked Stilt
Canada Lynx	Common Tern	Western Small-footed Myotis	Wood Duck	American Avocet
	Northern Pygmy-owl	Silver-haired Bat	Green-winged Teal	Greater Yellowlegs
TIER II: 64	Great Gray Owl	Big Brown Bat	Mallard	Lesser Yellowlegs
Long-toed Salamander	Northern Saw-whet Owl	Hoary Bat	Northern Pintail	Solitary Sandpiper
Columbia Spotted Frog	Black-chinned Hummingbird	Mountain Cottontail	Blue-winged Teal	Willet
Rubber Boa	Lewis' Woodpecker	White-tailed Jackrabbit	Cinnamon Teal	Spotted Sandpiper
Common Garter Snake	Williamson's Sapsucker	Northern Flying Squirrel	Northern Shoveler	Western Sandpiper
Western Rattlesnake	Pileated Woodpecker	Water Vole	Gadwall	Least Sandpiper
Horned Grebe	Hammond's Flycatcher	Sagebrush Vole	Greater Scaup	Baird's Sandpiper

Pectoral Sandpiper	Bank Swallow	Northern Waterthrush	Masked Shrew	Striped Skunk
Long-billed Dowitcher	Cliff Swallow	Macgillivray's Warbler	Dusky Or Montane Shrew	Bobcat
Common Snipe	Barn Swallow	Common Yellowthroat	Water Shrew	Wapiti Or Elk
Wilson's Phalarope	Gray Jay	Wilson's Warbler	Little Brown Myotis	Mule Deer
Ring-billed Gull	Steller's Jay	Western Tanager	Snowshoe Hare	White-tailed Deer
California Gull	Clark's Nutcracker	Black-headed Grosbeak	Least Chipmunk	Moose
Herring Gull	Black-billed Magpie	Lazuli Bunting	Yellow-pine Chipmunk	Pronghorn
Mourning Dove	American Crow	Spotted Towhee	Red-tailed Chipmunk	
Great Horned Owl	Black-capped Chickadee	American Tree Sparrow	Yellow-bellied Marmot	**TIER IV: 10**
Common Nighthawk	Rock Wren	Chipping Sparrow	Columbian Ground Squirrel	Greater White-fronted Goose
White-throated Swift	House Wren	Vesper Sparrow	Golden-mantled Ground Squirrel	Gray Partridge
Calliope Hummingbird	Marsh Wren	Lark Sparrow	Red Squirrel	Ring-necked Pheasant
Rufous Hummingbird	American Dipper	Savannah Sparrow	Northern Pocket Gopher	Wild Turkey
Belted Kingfisher	Golden-crowned Kinglet	Song Sparrow	American Beaver	Rock Dove
Red-naped Sapsucker	Ruby-crowned Kinglet	White-throated Sparrow	Deer Mouse	European Starling
Downy Woodpecker	Mountain Bluebird	White-crowned Sparrow	Bushy-tailed Woodrat	Hoary Redpoll
Hairy Woodpecker	Townsend's Solitaire	Dark-eyed Junco	Southern Red-backed Vole	House Sparrow
Northern Flicker	Swainson's Thrush	Bobolink	Heather Vole	House Mouse
Western Wood-pewee	Hermit Thrush	Red-winged Blackbird	Meadow Vole	Common Raccoon
Willow Flycatcher	American Robin	Western Meadowlark	Montane Vole	
Least Flycatcher	Gray Catbird	Yellow-headed Blackbird	Long-tailed Vole	
Dusky Flycatcher	American Pipit	Brewer's Blackbird	Muskrat	
Cordilleran Flycatcher	Bohemian Waxwing	Common Grackle	Western Jumping Mouse	
Say's Phoebe	Cedar Waxwing	Brown-headed Cowbird	Common Porcupine	
Western Kingbird	Northern Shrike	Pine Grosbeak	Coyote	
Eastern Kingbird	Warbling Vireo	Cassin's Finch	Red Fox	
Horned Lark	Red-eyed Vireo	House Finch	Black Bear	
Tree Swallow	Yellow Warbler	Common Redpoll	Ermine	
Violet-green Swallow	Yellow-rumped Warbler	American Goldfinch	Long-tailed Weasel	
Northern Rough-winged Swallow	Townsend's Warbler	Evening Grosbeak	Mink	

Table 12. Flathead River Valley Focus Area—Species Associations

TOTAL: 344	TIER II: 84			
	Long-toed Salamander	Blue Grouse	Winter Wren	Least Weasel
Group Breakdown	Pacific Treefrog	Upland Sandpiper	Western Bluebird	Wolverine
Amphibians: 5	Columbia Spotted Frog	Marbled Godwit	Veery	American Badger
Birds: 269	Northern Alligator Lizard	Franklin's Gull	Loggerhead Shrike	Northern River Otter
Mammals: 63	Western Skink	Caspian Tern	American Redstart	
Reptiles: 7	Rubber Boa	Common Tern	Yellow-breasted Chat	**TIER III: 206**
	Common Garter Snake	Forster's Tern	Clay-colored Sparrow	Painted Turtle
TIER I: 16	Horned Grebe	Northern Pygmy-owl	Field Sparrow	Gopher Snake
Western Toad	Red-necked Grebe	Barred Owl	Lark Bunting	Western Terrestrial Garter Snake
Northern Leopard Frog	Western Grebe	Great Gray Owl	Grasshopper Sparrow	Pied-billed Grebe
Common Loon	American Bittern	Northern Saw-whet Owl	Bullock's Oriole	Eared Grebe
Trumpeter Swan	Black-crowned Night-heron	Black Swift	Gray-crowned Rosy-finch	Clark's Grebe
Bald Eagle	Canvasback	Vaux's Swift	White-winged Crossbill	American White Pelican
Columbian Sharp-tailed Grouse	Redhead	Black-chinned Hummingbird	Vagrant Shrew	Double-crested Cormorant
Long-billed Curlew	Hooded Merganser	Broad-tailed Hummingbird	Pygmy Shrew	Great Blue Heron
Black Tern	Turkey Vulture	Lewis' Woodpecker	Yuma Myotis	Tundra Swan
Flammulated Owl	Northern Harrier	Red-headed Woodpecker	Long-eared Myotis	Snow Goose
Black-backed Woodpecker	Sharp-shinned Hawk	Williamson's Sapsucker	Long-legged Myotis	Ross' Goose
Olive-sided Flycatcher	Cooper's Hawk	Three-toed Woodpecker	California Myotis	Canada Goose
Townsend's Big-eared Bat	Northern Goshawk	Pileated Woodpecker	Silver-haired Bat	Wood Duck
Northern Bog Lemming	Swainson's Hawk	Alder Flycatcher	Big Brown Bat	Green-winged Teal
Gray Wolf	Ferruginous Hawk	Hammond's Flycatcher	Hoary Bat	Mallard
Grizzly Bear	Golden Eagle	Pinyon Jay	Mountain Cottontail	Northern Pintail
Canada Lynx	Merlin	Chestnut-backed Chickadee	Northern Flying Squirrel	Blue-winged Teal
	Peregrine Falcon	White-breasted Nuthatch	Water Vole	Cinnamon Teal
	Prairie Falcon	Pygmy Nuthatch	American Marten	Northern Shoveler
		Brown Creeper	Fisher	Gadwall

American Wigeon	Western Sandpiper	Least Flycatcher	Townsend's Solitaire	Savannah Sparrow
Ring-necked Duck	Least Sandpiper	Dusky Flycatcher	Swainson's Thrush	Fox Sparrow
Greater Scaup	White-rumped Sandpiper	Cordilleran Flycatcher	Hermit Thrush	Song Sparrow
Lesser Scaup	Baird's Sandpiper	Say's Phoebe	American Robin	Lincoln's Sparrow
White-winged Scoter	Pectoral Sandpiper	Western Kingbird	Varied Thrush	Swamp Sparrow
Common Goldeneye	Dunlin	Eastern Kingbird	Gray Catbird	White-throated Sparrow
Barrow's Goldeneye	Long-billed Dowitcher	Horned Lark	American Pipit	White-crowned Sparrow
Bufflehead	Common Snipe	Tree Swallow	Bohemian Waxwing	Harris' Sparrow
Common Merganser	Wilson's Phalarope	Violet-green Swallow	Cedar Waxwing	Dark-eyed Junco
Red-breasted Merganser	Red-necked Phalarope	Northern Rough-winged Swallow	Northern Shrike	Chestnut-collared Longspur
Ruddy Duck	Ring-billed Gull	Bank Swallow	Warbling Vireo	Snow Bunting
Osprey	California Gull	Cliff Swallow	Red-eyed Vireo	Bobolink
Red-tailed Hawk	Herring Gull	Barn Swallow	Cassin's Vireo	Red-winged Blackbird
Rough-legged Hawk	Mourning Dove	Gray Jay	Orange-crowned Warbler	Western Meadowlark
American Kestrel	Western Screech-owl	Steller's Jay	Nashville Warbler	Yellow-headed Blackbird
Gyrfalcon	Great Horned Owl	Blue Jay	Yellow Warbler	Rusty Blackbird
Ruffed Grouse	Snowy Owl	Clark's Nutcracker	Yellow-rumped Warbler	Brewer's Blackbird
Virginia Rail	Long-eared Owl	Black-billed Magpie	Townsend's Warbler	Common Grackle
Sora	Short-eared Owl	American Crow	Northern Waterthrush	Brown-headed Cowbird
American Coot	Common Nighthawk	Common Raven	Macgillivray's Warbler	Pine Grosbeak
Lesser Sandhill Crane	White-throated Swift	Black-capped Chickadee	Common Yellowthroat	Cassin's Finch
Killdeer	Calliope Hummingbird	Mountain Chickadee	Wilson's Warbler	House Finch
Black-necked Stilt	Rufous Hummingbird	Red-breasted Nuthatch	Western Tanager	Red Crossbill
American Avocet	Belted Kingfisher	Rock Wren	Black-headed Grosbeak	Common Redpoll
Greater Yellowlegs	Red-naped Sapsucker	House Wren	Lazuli Bunting	Pine Siskin
Lesser Yellowlegs	Downy Woodpecker	Marsh Wren	Spotted Towhee	American Goldfinch
Solitary Sandpiper	Hairy Woodpecker	American Dipper	American Tree Sparrow	Evening Grosbeak
Willet	Northern Flicker	Golden-crowned Kinglet	Chipping Sparrow	Masked Shrew
Spotted Sandpiper	Western Wood-pewee	Ruby-crowned Kinglet	Vesper Sparrow	Dusky Or Montane Shrew
Semipalmated Sandpiper	Willow Flycatcher	Mountain Bluebird	Lark Sparrow	Water Shrew

Little Brown Myotis	Mountain Lion	Glaucous Gull
Desert Cottontail	Wapiti Or Elk	Arctic Tern
Snowshoe Hare	Mule Deer	Rock Dove
Least Chipmunk	White-tailed Deer	Barn Owl
Yellow-pine Chipmunk	Moose	Anna’s Hummingbird
Red-tailed Chipmunk	Bighorn Sheep	Scissor-tailed Flycatcher
Yellow-bellied Marmot		Northern Mockingbird
Richardson's Ground Squirrel	**TIER IV: 38**	European Starling
Columbian Ground Squirrel	Green Heron	Magnolia Warbler
Golden-mantled Ground Squirrel	Greater White-fronted Goose	Mourning Warbler
Red Squirrel	Brant	Scarlet Tanager
Northern Pocket Gopher	Eurasian Wigeon	Rose-breasted Grosbeak
American Beaver	Long Tailed Duck	Purple Finch
Deer Mouse	Surf Scoter	Hoary Redpoll
Bushy-tailed Woodrat	Gray Partridge	House Sparrow
Southern Red-backed Vole	Chukar	House Mouse
Heather Vole	Ring-necked Pheasant	Common Raccoon
Meadow Vole	Wild Turkey	
Long-tailed Vole	Black-bellied Plover	
Muskrat	American Golden-plover	
Common Porcupine	Semipalmated Plover	
Coyote	Whimbrel	
Red Fox	Hudsonian Godwit	
Black Bear	Sanderling	
Ermine	Stilt Sandpiper	
Long-tailed Weasel	Short-billed Dowitcher	
Mink	Bonaparte's Gull	
Striped Skunk	Thayer's Gull	
Bobcat	Glaucous-winged Gull	

Table 13. Little Belt Foothills Focus Area—Species Associations

TOTAL: 288	Columbia Spotted Frog	Lewis' Woodpecker	Fringed Myotis	Tundra Swan
	Short-horned Lizard	Pinyon Jay	Long-legged Myotis	Snow Goose
Group Breakdown	Sagebrush Lizard	White-breasted Nuthatch	Western Small-footed Myotis	Ross' Goose
Amphibians: 7	Rubber Boa	Brown Creeper	Silver-haired Bat	Canada Goose
Birds: 202	Common Garter Snake	Canyon Wren	Big Brown Bat	Green-winged Teal
Mammals: 67	Western Rattlesnake	Eastern Bluebird	Hoary Bat	Mallard
Reptiles: 12	Western Grebe	Western Bluebird	Mountain Cottontail	Northern Pintail
	American Bittern	Veery	White-tailed Jackrabbit	Blue-winged Teal
TIER I: 12	Turkey Vulture	Sprague's Pipit	Olive-backed Pocket Mouse	Cinnamon Teal
Northern Leopard Frog	Northern Harrier	Loggerhead Shrike	Ord's Kangaroo Rat	Northern Shoveler
Western Hog-nosed Snake	Sharp-shinned Hawk	American Redstart	Sagebrush Vole	Gadwall
Milksnake	Cooper's Hawk	Yellow-breasted Chat	Swift Fox	American Wigeon
Bald Eagle	Northern Goshawk	Clay-colored Sparrow	Least Weasel	Ring-necked Duck
Greater Sage-Grouse	Swainson's Hawk	Brewer's Sparrow	American Badger	Lesser Scaup
Mountain Plover	Ferruginous Hawk	Field Sparrow		Common Goldeneye
Long-billed Curlew	Golden Eagle	Lark Bunting	**TIER III: 193**	Bufflehead
Black Tern	Merlin	Baird's Sparrow	Boreal Chorus Frog	Common Merganser
Burrowing Owl	Peregrine Falcon	Grasshopper Sparrow	Painted Turtle	Ruddy Duck
Townsend's Big-eared Bat	Prairie Falcon	Mccown's Longspur	Racer	Osprey
Black-tailed Prairie Dog	Blue Grouse	Baltimore Oriole	Gopher Snake	Red-tailed Hawk
Black-footed Ferret	Greater Sandhill Crane	Bullock's Oriole	Western Terrestrial Garter Snake	Rough-legged Hawk
	Upland Sandpiper	Preble's Shrew	Plains Garter Snake	American Kestrel
TIER II: 72	Marbled Godwit	Vagrant Shrew	Pied-billed Grebe	Gyrfalcon
Tiger Salamander	Franklin's Gull	Dwarf Shrew	Eared Grebe	Ruffed Grouse
Great Plains Toad	Northern Pygmy-owl	Hayden's Shrew	American White Pelican	Sharp-tailed Grouse
Woodhouse's Toad	Great Gray Owl	Yuma Myotis	Double-crested Cormorant	Virginia Rail
Plains Spadefoot	Northern Saw-whet Owl	Long-eared Myotis	Great Blue Heron	Sora

American Coot	Hairy Woodpecker	Ruby-crowned Kinglet	Savannah Sparrow	Yellow-pine Chipmunk
Killdeer	Northern Flicker	Mountain Bluebird	Song Sparrow	Yellow-bellied Marmot
American Avocet	Western Wood-pewee	Townsend's Solitaire	Lincoln's Sparrow	Richardson's Ground Squirrel
Greater Yellowlegs	Willow Flycatcher	Swainson's Thrush	White-crowned Sparrow	Columbian Ground Squirrel
Lesser Yellowlegs	Least Flycatcher	Hermit Thrush	Harris' Sparrow	Thirteen-lined Ground Squirrel
Solitary Sandpiper	Dusky Flycatcher	American Robin	Dark-eyed Junco	Red Squirrel
Willet	Cordilleran Flycatcher	Gray Catbird	Lapland Longspur	Northern Pocket Gopher
Spotted Sandpiper	Say's Phoebe	Brown Thrasher	Chestnut-collared Longspur	American Beaver
Least Sandpiper	Western Kingbird	American Pipit	Bobolink	Western Harvest Mouse
Pectoral Sandpiper	Eastern Kingbird	Bohemian Waxwing	Red-winged Blackbird	Deer Mouse
Long-billed Dowitcher	Horned Lark	Cedar Waxwing	Western Meadowlark	Northern Grasshopper Mouse
Common Snipe	Tree Swallow	Northern Shrike	Yellow-headed Blackbird	Bushy-tailed Woodrat
Wilson's Phalarope	Violet-green Swallow	Warbling Vireo	Brewer's Blackbird	Southern Red-backed Vole
Red-necked Phalarope	Northern Rough-winged Swallow	Red-eyed Vireo	Common Grackle	Meadow Vole
Ring-billed Gull	Bank Swallow	Orange-crowned Warbler	Brown-headed Cowbird	Montane Vole
California Gull	Cliff Swallow	Yellow Warbler	Pine Grosbeak	Long-tailed Vole
Herring Gull	Barn Swallow	Yellow-rumped Warbler	Cassin's Finch	Prairie Vole
Mourning Dove	Gray Jay	Ovenbird	House Finch	Muskrat
Eastern Screech-owl	Blue Jay	Northern Waterthrush	Red Crossbill	Western Jumping Mouse
Western Screech-owl	Clark's Nutcracker	Macgillivray's Warbler	Common Redpoll	Common Porcupine
Great Horned Owl	Black-billed Magpie	Common Yellowthroat	Pine Siskin	Coyote
Snowy Owl	American Crow	Wilson's Warbler	American Goldfinch	Red Fox
Long-eared Owl	Black-capped Chickadee	Western Tanager	Evening Grosbeak	Black Bear
Short-eared Owl	Mountain Chickadee	Black-headed Grosbeak	Masked Shrew	Ermine
Common Nighthawk	Red-breasted Nuthatch	Lazuli Bunting	Dusky Or Montane Shrew	Long-tailed Weasel
Common Poorwill	Rock Wren	Spotted Towhee	Water Shrew	Mink
White-throated Swift	House Wren	American Tree Sparrow	Little Brown Myotis	Striped Skunk
Belted Kingfisher	Marsh Wren	Chipping Sparrow	Desert Cottontail	Bobcat
Red-naped Sapsucker	American Dipper	Vesper Sparrow	Snowshoe Hare	Wapiti Or Elk
Downy Woodpecker	Golden-crowned Kinglet	Lark Sparrow	Least Chipmunk	Mule Deer

White-tailed Deer
Moose
Pronghorn
Mountain Goat
Bighorn Sheep
TIER IV: 11
Gray Partridge
Ring-necked Pheasant
Wild Turkey
Bonaparte's Gull
Rock Dove
Northern Mockingbird
European Starling
Hoary Redpoll
House Sparrow
House Mouse
Common Raccoon

Table 14. North Tobacco Root Mountains and Foothills Focus Area—Species Associations

TOTAL: 244	Northern Goshawk	Fringed Myotis	Great Blue Heron	American Avocet
	Swainson's Hawk	Long-legged Myotis	Cattle Egret	Greater Yellowlegs
Group Breakdown	Ferruginous Hawk	Western Small-footed Myotis	Canada Goose	Lesser Yellowlegs
Amphibians: 5	Golden Eagle	Silver-haired Bat	Green-winged Teal	Solitary Sandpiper
Birds: 170	Merlin	Big Brown Bat	Mallard	Spotted Sandpiper
Mammals: 63	Prairie Falcon	Hoary Bat	Northern Pintail	Semipalmated Sandpiper
Reptiles: 6	Blue Grouse	Mountain Cottontail	Blue-winged Teal	Western Sandpiper
	Greater Sandhill Crane	White-tailed Jackrabbit	Cinnamon Teal	Least Sandpiper
TIER I: 6	Northern Saw-whet Owl	Northern Flying Squirrel	Northern Shoveler	Baird's Sandpiper
Western Toad	Alder Flycatcher	Olive-backed Pocket Mouse	Ring-necked Duck	Pectoral Sandpiper
Bald Eagle	Hammond's Flycatcher	White-footed Mouse	Lesser Scaup	Long-billed Dowitcher
Flammulated Owl	White-breasted Nuthatch	Sagebrush Vole	Common Goldeneye	Common Snipe
Townsend's Big-eared Bat	Canyon Wren	American Marten	Barrow's Goldeneye	Wilson's Phalarope
Grizzly Bear	Western Bluebird	American Badger	Bufflehead	Red-necked Phalarope
Canada Lynx	Veery	Northern River Otter	Common Merganser	Ring-billed Gull
	Loggerhead Shrike		Red-breasted Merganser	California Gull
TIER II: 52	Clay-colored Sparrow	**TIER III: 169**	Ruddy Duck	Mourning Dove
Long-toed Salamander	Brewer's Sparrow	Boreal Chorus Frog	Osprey	Eastern Screech-owl
Tiger Salamander	Baltimore Oriole	Painted Turtle	Red-tailed Hawk	Great Horned Owl
Tailed Frog	Bullock's Oriole	Racer	Rough-legged Hawk	Short-eared Owl
Rubber Boa	Preble's Shrew	Gopher Snake	American Kestrel	White-throated Swift
Western Rattlesnake	Vagrant Shrew	Western Terrestrial Garter Snake	Ruffed Grouse	Calliope Hummingbird
Western Grebe	Merriam's Shrew	Pied-billed Grebe	Virginia Rail	Rufous Hummingbird
Turkey Vulture	Pygmy Shrew	Eared Grebe	Sora	Belted Kingfisher
Northern Harrier	Hayden's Shrew	Clark's Grebe	American Coot	Red-naped Sapsucker
Sharp-shinned Hawk	Yuma Myotis	American White Pelican	Lesser Sandhill Crane	Downy Woodpecker
Cooper's Hawk	Long-eared Myotis	Double-crested Cormorant	Killdeer	Hairy Woodpecker

Northern Flicker	American Robin	Brewer's Blackbird	Western Jumping Mouse	Scarlet Tanager
Western Wood-pewee	Sage Thrasher	Common Grackle	Common Porcupine	Rose-breasted Grosbeak
Willow Flycatcher	American Pipit	Brown-headed Cowbird	Coyote	House Sparrow
Least Flycatcher	Bohemian Waxwing	Cassin's Finch	Red Fox	Common Raccoon
Dusky Flycatcher	Cedar Waxwing	House Finch	Black Bear	
Cordilleran Flycatcher	Northern Shrike	Common Redpoll	Ermine	
Western Kingbird	Warbling Vireo	American Goldfinch	Long-tailed Weasel	
Eastern Kingbird	Red-eyed Vireo	Evening Grosbeak	Mink	
Horned Lark	Yellow Warbler	Masked Shrew	Striped Skunk	
Tree Swallow	Yellow-rumped Warbler	Dusky Or Montane Shrew	Bobcat	
Violet-green Swallow	Ovenbird	Water Shrew	Wapiti Or Elk	
Northern Rough-winged Swallow	Macgillivray's Warbler	Little Brown Myotis	Mule Deer	
Bank Swallow	Common Yellowthroat	Snowshoe Hare	White-tailed Deer	
Cliff Swallow	Wilson's Warbler	Least Chipmunk	Moose	
Barn Swallow	Western Tanager	Yellow-pine Chipmunk	Pronghorn	
Blue Jay	Black-headed Grosbeak	Yellow-bellied Marmot		
Clark's Nutcracker	Lazuli Bunting	Richardson's Ground Squirrel	**TIER IV: 17**	
Black-billed Magpie	Spotted Towhee	Columbian Ground Squirrel	Red-throated Loon	
American Crow	American Tree Sparrow	Golden-mantled Ground Squirrel	Great Egret	
Black-capped Chickadee	Chipping Sparrow	Red Squirrel	Broad-winged Hawk	
Red-breasted Nuthatch	Vesper Sparrow	Northern Pocket Gopher	Gray Partridge	
Rock Wren	Savannah Sparrow	American Beaver	Ring-necked Pheasant	
House Wren	Song Sparrow	Deer Mouse	Wild Turkey	
Marsh Wren	White-crowned Sparrow	Bushy-tailed Woodrat	American Golden-plover	
American Dipper	Harris' Sparrow	Southern Red-backed Vole	Semipalmated Plover	
Ruby-crowned Kinglet	Dark-eyed Junco	Heather Vole	Buff-breasted Sandpiper	
Mountain Bluebird	Bobolink	Meadow Vole	Short-billed Dowitcher	
Townsend's Solitaire	Red-winged Blackbird	Montane Vole	Rock Dove	
Swainson's Thrush	Western Meadowlark	Long-tailed Vole	Gray-cheeked Thrush	
Hermit Thrush	Yellow-headed Blackbird	Muskrat	European Starling	

Table 15. Rocky Mountain Front Foothills Focus Area—Species Associations

TOTAL: 362	American Bison	Swainson's Hawk	Brown Creeper	Yuma Myotis
		Ferruginous Hawk	Canyon Wren	Long-eared Myotis
Group Breakdown	**TIER II: 95**	Golden Eagle	Winter Wren	Fringed Myotis
Amphibians: 9	Long-toed Salamander	Merlin	Eastern Bluebird	Long-legged Myotis
Birds: 270	Tiger Salamander	Peregrine Falcon	Western Bluebird	Western Small-footed Myotis
Mammals: 73	Tailed Frog	Prairie Falcon	Veery	Silver-haired Bat
Reptiles: 10	Great Plains Toad	Blue Grouse	Sprague's Pipit	Big Brown Bat
	Plains Spadefoot	Greater Sandhill Crane	Loggerhead Shrike	Hoary Bat
TIER I: 19	Columbia Spotted Frog	Upland Sandpiper	Black-and-white Warbler	Mountain Cottontail
Western Toad	Short-horned Lizard	Marbled Godwit	American Redstart	White-tailed Jackrabbit
Northern Leopard Frog	Rubber Boa	Franklin's Gull	Yellow-breasted Chat	Northern Flying Squirrel
Western Hog-nosed Snake	Common Garter Snake	Caspian Tern	Indigo Bunting	Sagebrush Vole
Common Loon	Western Rattlesnake	Common Tern	Green-tailed Towhee	Swift Fox
Trumpeter Swan	Horned Grebe	Forster's Tern	Clay-colored Sparrow	American Marten
Harlequin Duck	Red-necked Grebe	Black-billed Cuckoo	Brewer's Sparrow	Least Weasel
Bald Eagle	Western Grebe	Northern Pygmy-owl	Field Sparrow	American Badger
Piping Plover	American Bittern	Great Gray Owl	Lark Bunting	Northern River Otter
Mountain Plover	Black-crowned Night-heron	Northern Saw-whet Owl	Baird's Sparrow	
Long-billed Curlew	White-faced Ibis	Black-chinned Hummingbird	Grasshopper Sparrow	**TIER III: 214**
Black Tern	Canvasback	Broad-tailed Hummingbird	Le Conte's Sparrow	Boreal Chorus Frog
Flammulated Owl	Redhead	Lewis' Woodpecker	Mccown's Longspur	Painted Turtle
Burrowing Owl	Hooded Merganser	Pileated Woodpecker	Baltimore Oriole	Racer
Townsend's Big-eared Bat	Turkey Vulture	Alder Flycatcher	Bullock's Oriole	Gopher Snake
Black-tailed Prairie Dog	Northern Harrier	Hammond's Flycatcher	Preble's Shrew	Western Terrestrial Garter Snake
Northern Bog Lemming	Sharp-shinned Hawk	Pinyon Jay	Vagrant Shrew	Plains Garter Snake
Grizzly Bear	Cooper's Hawk	White-breasted Nuthatch	Dwarf Shrew	Pied-billed Grebe
Canada Lynx	Northern Goshawk	Pygmy Nuthatch	Pygmy Shrew	Eared Grebe

Clark's Grebe	Rough-legged Hawk	Eastern Screech-owl	Barn Swallow	Yellow Warbler
American White Pelican	American Kestrel	Western Screech-owl	Gray Jay	Yellow-rumped Warbler
Double-crested Cormorant	Gyrfalcon	Great Horned Owl	Steller's Jay	Townsend's Warbler
Great Blue Heron	Ruffed Grouse	Snowy Owl	Blue Jay	Ovenbird
Cattle Egret	Sharp-tailed Grouse	Long-eared Owl	Clark's Nutcracker	Northern Waterthrush
Tundra Swan	Virginia Rail	Short-eared Owl	Black-billed Magpie	Macgillivray's Warbler
Snow Goose	Sora	Common Nighthawk	American Crow	Common Yellowthroat
Ross' Goose	American Coot	Common Poorwill	Black-capped Chickadee	Wilson's Warbler
Canada Goose	Killdeer	White-throated Swift	Mountain Chickadee	Western Tanager
Wood Duck	Black-necked Stilt	Calliope Hummingbird	Red-breasted Nuthatch	Black-headed Grosbeak
Green-winged Teal	American Avocet	Rufous Hummingbird	Rock Wren	Lazuli Bunting
Mallard	Greater Yellowlegs	Belted Kingfisher	House Wren	Spotted Towhee
Northern Pintail	Lesser Yellowlegs	Red-naped Sapsucker	Marsh Wren	American Tree Sparrow
Blue-winged Teal	Solitary Sandpiper	Downy Woodpecker	American Dipper	Chipping Sparrow
Cinnamon Teal	Willet	Hairy Woodpecker	Golden-crowned Kinglet	Vesper Sparrow
Northern Shoveler	Spotted Sandpiper	Northern Flicker	Ruby-crowned Kinglet	Lark Sparrow
Gadwall	Semipalmated Sandpiper	Western Wood-pewee	Mountain Bluebird	Savannah Sparrow
American Wigeon	Western Sandpiper	Willow Flycatcher	Townsend's Solitaire	Fox Sparrow
Ring-necked Duck	Least Sandpiper	Least Flycatcher	Swainson's Thrush	Song Sparrow
Greater Scaup	Baird's Sandpiper	Dusky Flycatcher	Hermit Thrush	Lincoln's Sparrow
Lesser Scaup	Pectoral Sandpiper	Cordilleran Flycatcher	American Robin	White-crowned Sparrow
White-winged Scoter	Dunlin	Say's Phoebe	Gray Catbird	Harris' Sparrow
Common Goldeneye	Long-billed Dowitcher	Western Kingbird	Brown Thrasher	Dark-eyed Junco
Barrow's Goldeneye	Common Snipe	Eastern Kingbird	American Pipit	Lapland Longspur
Bufflehead	Wilson's Phalarope	Horned Lark	Bohemian Waxwing	Chestnut-collared Longspur
Common Merganser	Red-necked Phalarope	Tree Swallow	Cedar Waxwing	Snow Bunting
Red-breasted Merganser	Ring-billed Gull	Violet-green Swallow	Northern Shrike	Bobolink
Ruddy Duck	California Gull	Northern Rough-winged Swallow	Warbling Vireo	Red-winged Blackbird
Osprey	Herring Gull	Bank Swallow	Red-eyed Vireo	Western Meadowlark
Red-tailed Hawk	Mourning Dove	Cliff Swallow	Orange-crowned Warbler	Yellow-headed Blackbird

Rusty Blackbird	Deer Mouse	Green Heron	House Mouse
Brewer's Blackbird	Northern Grasshopper Mouse	Greater White-fronted Goose	Common Raccoon
Common Grackle	Bushy-tailed Woodrat	Brant	
Brown-headed Cowbird	Southern Red-backed Vole	Eurasian Wigeon	
Pine Grosbeak	Heather Vole	Long Tailed Duck	
Cassin's Finch	Meadow Vole	Black Scoter	
House Finch	Montane Vole	Surf Scoter	
Red Crossbill	Long-tailed Vole	Gray Partridge	
Common Redpoll	Muskrat	Ring-necked Pheasant	
Pine Siskin	Western Jumping Mouse	Wild Turkey	
American Goldfinch	Common Porcupine	Black-bellied Plover	
Evening Grosbeak	Coyote	American Golden-plover	
Masked Shrew	Red Fox	Semipalmated Plover	
Dusky Or Montane Shrew	Black Bear	Whimbrel	
Water Shrew	Ermine	Hudsonian Godwit	
Little Brown Myotis	Long-tailed Weasel	Ruddy Turnstone	
American Pika	Mink	Red Knot	
Desert Cottontail	Striped Skunk	Sanderling	
Snowshoe Hare	Bobcat	Stilt Sandpiper	
Least Chipmunk	Wapiti Or Elk	Short-billed Dowitcher	
Yellow-pine Chipmunk	Mule Deer	Red Phalarope	
Yellow-bellied Marmot	White-tailed Deer	Bonaparte's Gull	
Richardson's Ground Squirrel	Moose	Glaucous Gull	
Columbian Ground Squirrel	Pronghorn	Rock Dove	
Thirteen-lined Ground Squirrel	Mountain Goat	Northern Mockingbird	
Golden-mantled Ground Squirrel	Bighorn Sheep	European Starling	
Red Squirrel		Palm Warbler	
Northern Pocket Gopher	**TIER IV: 34**	Blackpoll Warbler	
American Beaver	Great Egret	Hoary Redpoll	
Western Harvest Mouse	Snowy Egret	House Sparrow	

Table 16. South Elkhorn Mountains Focus Area—Species Associations

TOTAL: 243	Northern Goshawk	Yuma Myotis	American White Pelican	Western Sandpiper
	Swainson's Hawk	Long-eared Myotis	Double-crested Cormorant	Least Sandpiper
Group Breakdown	Golden Eagle	Long-legged Myotis	Great Blue Heron	Baird's Sandpiper
Amphibians: 7	Merlin	California Myotis	Canada Goose	Pectoral Sandpiper
Birds: 162	Prairie Falcon	Western Small-footed Myotis	Green-winged Teal	Long-billed Dowitcher
Mammals: 69	Blue Grouse	Silver-haired Bat	Mallard	Common Snipe
Reptiles: 5	Great Gray Owl	Big Brown Bat	Northern Pintail	Wilson's Phalarope
	Boreal Owl	Hoary Bat	Blue-winged Teal	Ring-billed Gull
TIER I: 8	Northern Saw-whet Owl	Mountain Cottontail	Cinnamon Teal	California Gull
Western Toad	Alder Flycatcher	White-tailed Jackrabbit	Bufflehead	Mourning Dove
Northern Leopard Frog	Hammond's Flycatcher	Northern Flying Squirrel	Common Merganser	Great Horned Owl
Bald Eagle	White-breasted Nuthatch	Olive-backed Pocket Mouse	Red-breasted Merganser	Short-eared Owl
Black-backed Woodpecker	Brown Creeper	White-footed Mouse	Ruddy Duck	White-throated Swift
Townsend's Big-eared Bat	Winter Wren	American Marten	Osprey	Calliope Hummingbird
Pallid Bat	Western Bluebird	Fisher	Red-tailed Hawk	Rufous Hummingbird
Gray Wolf	Veery	Least Weasel	Rough-legged Hawk	Belted Kingfisher
Canada Lynx	Loggerhead Shrike	Wolverine	American Kestrel	Downy Woodpecker
	Clay-colored Sparrow	American Badger	Spruce Grouse	Hairy Woodpecker
TIER II: 56	Brewer's Sparrow	Northern River Otter	Ruffed Grouse	Northern Flicker
Long-toed Salamander	Baltimore Oriole		Sora	Western Wood-pewee
Tiger Salamander	Bullock's Oriole	**TIER III: 168**	American Coot	Willow Flycatcher
Tailed Frog	Black Rosy-finch	Boreal Chorus Frog	Lesser Sandhill Crane	Dusky Flycatcher
Columbia Spotted Frog	Gray-crowned Rosy-finch	Painted Turtle	Killdeer	Say's Phoebe
Western Rattlesnake	White-winged Crossbill	Racer	American Avocet	Western Kingbird
Turkey Vulture	Preble's Shrew	Gopher Snake	Greater Yellowlegs	Eastern Kingbird
Northern Harrier	Vagrant Shrew	Western Terrestrial Garter Snake	Lesser Yellowlegs	Horned Lark
Sharp-shinned Hawk	Merriam's Shrew	Pied-billed Grebe	Spotted Sandpiper	Tree Swallow
Cooper's Hawk	Hayden's Shrew	Eared Grebe	Semipalmated Sandpiper	Violet-green Swallow

Northern Rough-winged Swallow	Yellow Warbler	House Finch	Coyote
Bank Swallow	Yellow-rumped Warbler	Common Redpoll	Red Fox
Cliff Swallow	Townsend's Warbler	American Goldfinch	Black Bear
Barn Swallow	Northern Waterthrush	Evening Grosbeak	Ermine
Gray Jay	Macgillivray's Warbler	Masked Shrew	Long-tailed Weasel
Steller's Jay	Common Yellowthroat	Dusky Or Montane Shrew	Mink
Blue Jay	Wilson's Warbler	Water Shrew	Striped Skunk
Clark's Nutcracker	Western Tanager	Little Brown Myotis	Bobcat
Black-billed Magpie	Black-headed Grosbeak	American Pika	Mountain Lion
American Crow	Lazuli Bunting	Snowshoe Hare	Wapiti Or Elk
Common Raven	Spotted Towhee	Least Chipmunk	Mule Deer
Black-capped Chickadee	American Tree Sparrow	Yellow-pine Chipmunk	White-tailed Deer
Mountain Chickadee	Chipping Sparrow	Red-tailed Chipmunk	Moose
Red-breasted Nuthatch	Vesper Sparrow	Yellow-bellied Marmot	Pronghorn
Rock Wren	Savannah Sparrow	Richardson's Ground Squirrel	Mountain Goat
House Wren	Song Sparrow	Columbian Ground Squirrel	
American Dipper	White-throated Sparrow	Golden-mantled Ground Squirrel	**TIER IV: 11**
Golden-crowned Kinglet	White-crowned Sparrow	Red Squirrel	Gray Partridge
Ruby-crowned Kinglet	Harris' Sparrow	Northern Pocket Gopher	Ring-necked Pheasant
Mountain Bluebird	Dark-eyed Junco	American Beaver	Wild Turkey
Townsend's Solitaire	Snow Bunting	Deer Mouse	Semipalmated Plover
Swainson's Thrush	Bobolink	Bushy-tailed Woodrat	Stilt Sandpiper
Hermit Thrush	Red-winged Blackbird	Southern Red-backed Vole	Rock Dove
American Robin	Western Meadowlark	Heather Vole	European Starling
Gray Catbird	Yellow-headed Blackbird	Meadow Vole	Scarlet Tanager
Sage Thrasher	Brewer's Blackbird	Montane Vole	Rose-breasted Grosbeak
American Pipit	Common Grackle	Long-tailed Vole	House Sparrow
Bohemian Waxwing	Brown-headed Cowbird	Muskrat	Common Raccoon
Cedar Waxwing	Pine Grosbeak	Western Jumping Mouse	
Red-eyed Vireo	Cassin's Finch	Common Porcupine	

Table 17. Southwest Montana Intermontane Basins and Valleys Focus Area—Species Associations

TOTAL: 296	Short-horned Lizard	Cassin's Kingbird	Uinta Ground Squirrel	Canada Goose
	Sagebrush Lizard	Pinyon Jay	Wyoming Ground Squirrel	Wood Duck
Group Breakdown	Rubber Boa	White-breasted Nuthatch	Northern Flying Squirrel	Green-winged Teal
Amphibians: 5	Western Rattlesnake	Canyon Wren	Idaho Pocket Gopher	Mallard
Birds: 211	Horned Grebe	Western Bluebird	White-footed Mouse	Northern Pintail
Mammals: 72	Western Grebe	Veery	Sagebrush Vole	Blue-winged Teal
Reptiles: 8	American Bittern	Loggerhead Shrike	American Marten	Cinnamon Teal
	Black-crowned Night-heron	Clay-colored Sparrow	American Badger	Northern Shoveler
TIER I: 13	White-faced Ibis	Brewer's Sparrow	Western Spotted Skunk	Gadwall
Western Toad	Hooded Merganser	Baltimore Oriole	Northern River Otter	Ring-necked Duck
Common Loon	Turkey Vulture	Bullock's Oriole		Lesser Scaup
Trumpeter Swan	Northern Harrier	Preble's Shrew	**TIER III: 184**	White-winged Scoter
Bald Eagle	Sharp-shinned Hawk	Vagrant Shrew	Boreal Chorus Frog	Common Goldeneye
Greater Sage-Grouse	Cooper's Hawk	Merriam's Shrew	Painted Turtle	Barrow's Goldeneye
Long-billed Curlew	Northern Goshawk	Pygmy Shrew	Racer	Bufflehead
Flammulated Owl	Swainson's Hawk	Hayden's Shrew	Gopher Snake	Common Merganser
Townsend's Big-eared Bat	Ferruginous Hawk	Yuma Myotis	Western Terrestrial Garter Snake	Red-breasted Merganser
Pygmy Rabbit	Golden Eagle	Long-eared Myotis	Pied-billed Grebe	Ruddy Duck
Great Basin Pocket Mouse	Merlin	Fringed Myotis	Eared Grebe	Osprey
Gray Wolf	Prairie Falcon	Long-legged Myotis	Clark's Grebe	Red-tailed Hawk
Grizzly Bear	Blue Grouse	Western Small-footed Myotis	American White Pelican	Rough-legged Hawk
Canada Lynx	Greater Sandhill Crane	Silver-haired Bat	Double-crested Cormorant	American Kestrel
	Upland Sandpiper	Big Brown Bat	Great Blue Heron	Ruffed Grouse
TIER II: 67	Franklin's Gull	Hoary Bat	Cattle Egret	Virginia Rail
Long-toed Salamander	Northern Saw-whet Owl	Mountain Cottontail	Tundra Swan	Sora
Tiger Salamander	Alder Flycatcher	White-tailed Jackrabbit	Snow Goose	American Coot
Tailed Frog	Hammond's Flycatcher	Black-tailed Jackrabbit	Ross' Goose	Lesser Sandhill Crane

Killdeer	Northern Flicker	Swainson's Thrush	Harris' Sparrow	Bushy-tailed Woodrat
Black-necked Stilt	Western Wood-pewee	Hermit Thrush	Dark-eyed Junco	Southern Red-backed Vole
American Avocet	Willow Flycatcher	American Robin	Bobolink	Heather Vole
Greater Yellowlegs	Least Flycatcher	Gray Catbird	Red-winged Blackbird	Meadow Vole
Lesser Yellowlegs	Dusky Flycatcher	Sage Thrasher	Western Meadowlark	Montane Vole
Solitary Sandpiper	Cordilleran Flycatcher	American Pipit	Yellow-headed Blackbird	Long-tailed Vole
Willet	Say's Phoebe	Bohemian Waxwing	Brewer's Blackbird	Muskrat
Spotted Sandpiper	Western Kingbird	Cedar Waxwing	Common Grackle	Western Jumping Mouse
Least Sandpiper	Eastern Kingbird	Northern Shrike	Brown-headed Cowbird	Common Porcupine
Baird's Sandpiper	Horned Lark	Warbling Vireo	Cassin's Finch	Coyote
Long-billed Dowitcher	Tree Swallow	Red-eyed Vireo	House Finch	Red Fox
Common Snipe	Violet-green Swallow	Yellow Warbler	Common Redpoll	Black Bear
Wilson's Phalarope	Northern Rough-winged Swallow	Yellow-rumped Warbler	American Goldfinch	Ermine
Red-necked Phalarope	Bank Swallow	Ovenbird	Evening Grosbeak	Long-tailed Weasel
Ring-billed Gull	Cliff Swallow	Northern Waterthrush	Masked Shrew	Mink
California Gull	Barn Swallow	Macgillivray's Warbler	Dusky Or Montane Shrew	Striped Skunk
Herring Gull	Gray Jay	Common Yellowthroat	Water Shrew	Bobcat
Mourning Dove	Blue Jay	Wilson's Warbler	Little Brown Myotis	Wapiti Or Elk
Western Screech-owl	Clark's Nutcracker	Western Tanager	Snowshoe Hare	Mule Deer
Great Horned Owl	Black-billed Magpie	Black-headed Grosbeak	Least Chipmunk	White-tailed Deer
Short-eared Owl	American Crow	Lazuli Bunting	Yellow-pine Chipmunk	Moose
Common Nighthawk	Black-capped Chickadee	Spotted Towhee	Red-tailed Chipmunk	Pronghorn
Common Poorwill	Red-breasted Nuthatch	American Tree Sparrow	Yellow-bellied Marmot	
White-throated Swift	Rock Wren	Chipping Sparrow	Richardson's Ground Squirrel	**TIER IV: 32**
Calliope Hummingbird	House Wren	Vesper Sparrow	Columbian Ground Squirrel	Red-throated Loon
Rufous Hummingbird	Marsh Wren	Sage Sparrow	Golden-mantled Ground Squirrel	Little Blue Heron
Belted Kingfisher	American Dipper	Savannah Sparrow	Red Squirrel	Greater White-fronted Goose
Red-naped Sapsucker	Ruby-crowned Kinglet	Song Sparrow	Northern Pocket Gopher	Wood Stork
Downy Woodpecker	Mountain Bluebird	Lincoln's Sparrow	American Beaver	Eurasian Wigeon
Hairy Woodpecker	Townsend's Solitaire	White-crowned Sparrow	Deer Mouse	Black Scoter

Surf Scoter
Gray Partridge
Chukar
Ring-necked Pheasant
American Golden-plover
Semipalmated Plover
Whimbrel
Ruddy Turnstone
Red Knot
Sanderling
Stilt Sandpiper
Short-billed Dowitcher
Red Phalarope
Pomarine Jaeger
Bonaparte's Gull
Rock Dove
Scissor-tailed Flycatcher
Northern Mockingbird
European Starling
Pine Warbler
Blackpoll Warbler
Scarlet Tanager
Rose-breasted Grosbeak
House Sparrow
House Mouse
Common Raccoon

Table 18. Upper Yellowstone Valley Focus Area—Species Associations

TOTAL: 264	Horned Grebe	Veery	Uinta Ground Squirrel	Ross' Goose
	Western Grebe	Loggerhead Shrike	Wyoming Ground Squirrel	Canada Goose
Group Breakdown	Turkey Vulture	Clay-colored Sparrow	Northern Flying Squirrel	Wood Duck
Amphibians: 7	Northern Harrier	Brewer's Sparrow	Olive-backed Pocket Mouse	Green-winged Teal
Birds: 178	Sharp-shinned Hawk	Field Sparrow	White-footed Mouse	Mallard
Mammals: 74	Cooper's Hawk	Baltimore Oriole	Sagebrush Vole	Northern Pintail
Reptiles: 5	Northern Goshawk	Bullock's Oriole	American Marten	Blue-winged Teal
	Swainson's Hawk	Black Rosy-finch	Fisher	Cinnamon Teal
TIER I: 9	Ferruginous Hawk	Gray-crowned Rosy-finch	Least Weasel	Northern Shoveler
Western Toad	Golden Eagle	White-winged Crossbill	Wolverine	Gadwall
Northern Leopard Frog	Merlin	Vagrant Shrew	American Badger	Lesser Scaup
Trumpeter Swan	Prairie Falcon	Merriam's Shrew	Western Spotted Skunk	Common Goldeneye
Bald Eagle	Blue Grouse	Pygmy Shrew	Northern River Otter	Barrow's Goldeneye
Long-billed Curlew	Greater Sandhill Crane	Hayden's Shrew		Bufflehead
Black-backed Woodpecker	Franklin's Gull	Yuma Myotis	**TIER III: 166**	Common Merganser
Gray Wolf	Barred Owl	Long-eared Myotis	Boreal Chorus Frog	Red-breasted Merganser
Grizzly Bear	Great Gray Owl	Fringed Myotis	Racer	Ruddy Duck
Canada Lynx	Boreal Owl	Long-legged Myotis	Western Terrestrial Garter Snake	Osprey
	Northern Saw-whet Owl	California Myotis	Pied-billed Grebe	Red-tailed Hawk
TIER II: 74	Three-toed Woodpecker	Western Small-footed Myotis	Eared Grebe	Rough-legged Hawk
Long-toed Salamander	Alder Flycatcher	Northern Myotis	Clark's Grebe	American Kestrel
Tiger Salamander	Hammond's Flycatcher	Silver-haired Bat	American White Pelican	Ruffed Grouse
Tailed Frog	White-breasted Nuthatch	Big Brown Bat	Double-crested Cormorant	Sora
Columbia Spotted Frog	Brown Creeper	Hoary Bat	Great Blue Heron	American Coot
Sagebrush Lizard	Canyon Wren	Mountain Cottontail	Cattle Egret	Lesser Sandhill Crane
Rubber Boa	Winter Wren	White-tailed Jackrabbit	Tundra Swan	Killdeer
Western Rattlesnake	Western Bluebird	Uinta Chipmunk	Snow Goose	American Avocet

Spotted Sandpiper	American Crow	Wilson's Warbler	Water Shrew	Mountain Lion
Common Snipe	Common Raven	Western Tanager	Little Brown Myotis	Wapiti Or Elk
Wilson's Phalarope	Black-capped Chickadee	Black-headed Grosbeak	American Pika	Mule Deer
Ring-billed Gull	Red-breasted Nuthatch	Lazuli Bunting	Snowshoe Hare	White-tailed Deer
California Gull	Rock Wren	Spotted Towhee	Least Chipmunk	Moose
Mourning Dove	House Wren	American Tree Sparrow	Yellow-pine Chipmunk	Mountain Goat
Great Horned Owl	Marsh Wren	Chipping Sparrow	Yellow-bellied Marmot	Bighorn Sheep
White-throated Swift	American Dipper	Vesper Sparrow	Richardson's Ground Squirrel	
Rufous Hummingbird	Golden-crowned Kinglet	Savannah Sparrow	Golden-mantled Ground Squirrel	**TIER IV: 15**
Belted Kingfisher	Ruby-crowned Kinglet	Fox Sparrow	Red Squirrel	Little Blue Heron
Downy Woodpecker	Mountain Bluebird	Song Sparrow	Northern Pocket Gopher	Wood Stork
Hairy Woodpecker	Townsend's Solitaire	Lincoln's Sparrow	American Beaver	Mute Swan
Northern Flicker	Swainson's Thrush	White-crowned Sparrow	Deer Mouse	Surf Scoter
Western Wood-pewee	Hermit Thrush	Harris' Sparrow	Bushy-tailed Woodrat	Broad-winged Hawk
Dusky Flycatcher	American Robin	Dark-eyed Junco	Southern Red-backed Vole	Gray Partridge
Cordilleran Flycatcher	Varied Thrush	Bobolink	Heather Vole	Chukar
Western Kingbird	Gray Catbird	Red-winged Blackbird	Meadow Vole	Ring-necked Pheasant
Eastern Kingbird	Brown Thrasher	Western Meadowlark	Montane Vole	Stilt Sandpiper
Horned Lark	American Pipit	Yellow-headed Blackbird	Long-tailed Vole	Bonaparte's Gull
Tree Swallow	Bohemian Waxwing	Brewer's Blackbird	Muskrat	Rock Dove
Violet-green Swallow	Cedar Waxwing	Common Grackle	Western Jumping Mouse	European Starling
Northern Rough-winged Swallow	Northern Shrike	Brown-headed Cowbird	Common Porcupine	House Sparrow
Bank Swallow	Red-eyed Vireo	Pine Grosbeak	Coyote	House Mouse
Cliff Swallow	Yellow Warbler	Cassin's Finch	Red Fox	Common Raccoon
Barn Swallow	Yellow-rumped Warbler	House Finch	Black Bear	
Gray Jay	Townsend's Warbler	Common Redpoll	Ermine	
Steller's Jay	Ovenbird	American Goldfinch	Long-tailed Weasel	
Blue Jay	Northern Waterthrush	Evening Grosbeak	Mink	
Clark's Nutcracker	Macgillivray's Warbler	Masked Shrew	Striped Skunk	
Black-billed Magpie	Common Yellowthroat	Dusky Or Montane Shrew	Bobcat	

Table 19. Big Hole River Focus Area—Species Associations

TOTAL: 19	TIER IV: 5
Group Breakdown Crayfish: 2 Mussels: 1 Fish: 16	Rainbow Trout Golden Trout Brown Trout Brook Trout Common Carp
TIER I: 5	
Western Pearlshell Westslope Cutthroat Trout Lake Trout (Native Lakes) Arctic Grayling Burbot	
TIER III: 9	
Virile Crayfish A Crayfish (Gambelii) Mottled Sculpin Mountain Whitefish Longnose Dace Redside Shiner Longnose Sucker White Sucker Mountain Sucker	

Table 20. Bitterroot River Focus Area—Species Associations

TOTAL: 21	TIER IV: 7
Group Breakdown Crayfish: 1 Mussels: 1 Fish: 19	Rainbow Trout Golden Trout Brown Trout Brook Trout Northern Pike Pumpkinseed Largemouth Bass
TIER I: 3	
Western Pearlshell Westslope Cutthroat Trout Bull Trout	
TIER III: 11	
Signal Crayfish Mottled Sculpin Slimy Sculpin Mountain Whitefish Peamouth Northern Pike Minnow Longnose Dace Redside Shiner Longnose Sucker White Sucker Largescale Sucker	

Table 21. Blackfoot River Focus Area—Species Associations

TOTAL: 23	TIER IV: 8
Group Breakdown Crayfish: 1 Mussels: 1 Fish: 21	Kokanee Salmon Rainbow Trout Brown Trout Brook Trout Northern Pike Pumpkinseed Largemouth Bass Yellow Perch
TIER I: 3	
Western Pearlshell Westslope Cutthroat Trout Bull Trout	
TIER III: 12	
Signal Crayfish Mottled Sculpin Slimy Sculpin Mountain Whitefish Peamouth Fathead Minnow Northern Pike Minnow Longnose Dace Redside Shiner Longnose Sucker White Sucker Largescale Sucker	

Table 22. Jefferson River Focus Area—Species Associations

TOTAL: 20	TIER IV: 7
Group Breakdown Crayfish: 2 Mussels: 1 Fish: 17	Kokanee Salmon Rainbow Trout Brown Trout Brook Trout Lake Trout Common Carp Bluegill
TIER I: 3	
Western Pearlshell Westslope Cutthroat Trout Burbot	
TIER III: 10	
Virile Crayfish A Crayfish (Gambelii) Mottled Sculpin Mountain Whitefish Longnose Dace Redside Shiner Flathead Chub Longnose Sucker White Sucker Mountain Sucker	

Table 23. Upper Yellowstone River Focus Area—Species Associations

TOTAL: 46	Flathead Chub	Largemouth Bass
Group Breakdown Crayfish: 1 Fish: 45	River Carpsucker Longnose Sucker White Sucker Mountain Sucker Smallmouth Buffalo	White Crappie Black Crappie Yellow Perch Walleye
TIER I: 3	Shorthead Redhorse	
Yellowstone Cutthroat Trout Burbot Sauger	Channel Catfish Brook Stickleback Stonecat	
TIER II: 2	**TIER IV: 19**	
Bigmouth Buffalo Freshwater Drum	Rainbow Trout Golden Trout Brown Trout	
TIER III: 20	Brook Trout	
Virile Crayfish Mottled Sculpin Goldeye Mountain Whitefish Lake Chub Western Silvery Minnow Emerald Shiner Sand Shiner Fathead Minnow Longnose Dace	Lake Trout Northern Pike Common Carp Black Bullhead Yellow Bullhead Plains Killifish Green Sunfish Pumpkinseed Bluegill Smallmouth Bass	

Table 24. Mission/Swan Valley and Mountains Focus Area—Species Associations

TOTAL: 246	Pacific Treefrog	Black-chinned Hummingbird	Silver-haired Bat	Rough-legged Hawk
	Columbia Spotted Frog	Williamson's Sapsucker	Big Brown Bat	Gyrfalcon
Group Breakdown	Northern Alligator Lizard	Three-toed Woodpecker	Hoary Bat	Spruce Grouse
Amphibians: 8	Rubber Boa	Pileated Woodpecker	White-tailed Jackrabbit	Ruffed Grouse
Birds: 170	Common Garter Snake	Hammond's Flycatcher	Northern Flying Squirrel	Sora
Mammals: 63	Horned Grebe	Boreal Chickadee	Water Vole	Spotted Sandpiper
Reptiles: 5	Red-necked Grebe	Chestnut-backed Chickadee	American Marten	Common Snipe
	Hooded Merganser	White-breasted Nuthatch	Fisher	Western Screech-owl
TIER I: 14	Turkey Vulture	Pygmy Nuthatch	Wolverine	Great Horned Owl
Western Toad	Sharp-shinned Hawk	Brown Creeper	American Badger	Common Nighthawk
Common Loon	Cooper's Hawk	Canyon Wren	Northern River Otter	Common Poorwill
Trumpeter Swan	Northern Goshawk	Winter Wren		White-throated Swift
Harlequin Duck	Swainson's Hawk	Western Bluebird	**TIER III: 145**	Calliope Hummingbird
Bald Eagle	Golden Eagle	Veery	Painted Turtle	Rufous Hummingbird
Flammulated Owl	Merlin	American Redstart	Western Terrestrial Garter Snake	Belted Kingfisher
Black-backed Woodpecker	Peregrine Falcon	Clay-colored Sparrow	Pied-billed Grebe	Red-naped Sapsucker
Olive-sided Flycatcher	Prairie Falcon	Brewer's Sparrow	Great Blue Heron	Downy Woodpecker
Townsend's Big-eared Bat	Blue Grouse	Gray-crowned Rosy-finch	Tundra Swan	Hairy Woodpecker
Hoary Marmot	White-tailed Ptarmigan	White-winged Crossbill	Wood Duck	Northern Flicker
Northern Bog Lemming	Franklin's Gull	Preble's Shrew	Mallard	Western Wood-pewee
Gray Wolf	Northern Pygmy-owl	Vagrant Shrew	Common Goldeneye	Willow Flycatcher
Grizzly Bear	Barred Owl	Pygmy Shrew	Barrow's Goldeneye	Dusky Flycatcher
Canada Lynx	Great Gray Owl	Long-eared Myotis	Bufflehead	Cordilleran Flycatcher
	Boreal Owl	Fringed Myotis	Common Merganser	Tree Swallow
TIER II: 67	Northern Saw-whet Owl	Long-legged Myotis	Ruddy Duck	Violet-green Swallow
Long-toed Salamander	Black Swift	California Myotis	Osprey	Northern Rough-winged Swallow
Tailed Frog	Vaux's Swift	Western Small-footed Myotis	Red-tailed Hawk	Bank Swallow

Cliff Swallow	Cassin's Vireo	Pine Grosbeak	Coyote	Mourning Warbler
Barn Swallow	Tennessee Warbler	Cassin's Finch	Red Fox	Scarlet Tanager
Gray Jay	Orange-crowned Warbler	Red Crossbill	Black Bear	Rose-breasted Grosbeak
Steller's Jay	Nashville Warbler	Common Redpoll	Ermine	Purple Finch
Blue Jay	Yellow Warbler	Pine Siskin	Mink	Hoary Redpoll
Clark's Nutcracker	Yellow-rumped Warbler	American Goldfinch	Striped Skunk	Norway Rat
American Crow	Townsend's Warbler	Evening Grosbeak	Bobcat	
Common Raven	Northern Waterthrush	Masked Shrew	Mountain Lion	
Black-capped Chickadee	Macgillivray's Warbler	Dusky Or Montane Shrew	Wapiti Or Elk	
Mountain Chickadee	Common Yellowthroat	Water Shrew	Mule Deer	
Red-breasted Nuthatch	Wilson's Warbler	Little Brown Myotis	White-tailed Deer	
Rock Wren	Western Tanager	American Pika	Moose	
House Wren	Black-headed Grosbeak	Snowshoe Hare	Mountain Goat	
Marsh Wren	Lazuli Bunting	Yellow-pine Chipmunk	Bighorn Sheep	
American Dipper	Spotted Towhee	Red-tailed Chipmunk		
Golden-crowned Kinglet	American Tree Sparrow	Yellow-bellied Marmot	**TIER IV: 20**	
Ruby-crowned Kinglet	Chipping Sparrow	Columbian Ground Squirrel	Roughskin Newt	
Mountain Bluebird	Vesper Sparrow	Golden-mantled Ground Squirrel	Idaho Giant Salamander	
Townsend's Solitaire	Savannah Sparrow	Red Squirrel	Bullfrog	
Swainson's Thrush	Fox Sparrow	Northern Pocket Gopher	Red-throated Loon	
Hermit Thrush	Song Sparrow	American Beaver	Green Heron	
American Robin	Lincoln's Sparrow	Deer Mouse	Broad-winged Hawk	
Varied Thrush	White-crowned Sparrow	Bushy-tailed Woodrat	Wild Turkey	
Gray Catbird	Dark-eyed Junco	Southern Red-backed Vole	American Woodcock	
American Pipit	Snow Bunting	Heather Vole	Rock Dove	
Bohemian Waxwing	Bobolink	Meadow Vole	Yellow-bellied Sapsucker	
Cedar Waxwing	Red-winged Blackbird	Montane Vole	Scissor-tailed Flycatcher	
Northern Shrike	Yellow-headed Blackbird	Long-tailed Vole	Chestnut-sided Warbler	
Warbling Vireo	Brewer's Blackbird	Muskrat	Magnolia Warbler	
Red-eyed Vireo	Brown-headed Cowbird	Common Porcupine	Connecticut Warbler	

Table 25. Lower Clark Fork River Focus Area—Species Associations

TOTAL: 27	TIER IV: 14
Group Breakdown Crayfish: 1 Mussels: 1 Fish: 25	Kokanee Salmon Rainbow Trout Golden Trout Brown Trout Brook Trout Lake Trout
TIER I: 3	Northern Pike
Western Pearlshell Westslope Cutthroat Trout Bull Trout	Black Bullhead Yellow Bullhead Pumpkinseed Smallmouth Bass
TIER III: 10	Largemouth Bass
Signal Crayfish Mottled Sculpin Slimy Sculpin Mountain Whitefish Peamouth Northern Pike Minnow Longnose Dace Redside Shiner Longnose Sucker Largescale Sucker	Yellow Perch Lake Whitefish

Table 26. Middle Clark Fork River Focus Area—Species Associations

TOTAL: 20	TIER IV: 7
Group Breakdown Crayfish: 1 Mussels: 1 Fish: 18	Rainbow Trout Brown Trout Brook Trout Northern Pike Pumpkinseed Largemouth Bass Yellow Perch
TIER I: 3	
Western Pearlshell Westslope Cutthroat Trout Bull Trout	
TIER III: 10	
Signal Crayfish Mottled Sculpin Slimy Sculpin Mountain Whitefish Northern Pike Minnow Longnose Dace Redside Shiner Longnose Sucker White Sucker Largescale Sucker	

Table 27. Missouri Coteau Focus Area—Species Associations

TOTAL: 318	Meadow Jumping Mouse	Merlin	Mccown's Longspur	Northern River Otter
		Peregrine Falcon	Baltimore Oriole	
Group Breakdown	**TIER II: 79**	Prairie Falcon	Bullock's Oriole	**TIER III: 181**
Amphibians: 6	Tiger Salamander	Upland Sandpiper	Preble's Shrew	Boreal Chorus Frog
Birds: 237	Great Plains Toad	Marbled Godwit	Vagrant Shrew	Painted Turtle
Mammals: 63	Woodhouse's Toad	Franklin's Gull	Arctic Shrew	Racer
Reptiles: 12	Plains Spadefoot	Caspian Tern	Merriam's Shrew	Gopher Snake
	Short-horned Lizard	Common Tern	Hayden's Shrew	Plains Garter Snake
TIER I: 19	Rubber Boa	Forster's Tern	Yuma Myotis	Pied-billed Grebe
Northern Leopard Frog	Common Garter Snake	Black-billed Cuckoo	Long-eared Myotis	Eared Grebe
Snapping Turtle	Western Rattlesnake	Red-headed Woodpecker	Long-legged Myotis	Clark's Grebe
Spiny Softshell	Horned Grebe	Alder Flycatcher	Western Small-footed Myotis	American White Pelican
Western Hog-nosed Snake	Western Grebe	Cassin's Kingbird	Northern Myotis	Double-crested Cormorant
Smooth Greensnake	American Bittern	White-breasted Nuthatch	Silver-haired Bat	Great Blue Heron
Common Loon	Black-crowned Night-heron	Eastern Bluebird	Big Brown Bat	Tundra Swan
Trumpeter Swan	White-faced Ibis	Veery	Eastern Red Bat	Snow Goose
Bald Eagle	Canvasback	Sprague's Pipit	Hoary Bat	Ross' Goose
Yellow Rail	Redhead	Loggerhead Shrike	Eastern Cottontail	Canada Goose
Whooping Crane	Hooded Merganser	American Redstart	Mountain Cottontail	Wood Duck
Piping Plover	Turkey Vulture	Yellow-breasted Chat	White-tailed Jackrabbit	Green-winged Teal
Long-billed Curlew	Northern Harrier	Clay-colored Sparrow	Olive-backed Pocket Mouse	Mallard
Interior Least Tern	Sharp-shinned Hawk	Dickcissel	Ord's Kangaroo Rat	Northern Pintail
Black Tern	Cooper's Hawk	Brewer's Sparrow	White-footed Mouse	Blue-winged Teal
Burrowing Owl	Northern Goshawk	Field Sparrow	Sagebrush Vole	Cinnamon Teal
Sedge Wren	Swainson's Hawk	Lark Bunting	Swift Fox	Northern Shoveler
Nelson's Sharp-tailed Sparrow	Ferruginous Hawk	Baird's Sparrow	Least Weasel	Gadwall
Townsend's Big-eared Bat	Golden Eagle	Grasshopper Sparrow	American Badger	American Wigeon

Ring-necked Duck	Pectoral Sandpiper	Cliff Swallow	Western Tanager	Pine Siskin
Greater Scaup	Dunlin	Barn Swallow	Black-headed Grosbeak	American Goldfinch
Lesser Scaup	Long-billed Dowitcher	Blue Jay	Lazuli Bunting	Evening Grosbeak
White-winged Scoter	Common Snipe	Black-billed Magpie	Spotted Towhee	Masked Shrew
Common Goldeneye	Wilson's Phalarope	American Crow	American Tree Sparrow	Dusky Or Montane Shrew
Bufflehead	Red-necked Phalarope	Black-capped Chickadee	Chipping Sparrow	Little Brown Myotis
Common Merganser	Ring-billed Gull	Red-breasted Nuthatch	Vesper Sparrow	Desert Cottontail
Red-breasted Merganser	California Gull	Rock Wren	Lark Sparrow	Yellow-bellied Marmot
Ruddy Duck	Herring Gull	House Wren	Savannah Sparrow	Richardson's Ground Squirrel
Osprey	Mourning Dove	Marsh Wren	Song Sparrow	Thirteen-lined Ground Squirrel
Red-tailed Hawk	Eastern Screech-owl	Ruby-crowned Kinglet	Lincoln's Sparrow	Eastern Fox Squirrel
Rough-legged Hawk	Great Horned Owl	Mountain Bluebird	Swamp Sparrow	Northern Pocket Gopher
American Kestrel	Snowy Owl	Townsend's Solitaire	White-throated Sparrow	American Beaver
Virginia Rail	Short-eared Owl	Swainson's Thrush	White-crowned Sparrow	Western Harvest Mouse
Sora	Common Nighthawk	American Robin	Harris' Sparrow	Deer Mouse
American Coot	Belted Kingfisher	Gray Catbird	Dark-eyed Junco	Northern Grasshopper Mouse
Lesser Sandhill Crane	Downy Woodpecker	Brown Thrasher	Lapland Longspur	Bushy-tailed Woodrat
Killdeer	Hairy Woodpecker	American Pipit	Chestnut-collared Longspur	Southern Red-backed Vole
Black-necked Stilt	Northern Flicker	Bohemian Waxwing	Bobolink	Meadow Vole
American Avocet	Western Wood-pewee	Cedar Waxwing	Red-winged Blackbird	Montane Vole
Greater Yellowlegs	Willow Flycatcher	Northern Shrike	Western Meadowlark	Long-tailed Vole
Lesser Yellowlegs	Least Flycatcher	Red-eyed Vireo	Yellow-headed Blackbird	Prairie Vole
Solitary Sandpiper	Say's Phoebe	Orange-crowned Warbler	Rusty Blackbird	Muskrat
Willet	Western Kingbird	Yellow Warbler	Brewer's Blackbird	Western Jumping Mouse
Spotted Sandpiper	Eastern Kingbird	Yellow-rumped Warbler	Common Grackle	Common Porcupine
Semipalmated Sandpiper	Horned Lark	Ovenbird	Brown-headed Cowbird	Coyote
Western Sandpiper	Tree Swallow	Northern Waterthrush	Cassin's Finch	Red Fox
Least Sandpiper	Violet-green Swallow	Macgillivray's Warbler	House Finch	Black Bear
White-rumped Sandpiper	Northern Rough-winged Swallow	Common Yellowthroat	Red Crossbill	Long-tailed Weasel
Baird's Sandpiper	Bank Swallow	Wilson's Warbler	Common Redpoll	Mink

Striped Skunk	Stilt Sandpiper
Bobcat	Short-billed Dowitcher
Wapiti Or Elk	Bonaparte's Gull
Mule Deer	Glaucous Gull
White-tailed Deer	Rock Dove
Moose	Band-tailed Pigeon
Pronghorn	Ruby-throated Hummingbird
	Gray-cheeked Thrush
TIER IV: 39	European Starling
Red-throated Loon	Magnolia Warbler
Pacific Loon	Cape May Warbler
Least Bittern	Palm Warbler
Snowy Egret	Blackpoll Warbler
Greater White-fronted Goose	Mourning Warbler
American Black Duck	Canada Warbler
Eurasian Wigeon	Rose-breasted Grosbeak
Long Tailed Duck	Purple Finch
Gray Partridge	House Sparrow
Ring-necked Pheasant	House Mouse
Wild Turkey	Common Raccoon
Black-bellied Plover	
American Golden-plover	
Semipalmated Plover	
Whimbrel	
Hudsonian Godwit	
Ruddy Turnstone	
Red Knot	
Sanderling	

Table 28. Montana Sedimentary Plains Focus Area—Species Associations

TOTAL: 346	Black-footed Ferret	Ferruginous Hawk	American Redstart	White-tailed Jackrabbit
	Canada Lynx	Golden Eagle	Yellow-breasted Chat	Ord's Kangaroo Rat
Group Breakdown	American Bison	Merlin	Indigo Bunting	Hispid Pocket Mouse
Amphibians: 7		Peregrine Falcon	Dickcissel	White-footed Mouse
Birds: 258	**TIER II: 85**	Prairie Falcon	Clay-colored Sparrow	Sagebrush Vole
Mammals: 68	Tiger Salamander	Blue Grouse	Brewer's Sparrow	Swift Fox
Reptiles: 13	Great Plains Toad	Greater Sandhill Crane	Field Sparrow	Least Weasel
	Woodhouse's Toad	Upland Sandpiper	Lark Bunting	American Badger
TIER I: 21	Plains Spadefoot	Marbled Godwit	Baird's Sparrow	Northern River Otter
Northern Leopard Frog	Short-horned Lizard	Franklin's Gull	Grasshopper Sparrow	
Snapping Turtle	Sagebrush Lizard	Caspian Tern	Mccown's Longspur	**TIER III: 201**
Spiny Softshell	Common Garter Snake	Common Tern	Baltimore Oriole	Boreal Chorus Frog
Western Hog-nosed Snake	Western Rattlesnake	Forster's Tern	Bullock's Oriole	Painted Turtle
Milksnake	Horned Grebe	Black-billed Cuckoo	Preble's Shrew	Racer
Common Loon	Western Grebe	Northern Pygmy-owl	Dwarf Shrew	Gopher Snake
Bald Eagle	American Bittern	Northern Saw-whet Owl	Merriam's Shrew	Western Terrestrial Garter Snake
Greater Sage-Grouse	Black-crowned Night-heron	Red-headed Woodpecker	Hayden's Shrew	Plains Garter Snake
Whooping Crane	White-faced Ibis	Cassin's Kingbird	Yuma Myotis	Pied-billed Grebe
Mountain Plover	Canvasback	Pinyon Jay	Long-eared Myotis	Eared Grebe
Long-billed Curlew	Redhead	White-breasted Nuthatch	Long-legged Myotis	Clark's Grebe
Interior Least Tern	Hooded Merganser	Pygmy Nuthatch	Western Small-footed Myotis	American White Pelican
Black Tern	Turkey Vulture	Canyon Wren	Silver-haired Bat	Double-crested Cormorant
Burrowing Owl	Northern Harrier	Eastern Bluebird	Big Brown Bat	Great Blue Heron
Spotted Bat	Sharp-shinned Hawk	Veery	Eastern Red Bat	Cattle Egret
Townsend's Big-eared Bat	Cooper's Hawk	Sprague's Pipit	Hoary Bat	Tundra Swan
Black-tailed Prairie Dog	Northern Goshawk	Loggerhead Shrike	Eastern Cottontail	Snow Goose
Meadow Jumping Mouse	Swainson's Hawk	Black-and-white Warbler	Mountain Cottontail	Ross' Goose

Canada Goose	Killdeer	Common Poorwill	House Wren	Chipping Sparrow
Wood Duck	Black-necked Stilt	Chimney Swift	Marsh Wren	Vesper Sparrow
Green-winged Teal	American Avocet	White-throated Swift	Ruby-crowned Kinglet	Lark Sparrow
Mallard	Greater Yellowlegs	Belted Kingfisher	Mountain Bluebird	Savannah Sparrow
Northern Pintail	Lesser Yellowlegs	Red-naped Sapsucker	Townsend's Solitaire	Song Sparrow
Blue-winged Teal	Solitary Sandpiper	Downy Woodpecker	Swainson's Thrush	Lincoln's Sparrow
Cinnamon Teal	Willet	Hairy Woodpecker	American Robin	Swamp Sparrow
Northern Shoveler	Spotted Sandpiper	Northern Flicker	Gray Catbird	White-throated Sparrow
Gadwall	Semipalmated Sandpiper	Western Wood-pewee	Sage Thrasher	White-crowned Sparrow
American Wigeon	Western Sandpiper	Willow Flycatcher	Brown Thrasher	Harris' Sparrow
Ring-necked Duck	Least Sandpiper	Least Flycatcher	American Pipit	Dark-eyed Junco
Lesser Scaup	White-rumped Sandpiper	Dusky Flycatcher	Bohemian Waxwing	Lapland Longspur
White-winged Scoter	Baird's Sandpiper	Say's Phoebe	Cedar Waxwing	Chestnut-collared Longspur
Common Goldeneye	Pectoral Sandpiper	Western Kingbird	Northern Shrike	Bobolink
Barrow's Goldeneye	Dunlin	Eastern Kingbird	Warbling Vireo	Red-winged Blackbird
Bufflehead	Long-billed Dowitcher	Horned Lark	Red-eyed Vireo	Western Meadowlark
Common Merganser	Common Snipe	Tree Swallow	Orange-crowned Warbler	Yellow-headed Blackbird
Red-breasted Merganser	Wilson's Phalarope	Violet-green Swallow	Nashville Warbler	Rusty Blackbird
Ruddy Duck	Red-necked Phalarope	Northern Rough-winged Swallow	Yellow Warbler	Brewer's Blackbird
Osprey	Ring-billed Gull	Bank Swallow	Yellow-rumped Warbler	Common Grackle
Red-tailed Hawk	California Gull	Cliff Swallow	Ovenbird	Brown-headed Cowbird
Rough-legged Hawk	Herring Gull	Barn Swallow	Northern Waterthrush	Orchard Oriole
American Kestrel	Mourning Dove	Blue Jay	Macgillivray's Warbler	Cassin's Finch
Gyrfalcon	Eastern Screech-owl	Clark's Nutcracker	Common Yellowthroat	House Finch
Ruffed Grouse	Great Horned Owl	Black-billed Magpie	Wilson's Warbler	Red Crossbill
Sharp-tailed Grouse	Snowy Owl	American Crow	Western Tanager	Common Redpoll
Virginia Rail	Northern Hawk Owl	Black-capped Chickadee	Black-headed Grosbeak	Pine Siskin
Sora	Long-eared Owl	Mountain Chickadee	Lazuli Bunting	American Goldfinch
American Coot	Short-eared Owl	Red-breasted Nuthatch	Spotted Towhee	Evening Grosbeak
Lesser Sandhill Crane	Common Nighthawk	Rock Wren	American Tree Sparrow	Masked Shrew

Dusky Or Montane Shrew	Wapiti Or Elk	Buff-breasted Sandpiper
Water Shrew	Mule Deer	Short-billed Dowitcher
Little Brown Myotis	White-tailed Deer	Red Phalarope
Desert Cottontail	Moose	Bonaparte's Gull
Least Chipmunk	Pronghorn	Rock Dove
Yellow-pine Chipmunk		Scissor-tailed Flycatcher
Yellow-bellied Marmot	**TIER IV: 39**	Gray-cheeked Thrush
Richardson's Ground Squirrel	Bullfrog	Northern Mockingbird
Thirteen-lined Ground Squirrel	Great Egret	European Starling
Eastern Fox Squirrel	Snowy Egret	Magnolia Warbler
Red Squirrel	Little Blue Heron	Blackpoll Warbler
Northern Pocket Gopher	Green Heron	Rose-breasted Grosbeak
American Beaver	Wood Stork	Purple Finch
Western Harvest Mouse	Greater White-fronted Goose	House Sparrow
Deer Mouse	Brant	House Mouse
Northern Grasshopper Mouse	American Black Duck	Common Raccoon
Bushy-tailed Woodrat	Long Tailed Duck	
Meadow Vole	Surf Scoter	
Long-tailed Vole	Broad-winged Hawk	
Prairie Vole	Gray Partridge	
Muskrat	Ring-necked Pheasant	
Western Jumping Mouse	Wild Turkey	
Common Porcupine	Black-bellied Plover	
Coyote	American Golden-plover	
Red Fox	Semipalmated Plover	
Black Bear	Whimbrel	
Long-tailed Weasel	Hudsonian Godwit	
Mink	Red Knot	
Striped Skunk	Sanderling	
Bobcat	Stilt Sandpiper	

Table 29. Lower Missouri River Focus Area—Species Associations

TOTAL: 55	Fatmucket	TIER IV: 15
Group Breakdown Crayfish: 2 Mussels: 3 Fish: 50	Giant Floater Shovelnose Sturgeon Goldeye Lake Whitefish Mountain Whitefish Lake Chub	Cisco Chinook Salmon Rainbow Trout Brown Trout Lake Trout Rainbow Smelt
TIER I: 9	Brassy Minnow	Northern Pike
Pallid Sturgeon Paddlefish Shortnose Gar Sturgeon Chub Sicklefin Chub Pearl Dace Blue Sucker Burbot Sauger	Plains Minnow Emerald Shiner Sand Shiner Northern Redbelly Dace Fathead Minnow Longnose Dace Creek Chub Flathead Chub River Carpsucker Longnose Sucker	Common Carp Spottail Shiner Black Bullhead Smallmouth Bass Largemouth Bass White Crappie Yellow Perch Walleye
TIER II: 4	White Sucker	
Black Sandshell Northern Redbelly X Finescale Dace Bigmouth Buffalo Freshwater Drum	Smallmouth Buffalo Shorthead Redhorse Channel Catfish Stonecat Brook Stickleback	
TIER: 27	Iowa Darter	
Calico Crayfish Virile Crayfish		

Table 30. Lower Yellowstone River Focus Area—Species Associations

TOTAL: 65	Fatmucket	TIER IV: 24
	Giant Floater	Cisco
Group Breakdown	Shovelnose Sturgeon	Rainbow Trout
Crayfish: 1	Goldeye	Brown Trout
Mussels: 3	Mountain Whitefish	Brook Trout
Fish: 60	Lake Chub	Rainbow Smelt
	Western Silvery Minnow	Northern Pike
TIER I: 9	Brassy Minnow	Common Carp
Pallid Sturgeon	Plains Minnow	Golden Shiner
Paddlefish	Emerald Shiner	Spottail Shiner
Shortnose Gar	Sand Shiner	Black Bullhead
Sturgeon Chub	Northern Redbelly Dace	Yellow Bullhead
Sicklefin Chub	Fathead Minnow	Rock Bass
Pearl Dace	Longnose Dace	Plains Killifish
Blue Sucker	Creek Chub	Sailfin Molly
Burbot	Flathead Chub	White Bass
Sauger	River Carpsucker	Green Sunfish
	Longnose Sucker	Pumpkinseed
	White Sucker	Bluegill
TIER II: 4	Mountain Sucker	Smallmouth Bass
Black Sandshell	Smallmouth Buffalo	Largemouth Bass
Northern Redbelly X Finescale Dace	Shorthead Redhorse	White Crappie
Bigmouth Buffalo	Channel Catfish	Black Crappie
Freshwater Drum	Stonecat	Yellow Perch
	Brook Stickleback	Walleye
TIER III: 27	Iowa Darter	
Virile Crayfish		

Table 31. Powder River Focus Area—Species Associations

TOTAL: 38	Flathead Chub
Group Breakdown Crayfish: 1 Mussels: 1 Fish: 36	River Carpsucker Longnose Sucker White Sucker Smallmouth Buffalo Shorthead Redhorse Channel Catfish
TIER I: 3	Stonecat
Sturgeon Chub Burbot Sauger	Brook Stickleback Iowa Darter
	TIER IV: 13
TIER III: 22	Rainbow Trout
Virile Crayfish Fatmucket Shovelnose Sturgeon Goldeye Lake Chub Western Silvery Minnow Brassy Minnow Plains Minnow Sand Shiner Fathead Minnow Longnose Dace Creek Chub	Brown Trout Brook Trout Northern Pike Common Carp Black Bullhead Yellow Bullhead Plains Killifish Green Sunfish Bluegill Largemouth Bass White Crappie Walleye

Table 32. Tongue River Focus Area—Species Associations

TOTAL: 49
Group Breakdown Crayfish: 1 Mussels: 1 Fish: 47
TIER I: 5
Paddlefish
Sturgeon Chub
Blue Sucker
Burbot
Sauger
TIER II: 1
Bigmouth Buffalo
TIER III: 23
Virile Crayfish
Fatmucket
Shovelnose Sturgeon
Mountain Whitefish
Goldeye
Lake Chub
Western Silvery Minnow
Brassy Minnow
Plains Minnow
Emerald Shiner
Sand Shiner
Fathead Minnow
Longnose Dace
Creek Chub
Flathead Chub
River Carpsucker
Longnose Sucker
White Sucker
Mountain Sucker
Smallmouth Buffalo
Shorthead Redhorse
Channel Catfish
Stonecat
TIER IV: 20
Rainbow Trout
Brown Trout
Brook Trout
Northern Pike
Common Carp
Golden Shiner
Spottail Shiner
Black Bullhead
Yellow Bullhead
White Bass
Rock Bass
Green Sunfish
Pumpkinseed
Bluegill
Smallmouth Bass
Largemouth Bass
White Crappie
Black Crappie
Yellow Perch
Walleye

Table 33. Bighorn Intermontane Basin Focus Area—Species Associations

TOTAL: 174	Plains Spadefoot	Long-legged Myotis	Northern Shoveler	Snowy Owl
	Short-horned Lizard	Western Small-footed Myotis	Gadwall	Long-eared Owl
Group Breakdown	Sagebrush Lizard	Mountain Cottontail	American Wigeon	Short-eared Owl
Amphibians: 5	Western Rattlesnake	Olive-backed Pocket Mouse	Canvasback	Common Nighthawk
Birds: 117	Northern Harrier	Ord's Kangaroo Rat	Redhead	Calliope Hummingbird
Mammals: 43	Ferruginous Hawk	Sagebrush Vole	Ring-necked Duck	Belted Kingfisher
Reptiles: 9	Rough-legged Hawk	American Badger	Lesser Scaup	Northern Flicker
	Golden Eagle		Common Goldeneye	Say's Phoebe
TIER I: 14	Merlin	**TIER III: 108**	Barrow's Goldeneye	Eastern Kingbird
Northern Leopard Frog	Peregrine Falcon	Boreal Chorus Frog	Bufflehead	Horned Lark
Western Hog-nosed Snake	Gyrfalcon	Painted Turtle	Common Merganser	Violet-green Swallow
Milksnake	Prairie Falcon	Racer	Ruddy Duck	Bank Swallow
Bald Eagle	Canyon Wren	Gopher Snake	Turkey Vulture	Cliff Swallow
Greater Sage-Grouse	Blue-gray Gnatcatcher	Plains Garter Snake	Red-tailed Hawk	Barn Swallow
Mountain Plover	Loggerhead Shrike	Eared Grebe	American Kestrel	Pinyon Jay
Long-billed Curlew	Black-and-white Warbler	Western Grebe	Sharp-tailed Grouse	Black-billed Magpie
Burrowing Owl	Yellow-breasted Chat	American White Pelican	American Coot	American Crow
Spotted Bat	Indigo Bunting	Double-crested Cormorant	American Coot	Common Raven
Pallid Bat	Green-tailed Towhee	Great Blue Heron	Greater Sandhill Crane	Mountain Chickadee
Black-tailed Prairie Dog	Clay-colored Sparrow	Tundra Swan	Killdeer	Rock Wren
White-tailed Prairie Dog	Brewer's Sparrow	Snow Goose	American Avocet	House Wren
Gray Wolf	Bullock's Oriole	Canada Goose	Dunlin	Mountain Bluebird
Black-footed Ferret	Preble's Shrew	Green-winged Teal	Common Snipe	American Robin
	Dwarf Shrew	Mallard	Wilson's Phalarope	Gray Catbird
TIER II: 36	Merriam's Shrew	Northern Pintail	California Gull	Sage Thrasher
Tiger Salamander	Yuma Myotis	Blue-winged Teal	Mourning Dove	Bohemian Waxwing
Woodhouse's Toad	Long-eared Myotis	Cinnamon Teal	Great Horned Owl	Cedar Waxwing

Northern Shrike	Bobcat
Spotted Towhee	Mountain Lion
Vesper Sparrow	Wapiti or Elk
Lark Sparrow	Mule Deer
Savannah Sparrow	White-tailed Deer
Lapland Longspur	Pronghorn
Bobolink	
Red-winged Blackbird	**TIER IV: 16**
Western Meadowlark	Greater White-fronted Goose
Yellow-headed Blackbird	American Black Duck
Brewer's Blackbird	Long Tailed Duck
Common Grackle	Broad-winged Hawk
House Finch	Chukar
Common Redpoll	Ring-necked Pheasant
Dusky Or Montane Shrew	Wild Turkey
Desert Cottontail	Rock Dove
Least Chipmunk	Northern Mockingbird
Thirteen-lined Ground Squirrel	European Starling
Northern Pocket Gopher	Pine Warbler
American Beaver	Palm Warbler
Western Harvest Mouse	House Sparrow
Deer Mouse	Eastern Fox Squirrel
Northern Grasshopper Mouse	House Mouse
Meadow Vole	Common Raccoon
Muskrat	
Common Porcupine	
Coyote	
Red Fox	
Black Bear	
Striped Skunk	

Table 34. Montana Glaciated Plains Focus Area—Species Associations

TOTAL: 364	Black-tailed Prairie Dog	Swainson's Hawk	American Redstart	Eastern Red Bat
	Black-footed Ferret	Ferruginous Hawk	Yellow-breasted Chat	Hoary Bat
Group Breakdown	American Bison	Golden Eagle	Indigo Bunting	Mountain Cottontail
Amphibians: 6		Merlin	Dickcissel	White-tailed Jackrabbit
Birds: 278	**TIER II: 88**	Peregrine Falcon	Green-tailed Towhee	Olive-backed Pocket Mouse
Mammals: 67	Tiger Salamander	Prairie Falcon	Clay-colored Sparrow	Ord's Kangaroo Rat
Reptiles: 13	Great Plains Toad	Greater Sandhill Crane	Brewer's Sparrow	White-footed Mouse
	Woodhouse's Toad	Upland Sandpiper	Field Sparrow	Sagebrush Vole
TIER I: 21	Plains Spadefoot	Marbled Godwit	Lark Bunting	Swift Fox
Northern Leopard Frog	Short-horned Lizard	Franklin's Gull	Baird's Sparrow	Least Weasel
Spiny Softshell	Sagebrush Lizard	Caspian Tern	Grasshopper Sparrow	American Badger
Snapping Turtle	Common Garter Snake	Common Tern	Le Conte's Sparrow	Northern River Otter
Western Hog-nosed Snake	Western Rattlesnake	Forster's Tern	Mccown's Longspur	
Milksnake	Horned Grebe	Black-billed Cuckoo	Baltimore Oriole	**TIER III: 200**
Common Loon	Red-necked Grebe	Northern Saw-whet Owl	Bullock's Oriole	Boreal Chorus Frog
Bald Eagle	Western Grebe	Lewis' Woodpecker	Preble's Shrew	Painted Turtle
Greater Sage-Grouse	American Bittern	Red-headed Woodpecker	Vagrant Shrew	Racer
Yellow Rail	Black-crowned Night-heron	Alder Flycatcher	Merriam's Shrew	Gopher Snake
Whooping Crane	White-faced Ibis	Cassin's Kingbird	Hayden's Shrew	Western Terrestrial Garter Snake
Piping Plover	Canvasback	Pinyon Jay	Yuma Myotis	Plains Garter Snake
Mountain Plover	Redhead	White-breasted Nuthatch	Long-eared Myotis	Pied-billed Grebe
Long-billed Curlew	Hooded Merganser	Eastern Bluebird	Fringed Myotis	Eared Grebe
Interior Least Tern	Turkey Vulture	Western Bluebird	Long-legged Myotis	Clark's Grebe
Black Tern	Northern Harrier	Veery	Western Small-footed Myotis	American White Pelican
Burrowing Owl	Sharp-shinned Hawk	Sprague's Pipit	Northern Myotis	Double-crested Cormorant
Spotted Bat	Cooper's Hawk	Loggerhead Shrike	Silver-haired Bat	Great Blue Heron
Townsend's Big-eared Bat	Northern Goshawk	Black-and-white Warbler	Big Brown Bat	Cattle Egret

Tundra Swan	Sora	Short-eared Owl	Red-breasted Nuthatch	Spotted Towhee
Snow Goose	American Coot	Common Nighthawk	Rock Wren	American Tree Sparrow
Ross' Goose	Lesser Sandhill Crane	Common Poorwill	House Wren	Chipping Sparrow
Canada Goose	Killdeer	Chimney Swift	Marsh Wren	Vesper Sparrow
Wood Duck	Black-necked Stilt	White-throated Swift	Ruby-crowned Kinglet	Lark Sparrow
Green-winged Teal	American Avocet	Belted Kingfisher	Mountain Bluebird	Savannah Sparrow
Mallard	Greater Yellowlegs	Red-naped Sapsucker	Townsend's Solitaire	Song Sparrow
Northern Pintail	Lesser Yellowlegs	Downy Woodpecker	Swainson's Thrush	Lincoln's Sparrow
Blue-winged Teal	Solitary Sandpiper	Hairy Woodpecker	Hermit Thrush	Swamp Sparrow
Cinnamon Teal	Willet	Northern Flicker	American Robin	White-throated Sparrow
Northern Shoveler	Spotted Sandpiper	Western Wood-pewee	Gray Catbird	White-crowned Sparrow
Gadwall	Semipalmated Sandpiper	Willow Flycatcher	Sage Thrasher	Harris' Sparrow
American Wigeon	Western Sandpiper	Least Flycatcher	Brown Thrasher	Dark-eyed Junco
Ring-necked Duck	Least Sandpiper	Dusky Flycatcher	American Pipit	Lapland Longspur
Greater Scaup	White-rumped Sandpiper	Cordilleran Flycatcher	Bohemian Waxwing	Chestnut-collared Longspur
Lesser Scaup	Baird's Sandpiper	Say's Phoebe	Cedar Waxwing	Bobolink
White-winged Scoter	Pectoral Sandpiper	Western Kingbird	Northern Shrike	Red-winged Blackbird
Common Goldeneye	Dunlin	Eastern Kingbird	Warbling Vireo	Western Meadowlark
Barrow's Goldeneye	Long-billed Dowitcher	Horned Lark	Red-eyed Vireo	Yellow-headed Blackbird
Bufflehead	Common Snipe	Tree Swallow	Orange-crowned Warbler	Rusty Blackbird
Common Merganser	Wilson's Phalarope	Violet-green Swallow	Yellow Warbler	Brewer's Blackbird
Red-breasted Merganser	Red-necked Phalarope	Northern Rough-winged Swallow	Yellow-rumped Warbler	Common Grackle
Ruddy Duck	Ring-billed Gull	Bank Swallow	Ovenbird	Brown-headed Cowbird
Osprey	California Gull	Cliff Swallow	Northern Waterthrush	Purple Finch
Red-tailed Hawk	Herring Gull	Barn Swallow	Macgillivray's Warbler	Cassin's Finch
Rough-legged Hawk	Mourning Dove	Blue Jay	Common Yellowthroat	House Finch
American Kestrel	Eastern Screech-owl	Black-billed Magpie	Wilson's Warbler	Red Crossbill
Ruffed Grouse	Great Horned Owl	American Crow	Western Tanager	Common Redpoll
Sharp-tailed Grouse	Snowy Owl	Black-capped Chickadee	Black-headed Grosbeak	Pine Siskin
Virginia Rail	Long-eared Owl	Mountain Chickadee	Lazuli Bunting	American Goldfinch

Evening Grosbeak	Striped Skunk	Red Knot	Golden-crowned Sparrow
Masked Shrew	Bobcat	Sanderling	House Sparrow
Dusky Or Montane Shrew	Wapiti Or Elk	Curlew Sandpiper	House Mouse
Water Shrew	Mule Deer	Stilt Sandpiper	Common Raccoon
Little Brown Myotis	White-tailed Deer	Buff-breasted Sandpiper	
Desert Cottontail	Moose	Short-billed Dowitcher	
Snowshoe Hare	Pronghorn	Red Phalarope	
Least Chipmunk		Bonaparte's Gull	
Yellow-bellied Marmot	**TIER IV: 55**	Mew Gull	
Richardson's Ground Squirrel	Least Bittern	Thayer's Gull	
Thirteen-lined Ground Squirrel	Great Egret	Glaucous-winged Gull	
Red Squirrel	Snowy Egret	Glaucous Gull	
Northern Pocket Gopher	Green Heron	Arctic Tern	
American Beaver	Yellow-crowned Night-heron	Rock Dove	
Western Harvest Mouse	Greater White-fronted Goose	Band-tailed Pigeon	
Deer Mouse	American Black Duck	Barn Owl	
Northern Grasshopper Mouse	Long Tailed Duck	Ruby-throated Hummingbird	
Bushy-tailed Woodrat	Eurasian Wigeon	Red-bellied Woodpecker	
Meadow Vole	Black Scoter	Eastern Wood-pewee	
Montane Vole	Surf Scoter	Gray-cheeked Thrush	
Long-tailed Vole	Broad-winged Hawk	Northern Mockingbird	
Prairie Vole	Gray Partridge	European Starling	
Muskrat	Ring-necked Pheasant	Magnolia Warbler	
Common Porcupine	Wild Turkey	Cape May Warbler	
Coyote	Black-bellied Plover	Blackpoll Warbler	
Red Fox	American Golden-plover	Mourning Warbler	
Black Bear	Semipalmated Plover	Hooded Warbler	
Ermine	Whimbrel	Canada Warbler	
Long-tailed Weasel	Hudsonian Godwit	Scarlet Tanager	
Mink	Ruddy Turnstone	Rose-breasted Grosbeak	

Table 35. Montana Shale Plains Focus Area—Species Associations

TOTAL: 307	TIER II: 76	Greater Sandhill Crane	Baltimore Oriole	Racer
	Tiger Salamander	Upland Sandpiper	Bullock's Oriole	Gopher Snake
Group Breakdown	Great Plains Toad	Marbled Godwit	Preble's Shrew	Western Terrestrial Garter Snake
Amphibians: 6	Woodhouse's Toad	Franklin's Gull	Dwarf Shrew	Plains Garter Snake
Birds: 230	Plains Spadefoot	Caspian Tern	Merriam's Shrew	Pied-billed Grebe
Mammals: 59	Short-horned Lizard	Common Tern	Hayden's Shrew	Eared Grebe
Reptiles: 12	Sagebrush Lizard	Forster's Tern	Yuma Myotis	American White Pelican
	Common Garter Snake	Black-billed Cuckoo	Long-eared Myotis	Double-crested Cormorant
TIER I: 18	Western Rattlesnake	Northern Saw-whet Owl	Long-legged Myotis	Great Blue Heron
Northern Leopard Frog	Western Grebe	Lewis' Woodpecker	Western Small-footed Myotis	Tundra Swan
Spiny Softshell	American Bittern	Red-headed Woodpecker	Silver-haired Bat	Snow Goose
Western Hog-nosed Snake	Black-crowned Night-heron	Pinyon Jay	Big Brown Bat	Ross' Goose
Milksnake	White-faced Ibis	White-breasted Nuthatch	Eastern Red Bat	Canada Goose
Common Loon	Canvasback	Pygmy Nuthatch	Hoary Bat	Wood Duck
Bald Eagle	Redhead	Veery	Mountain Cottontail	Green-winged Teal
Greater Sage-Grouse	Hooded Merganser	Sprague's Pipit	White-tailed Jackrabbit	Mallard
Whooping Crane	Turkey Vulture	Loggerhead Shrike	Olive-backed Pocket Mouse	Northern Pintail
Mountain Plover	Northern Harrier	American Redstart	Ord's Kangaroo Rat	Blue-winged Teal
Long-billed Curlew	Sharp-shinned Hawk	Yellow-breasted Chat	White-footed Mouse	Cinnamon Teal
Black Tern	Cooper's Hawk	Dickcissel	Sagebrush Vole	Northern Shoveler
Burrowing Owl	Northern Goshawk	Clay-colored Sparrow	Swift Fox	Gadwall
Townsend's Big-eared Bat	Swainson's Hawk	Brewer's Sparrow	American Badger	American Wigeon
Black-tailed Prairie Dog	Ferruginous Hawk	Field Sparrow	Northern River Otter	Ring-necked Duck
Meadow Jumping Mouse	Golden Eagle	Lark Bunting		Lesser Scaup
Black-footed Ferret	Merlin	Baird's Sparrow	**TIER III: 185**	White-winged Scoter
Canada Lynx	Peregrine Falcon	Grasshopper Sparrow	Boreal Chorus Frog	Common Goldeneye
American Bison	Prairie Falcon	Mccown's Longspur	Painted Turtle	Barrow's Goldeneye

Bufflehead	Common Snipe	Bank Swallow	Yellow-rumped Warbler	House Finch
Common Merganser	Wilson's Phalarope	Cliff Swallow	Ovenbird	Red Crossbill
Red-breasted Merganser	Red-necked Phalarope	Barn Swallow	Northern Waterthrush	Common Redpoll
Ruddy Duck	Ring-billed Gull	Blue Jay	Macgillivray's Warbler	Pine Siskin
Osprey	California Gull	Clark's Nutcracker	Common Yellowthroat	American Goldfinch
Red-tailed Hawk	Herring Gull	Black-billed Magpie	Wilson's Warbler	Evening Grosbeak
Rough-legged Hawk	Mourning Dove	American Crow	Western Tanager	Masked Shrew
American Kestrel	Eastern Screech-owl	Black-capped Chickadee	Black-headed Grosbeak	Little Brown Myotis
Gyrfalcon	Great Horned Owl	Mountain Chickadee	Lazuli Bunting	Desert Cottontail
Ruffed Grouse	Snowy Owl	Red-breasted Nuthatch	Spotted Towhee	Least Chipmunk
Sharp-tailed Grouse	Long-eared Owl	Rock Wren	American Tree Sparrow	Yellow-bellied Marmot
Virginia Rail	Short-eared Owl	House Wren	Chipping Sparrow	Richardson's Ground Squirrel
Sora	Common Nighthawk	Marsh Wren	Vesper Sparrow	Thirteen-lined Ground Squirrel
American Coot	Common Poorwill	Ruby-crowned Kinglet	Lark Sparrow	Eastern Fox Squirrel
Lesser Sandhill Crane	White-throated Swift	Mountain Bluebird	Savannah Sparrow	Red Squirrel
Killdeer	Belted Kingfisher	Townsend's Solitaire	Song Sparrow	Northern Pocket Gopher
Black-necked Stilt	Downy Woodpecker	Swainson's Thrush	Lincoln's Sparrow	American Beaver
American Avocet	Hairy Woodpecker	Hermit Thrush	White-throated Sparrow	Western Harvest Mouse
Greater Yellowlegs	Northern Flicker	American Robin	White-crowned Sparrow	Deer Mouse
Lesser Yellowlegs	Western Wood-pewee	Gray Catbird	Harris' Sparrow	Northern Grasshopper Mouse
Solitary Sandpiper	Willow Flycatcher	Sage Thrasher	Dark-eyed Junco	Bushy-tailed Woodrat
Willet	Least Flycatcher	Brown Thrasher	Lapland Longspur	Meadow Vole
Spotted Sandpiper	Dusky Flycatcher	American Pipit	Chestnut-collared Longspur	Long-tailed Vole
Semipalmated Sandpiper	Say's Phoebe	Bohemian Waxwing	Bobolink	Prairie Vole
Western Sandpiper	Western Kingbird	Cedar Waxwing	Red-winged Blackbird	Muskrat
Least Sandpiper	Eastern Kingbird	Northern Shrike	Western Meadowlark	Common Porcupine
Baird's Sandpiper	Horned Lark	Warbling Vireo	Yellow-headed Blackbird	Coyote
Pectoral Sandpiper	Tree Swallow	Red-eyed Vireo	Brewer's Blackbird	Red Fox
Dunlin	Violet-green Swallow	Orange-crowned Warbler	Common Grackle	Long-tailed Weasel
Long-billed Dowitcher	Northern Rough-winged Swallow	Yellow Warbler	Brown-headed Cowbird	Mink

Striped Skunk	Rock Dove
Bobcat	Gray-cheeked Thrush
Wapiti Or Elk	Northern Mockingbird
Mule Deer	European Starling
White-tailed Deer	Blackpoll Warbler
Pronghorn	Rose-breasted Grosbeak
	House Sparrow
TIER IV: 28	House Mouse
Great Egret	Common Raccoon
Snowy Egret	
Greater White-fronted Goose	
Brant	
Eurasian Wigeon	
Long Tailed Duck	
Broad-winged Hawk	
Gray Partridge	
Ring-necked Pheasant	
Wild Turkey	
Black-bellied Plover	
Semipalmated Plover	
Whimbrel	
Hudsonian Godwit	
Red Knot	
Sanderling	
Stilt Sandpiper	
Buff-breasted Sandpiper	
Bonaparte's Gull	

Table 36. Powder River Basin/Breaks/Scoria Hills Focus Area—Species Associations

TOTAL: 299	American Bison	Peregrine Falcon	Green-tailed Towhee	American Badger
		Prairie Falcon	Brewer's Sparrow	Northern River Otter
Group Breakdown	**TIER II: 80**	Blue Grouse	Field Sparrow	
Amphibians: 6	Tiger Salamander	Greater Sandhill Crane	Lark Bunting	**TIER III: 177**
Birds: 219	Great Plains Toad	Upland Sandpiper	Grasshopper Sparrow	Boreal Chorus Frog
Mammals: 61	Woodhouse's Toad	Franklin's Gull	Le Conte's Sparrow	Painted Turtle
Reptiles: 13	Plains Spadefoot	Caspian Tern	Mccown's Longspur	Racer
	Short-horned Lizard	Common Tern	Bullock's Oriole	Gopher Snake
TIER I: 19	Sagebrush Lizard	Forster's Tern	Preble's Shrew	Western Terrestrial Garter Snake
Northern Leopard Frog	Common Garter Snake	Black-billed Cuckoo	Dwarf Shrew	Plains Garter Snake
Snapping Turtle	Western Rattlesnake	Yellow-billed Cuckoo	Merriam's Shrew	Pied-billed Grebe
Spiny Softshell	Horned Grebe	Northern Saw-whet Owl	Hayden's Shrew	Eared Grebe
Western Hog-nosed Snake	Western Grebe	Lewis' Woodpecker	Yuma Myotis	American White Pelican
Milksnake	American Bittern	Cassin's Kingbird	Long-eared Myotis	Double-crested Cormorant
Common Loon	Black-crowned Night-heron	Pinyon Jay	Long-legged Myotis	Great Blue Heron
Trumpeter Swan	Canvasback	White-breasted Nuthatch	Western Small-footed Myotis	Cattle Egret
Bald Eagle	Redhead	Pygmy Nuthatch	Silver-haired Bat	Tundra Swan
Greater Sage-Grouse	Hooded Merganser	Brown Creeper	Big Brown Bat	Snow Goose
Whooping Crane	Turkey Vulture	Canyon Wren	Eastern Red Bat	Canada Goose
Long-billed Curlew	Northern Harrier	Winter Wren	Hoary Bat	Wood Duck
Black Tern	Sharp-shinned Hawk	Veery	Mountain Cottontail	Green-winged Teal
Burrowing Owl	Cooper's Hawk	Sprague's Pipit	White-tailed Jackrabbit	Mallard
Spotted Bat	Northern Goshawk	Loggerhead Shrike	Olive-backed Pocket Mouse	Northern Pintail
Townsend's Big-eared Bat	Swainson's Hawk	Black-and-white Warbler	Ord's Kangaroo Rat	Blue-winged Teal
Black-tailed Prairie Dog	Ferruginous Hawk	American Redstart	White-footed Mouse	Cinnamon Teal
Meadow Jumping Mouse	Golden Eagle	Yellow-breasted Chat	Sagebrush Vole	Northern Shoveler
Black-footed Ferret	Merlin	Indigo Bunting	Swift Fox	Gadwall

American Wigeon	Long-billed Dowitcher	Tree Swallow	Yellow-rumped Warbler	American Goldfinch
Ring-necked Duck	Common Snipe	Violet-green Swallow	Ovenbird	Evening Grosbeak
Lesser Scaup	Wilson's Phalarope	Northern Rough-winged Swallow	Common Yellowthroat	Masked Shrew
Common Goldeneye	Red-necked Phalarope	Bank Swallow	Wilson's Warbler	Water Shrew
Barrow's Goldeneye	Ring-billed Gull	Cliff Swallow	Western Tanager	Little Brown Myotis
Bufflehead	California Gull	Barn Swallow	Black-headed Grosbeak	Desert Cottontail
Common Merganser	Herring Gull	Blue Jay	Lazuli Bunting	Least Chipmunk
Red-breasted Merganser	Mourning Dove	Clark's Nutcracker	Spotted Towhee	Yellow-bellied Marmot
Ruddy Duck	Eastern Screech-owl	Black-billed Magpie	American Tree Sparrow	Thirteen-lined Ground Squirrel
Osprey	Great Horned Owl	American Crow	Chipping Sparrow	Eastern Fox Squirrel
Red-tailed Hawk	Snowy Owl	Black-capped Chickadee	Vesper Sparrow	Red Squirrel
Rough-legged Hawk	Long-eared Owl	Red-breasted Nuthatch	Lark Sparrow	Northern Pocket Gopher
American Kestrel	Short-eared Owl	Rock Wren	Savannah Sparrow	American Beaver
Gyrfalcon	Common Nighthawk	House Wren	Song Sparrow	Western Harvest Mouse
Ruffed Grouse	Common Poorwill	Marsh Wren	White-crowned Sparrow	Deer Mouse
Virginia Rail	Chimney Swift	Golden-crowned Kinglet	Dark-eyed Junco	Northern Grasshopper Mouse
Sora	White-throated Swift	Ruby-crowned Kinglet	Lapland Longspur	Bushy-tailed Woodrat
American Coot	Belted Kingfisher	Mountain Bluebird	Chestnut-collared Longspur	Southern Red-backed Vole
Lesser Sandhill Crane	Red-naped Sapsucker	Townsend's Solitaire	Bobolink	Meadow Vole
Killdeer	Downy Woodpecker	Swainson's Thrush	Red-winged Blackbird	Long-tailed Vole
American Avocet	Hairy Woodpecker	American Robin	Western Meadowlark	Prairie Vole
Greater Yellowlegs	Northern Flicker	Gray Catbird	Yellow-headed Blackbird	Muskrat
Lesser Yellowlegs	Western Wood-pewee	Sage Thrasher	Brewer's Blackbird	Western Jumping Mouse
Solitary Sandpiper	Willow Flycatcher	Brown Thrasher	Common Grackle	Common Porcupine
Willet	Least Flycatcher	American Pipit	Brown-headed Cowbird	Coyote
Spotted Sandpiper	Dusky Flycatcher	Bohemian Waxwing	Cassin's Finch	Red Fox
Semipalmated Sandpiper	Say's Phoebe	Cedar Waxwing	House Finch	Black Bear
Least Sandpiper	Western Kingbird	Northern Shrike	Red Crossbill	Long-tailed Weasel
Baird's Sandpiper	Eastern Kingbird	Red-eyed Vireo	Common Redpoll	Mink
Pectoral Sandpiper	Horned Lark	Yellow Warbler	Pine Siskin	Striped Skunk

Wapiti Or Elk
Mule Deer
White-tailed Deer
Pronghorn
TIER IV: 23
Greater White-fronted Goose
American Black Duck
Surf Scoter
Broad-winged Hawk
Gray Partridge
Chukar
Ring-necked Pheasant
Wild Turkey
Black-bellied Plover
American Golden-plover
Semipalmated Plover
Whimbrel
Stilt Sandpiper
Rock Dove
Barn Owl
Yellow-bellied Sapsucker
Northern Mockingbird
European Starling
Blackpoll Warbler
Hoary Redpoll
House Sparrow
House Mouse
Common Raccoon

Table 37. Shale Scablands Focus Area—Species Associations

TOTAL: 245	TIER II: 77	Greater Sandhill Crane	Field Sparrow	Painted Turtle
	Tiger Salamander	Upland Sandpiper	Lark Bunting	Racer
Group Breakdown	Great Plains Toad	Franklin's Gull	Baird's Sparrow	Western Terrestrial Garter Snake
Amphibians: 6	Woodhouse's Toad	Forster's Tern	Grasshopper Sparrow	Plains Garter Snake
Birds: 172	Plains Spadefoot	Black-billed Cuckoo	Bullock's Oriole	Pied-billed Grebe
Mammals: 55	Short-horned Lizard	Yellow-billed Cuckoo	Dwarf Shrew	Eared Grebe
Reptiles: 12	Sagebrush Lizard	Northern Saw-whet Owl	Merriam's Shrew	American White Pelican
	Common Garter Snake	Lewis' Woodpecker	Hayden's Shrew	Double-crested Cormorant
TIER I: 17	Western Rattlesnake	Red-headed Woodpecker	Long-eared Myotis	Great Blue Heron
Northern Leopard Frog	Horned Grebe	Cassin's Kingbird	Long-legged Myotis	Canada Goose
Snapping Turtle	Western Grebe	Pinyon Jay	Western Small-footed Myotis	Green-winged Teal
Spiny Softshell	American Bittern	White-breasted Nuthatch	Silver-haired Bat	Mallard
Western Hog-nosed Snake	Black-crowned Night-heron	Pygmy Nuthatch	Big Brown Bat	Northern Pintail
Milksnake	Canvasback	Brown Creeper	Eastern Red Bat	Blue-winged Teal
Common Loon	Redhead	Canyon Wren	Hoary Bat	Cinnamon Teal
Bald Eagle	Hooded Merganser	Winter Wren	Eastern Cottontail	Northern Shoveler
Greater Sage-Grouse	Turkey Vulture	Eastern Bluebird	White-tailed Jackrabbit	Gadwall
Whooping Crane	Northern Harrier	Veery	Olive-backed Pocket Mouse	American Wigeon
Mountain Plover	Sharp-shinned Hawk	Sprague's Pipit	Hispid Pocket Mouse	Ring-necked Duck
Long-billed Curlew	Cooper's Hawk	Loggerhead Shrike	White-footed Mouse	Lesser Scaup
Black Tern	Northern Goshawk	Black-and-white Warbler	Sagebrush Vole	Bufflehead
Burrowing Owl	Swainson's Hawk	American Redstart	Swift Fox	Common Merganser
Townsend's Big-eared Bat	Ferruginous Hawk	Yellow-breasted Chat	American Badger	Ruddy Duck
Black-tailed Prairie Dog	Golden Eagle	Indigo Bunting	Northern River Otter	Osprey
Meadow Jumping Mouse	Merlin	Dickcissel		Red-tailed Hawk
Black-footed Ferret	Peregrine Falcon	Clay-colored Sparrow	**TIER III: 137**	Rough-legged Hawk
	Prairie Falcon	Brewer's Sparrow	Boreal Chorus Frog	American Kestrel

Gyrfalcon	Western Kingbird	Vesper Sparrow	Deer Mouse	European Starling
Sharp-tailed Grouse	Eastern Kingbird	Lark Sparrow	Northern Grasshopper Mouse	Blackpoll Warbler
Sora	Horned Lark	Savannah Sparrow	Bushy-tailed Woodrat	House Sparrow
American Coot	Tree Swallow	Song Sparrow	Meadow Vole	House Mouse
Lesser Sandhill Crane	Violet-green Swallow	Lincoln's Sparrow	Long-tailed Vole	Common Raccoon
Killdeer	Northern Rough-winged Swallow	White-throated Sparrow	Prairie Vole	
Greater Yellowlegs	Cliff Swallow	White-crowned Sparrow	Muskrat	
Lesser Yellowlegs	Barn Swallow	Chestnut-collared Longspur	Common Porcupine	
Solitary Sandpiper	Clark's Nutcracker	Snow Bunting	Coyote	
Willet	Red-breasted Nuthatch	Bobolink	Red Fox	
Spotted Sandpiper	House Wren	Red-winged Blackbird	Long-tailed Weasel	
Western Sandpiper	Golden-crowned Kinglet	Western Meadowlark	Mink	
Least Sandpiper	Mountain Bluebird	Yellow-headed Blackbird	Striped Skunk	
Dunlin	American Robin	Brewer's Blackbird	Bobcat	
Long-billed Dowitcher	Gray Catbird	Common Grackle	Wapiti Or Elk	
Common Snipe	Sage Thrasher	Brown-headed Cowbird	Mule Deer	
Wilson's Phalarope	Brown Thrasher	Orchard Oriole	White-tailed Deer	
Ring-billed Gull	American Pipit	Red Crossbill	Pronghorn	
California Gull	Bohemian Waxwing	American Goldfinch	Bighorn Sheep	
Mourning Dove	Cedar Waxwing	Masked Shrew		
Snowy Owl	Northern Shrike	Dusky Or Montane Shrew	**TIER IV: 14**	
Short-eared Owl	Orange-crowned Warbler	Little Brown Myotis	Least Bittern	
Common Nighthawk	Yellow Warbler	Desert Cottontail	Great Egret	
Belted Kingfisher	Northern Waterthrush	Least Chipmunk	Gray Partridge	
Downy Woodpecker	Common Yellowthroat	Thirteen-lined Ground Squirrel	Ring-necked Pheasant	
Northern Flicker	Wilson's Warbler	Eastern Fox Squirrel	Black-bellied Plover	
Western Wood-pewee	Black-headed Grosbeak	Red Squirrel	Stilt Sandpiper	
Willow Flycatcher	Spotted Towhee	Northern Pocket Gopher	Rock Dove	
Least Flycatcher	American Tree Sparrow	American Beaver	Barn Owl	
Say's Phoebe	Chipping Sparrow	Western Harvest Mouse	Eastern Wood-pewee	

Table 38. Middle Missouri River Focus Area—Species Associations

TOTAL: 63	Giant Floater	Brook Stickleback
	Mottled Sculpin	Iowa Darter
Group Breakdown	Shovelnose Sturgeon	
Crayfish: 2	Goldeye	**TIER IV: 21**
Mussels: 3	Lake Whitefish	Cisco
Fish: 58	Mountain Whitefish	Chinook Salmon
	Lake Chub	Kokanee Salmon
TIER I: 7	Western Silvery Minnow	Rainbow Trout
Pallid Sturgeon	Brassy Minnow	Brown Trout
Paddlefish	Plains Minnow	Brook Trout
Sturgeon Chub	Emerald Shiner	Lake Trout
Sicklefin Chub	Sand Shiner	Northern Pike
Blue Sucker	Northern Redbelly Dace	Common Carp
Burbot	Fathead Minnow	Spottail Shiner
Sauger	Longnose Dace	Black Bullhead
	Creek Chub	Pumpkinseed
TIER II: 4	Flathead Chub	Plains Killifish
Black Sandshell	River Carpsucker	Green Sunfish
Bigmouth Buffalo	Longnose Sucker	Bluegill
Freshwater Drum	White Sucker	Smallmouth Bass
Northern Redbelly X Finescale Dace	Mountain Sucker	Largemouth Bass
	Smallmouth Buffalo	White Crappie
TIER III: 31	Shorthead Redhorse	Black Crappie
Calico Crayfish	Channel Catfish	Yellow Perch
Virile Crayfish	Stonecat	Walleye
Fatmucket	Western Mosquitofish	

Table 39. Grassland Complexes Communities—Species Associations

Note: Essentially associated species are bolded in table. Total number of species essentially associated with each community type can be found in parenthesis.

TOTAL: 358 (199)	**Long-billed Curlew**	**Western Skink**	Caspian Tern	**Clay-colored Sparrow**
	Black Tern	**Rubber Boa**	Common Tern	**Brewer's Sparrow**
Generalists: 159	**Burrowing Owl**	Common Garter Snake	Forster's Tern	**Field Sparrow**
Amphibians: 2	**Sedge Wren**	**Western Rattlesnake**	**Black-billed Cuckoo**	**Lark Bunting**
Birds: 133	**Nelson's Sharp-tailed Sparrow**	Horned Grebe	Northern Pygmy-owl	**Baird's Sparrow**
Mammals: 20	**Spotted Bat**	Western Grebe	**Black-chinned Hummingbird**	**Grasshopper Sparrow**
Reptiles: 4	**Townsend's Big-eared Bat**	American Bittern	Lewis' Woodpecker	**Mccown's Longspur**
	Pallid Bat	Black-crowned Night-heron	**Red-headed Woodpecker**	**Baltimore Oriole**
Essentialists: 199	**Black-tailed Prairie Dog**	White-faced Ibis	Williamson's Sapsucker	**Bullock's Oriole**
Amphibians: 7	**White-tailed Prairie Dog**	Canvasback	**Alder Flycatcher**	**Preble's Shrew**
Birds: 121	Great Basin Pocket Mouse	Redhead	Hammond's Flycatcher	Vagrant Shrew
Mammals: 60	**Meadow Jumping Mouse**	**Turkey Vulture**	Cassin's Kingbird	**Arctic Shrew**
Reptiles: 11	Grizzly Bear	**Northern Harrier**	**Pinyon Jay**	**Merriam's Shrew**
	Black-footed Ferret	Sharp-shinned Hawk	White-breasted Nuthatch	**Hayden's Shrew**
TIER I: 26 (20)	**American Bison**	Cooper's Hawk	Pygmy Nuthatch	**Yuma Myotis**
Northern Leopard Frog		Northern Goshawk	Canyon Wren	**Long-eared Myotis**
Western Hog-nosed Snake	**TIER II: 99 (67)**	**Swainson's Hawk**	**Blue-gray Gnatcatcher**	**Long-legged Myotis**
Milksnake	**Tiger Salamander**	**Ferruginous Hawk**	**Eastern Bluebird**	**Western Small-footed Myotis**
Smooth Greensnake	**Great Plains Toad**	**Golden Eagle**	**Western Bluebird**	**Northern Myotis**
Trumpeter Swan	**Woodhouse's Toad**	**Merlin**	**Veery**	Silver-haired Bat
Greater Sage-Grouse	Pacific Treefrog	**Peregrine Falcon**	**Sprague's Pipit**	Big Brown Bat
Columbia Sharp-tailed Grouse	**Plains Spadefoot**	**Prairie Falcon**	**Loggerhead Shrike**	Eastern Red Bat
Yellow Rail	Columbia Spotted Frog	Blue Grouse	**Black-and-white Warbler**	**Hoary Bat**
Whooping Crane	Northern Alligator Lizard	**Greater Sandhill Crane**	American Redstart	**Mountain Cottontail**
Piping Plover	**Short-horned Lizard**	**Upland Sandpiper**	**Dickcissel**	**White-tailed Jackrabbit**
Mountain Plover	**Sagebrush Lizard**	**Marbled Godwit**	**Green-tailed Towhee**	**Black-tailed Jackrabbit**

Ord's Kangaroo Rat	Canada Goose	Lesser Yellowlegs	Red-naped Sapsucker	Townsend's Solitaire
Hispid Pocket Mouse	Wood Duck	Semipalmated Sandpiper	**Downy Woodpecker**	Swainson's Thrush
White-footed Mouse	Northern Pintail	Western Sandpiper	**Willow Flycatcher**	Sage Thrasher
Uinta Ground Squirrel	Blue-winged Teal	Least Sandpiper	**Dusky Flycatcher**	**Brown Thrasher**
Wyoming Ground Squirrel	Cinnamon Teal	White-rumped Sandpiper	Cordilleran Flycatcher	American Pipit
Northern Flying Squirrel	Northern Shoveler	Baird's Sandpiper	**Say's Phoebe**	Bohemian Waxwing
Olive-backed Pocket Mouse	Gadwall	Pectoral Sandpiper	**Western Kingbird**	Cedar Waxwing
Sagebrush Vole	American Wigeon	Dunlin	**Eastern Kingbird**	**Northern Shrike**
Swift Fox	Greater Scaup	Long-billed Dowitcher	**Horned Lark**	Warbling Vireo
Least Weasel	Lesser Scaup	Common Snipe	**Tree Swallow**	Red-eyed Vireo
American Badger	White-winged Scoter	Wilson's Phalarope	**Violet-green Swallow**	Orange-crowned Warbler
Western Spotted Skunk	Common Merganser	Ring-billed Gull	**Northern Rough-winged Swallow**	**Yellow Warbler**
	Red-breasted Merganser	**California Gull**	**Cliff Swallow**	Yellow-rumped Warbler
TIER III: 193 (91)	Ruddy Duck	**Mourning Dove**	**Barn Swallow**	Ovenbird
Boreal Chorus Frog	**Red-tailed Hawk**	Western Screech-owl	Gray Jay	Northern Waterthrush
Painted Turtle	**Rough-legged Hawk**	Great Horned Owl	**Blue Jay**	Macgillivray's Warbler
Racer	American Kestrel	Snowy Owl	Clark's Nutcracker	**Common Yellowthroat**
Gopher Snake	Ruffed Grouse	Northern Hawk Owl	**Black-billed Magpie**	Wilson's Warbler
Western Terrestrial Garter Snake	**Sharp-tailed Grouse**	**Long-eared Owl**	**American Crow**	Western Tanager
Plains Garter Snake	Virginia Rail	Short-eared Owl	Black-capped Chickadee	Black-headed Grosbeak
Pied-billed Grebe	Sora	**Common Nighthawk**	Mountain Chickadee	**Lazuli Bunting**
Eared Grebe	American Coot	Common Poorwill	Red-breasted Nuthatch	**Spotted Towhee**
American White Pelican	**Lesser Sandhill Crane**	**Chimney Swift**	**Rock Wren**	**American Tree Sparrow**
Double-crested Cormorant	**Killdeer**	**White-throated Swift**	**House Wren**	**Song Sparrow**
Great Blue Heron	**Solitary Sandpiper**	Calliope Hummingbird	Marsh Wren	Lincoln's Sparrow
Tundra Swan	Willet	Hairy Woodpecker	Hermit Thrush	**White-throated Sparrow**
Green-winged Teal	Spotted Sandpiper	Northern Flicker	**American Robin**	**Chipping Sparrow**
Mallard	Black-necked Stilt	**Western Wood-pewee**	**Gray Catbird**	**Vesper Sparrow**
Snow Goose	American Avocet	Rufous Hummingbird	Ruby-crowned Kinglet	**Lark Sparrow**
Ross' Goose	Greater Yellowlegs	Belted Kingfisher	**Mountain Bluebird**	**Savannah Sparrow**

White-crowned Sparrow	Golden-mantled Ground Squirrel	Great Egret	**Hooded Warbler**
Harris' Sparrow	Red Squirrel	**Snowy Egret**	**Scarlet Tanager**
Dark-eyed Junco	**Northern Pocket Gopher**	Little Blue Heron	**Rose-breasted Grosbeak**
Lapland Longspur	American Beaver	Green Heron	**Golden-crowned Sparrow**
Chestnut-collared Longspur	**Western Harvest Mouse**	Greater White-fronted Goose	**Purple Finch**
Bobolink	**Deer Mouse**	American Black Duck	**House Sparrow**
Red-winged Blackbird	**Northern Grasshopper Mouse**	Eurasian Wigeon	**House Mouse**
Western Meadowlark	**Bushy-tailed Woodrat**	Long Tailed Duck	**Common Raccoon**
Yellow-headed Blackbird	**Meadow Vole**	Surf Scoter	**Feral Horse**
Brewer's Blackbird	**Montane Vole**	Broad-winged Hawk	
Common Grackle	Long-tailed Vole	Gray Partridge	
Brown-headed Cowbird	**Prairie Vole**	**Ring-necked Pheasant**	
Cassin's Finch	**Muskrat**	Wild Turkey	
House Finch	Western Jumping Mouse	Black-bellied Plover	
Red Crossbill	**Common Porcupine**	Semipalmated Plover	
Common Redpoll	**Coyote**	Whimbrel	
Pine Siskin	**Red Fox**	Red Knot	
American Goldfinch	Black Bear	Sanderling	
Evening Grosbeak	Ermine	Stilt Sandpiper	
Masked Shrew	**Long-tailed Weasel**	**Ruby-throated Hummingbird**	
Dusky Or Montane Shrew	Mink	Scissor-tailed Flycatcher	
Red-tailed Chipmunk	White-tailed Deer	Rock Dove	
Yellow-bellied Marmot	**Pronghorn**	**Barn Owl**	
Richardson's Ground Squirrel	**Striped Skunk**	**Pine Warbler**	
Little Brown Myotis	Bobcat	**Palm Warbler**	
Desert Cottontail	**Wapiti Or Elk**	**Blackpoll Warbler**	
Least Chipmunk	**Mule Deer**	**Band-tailed Pigeon**	
Yellow-pine Chipmunk		**Northern Mockingbird**	
Columbian Ground Squirrel	**TIER IV: 40 (21)**	**European Starling**	
Thirteen-lined Ground Squirrel	**Canadian Toad**	**Brambling**	

Table 40. Mixed Broadleaf Forest Communities—Species Associations

Note: Essentially associated species are bolded in table. Total number of species essentially associated with each community type can be found in parenthesis.

TOTAL: 26 (5)	Red-eyed Vireo
	Ovenbird
Generalists: 21	Common Yellowthroat
Birds: 15	Snow Bunting
Mammals: 6	Thirteen-lined Ground Squirrel
	American Beaver
Essentialists: 5	Deer Mouse
Birds: 3	Coyote
Mammals: 2	**Wapiti Or Elk**
	White-tailed Deer
TIER II: 5 (1)	**Moose**
American Bittern	Bighorn Sheep
Blue Grouse	
Veery	**TIER IV: 1 (0)**
Black-and-white Warbler	Ruby-throated Hummingbird
Yellow-breasted Chat	
TIER III: 20 (4)	
Red-necked Phalarope	
Eastern Screech-owl	
Western Screech-owl	
Least Flycatcher	
Blue Jay	
House Wren	
American Dipper	
Bohemian Waxwing	

Table 41. Mixed Shrub/Grass Associations Communities—Species Associations

Note: Essentially associated species are bolded in table. Total number of species essentially associated with each community type can be found in parenthesis.

TOTAL: 39 (10)	**Sagebrush Lizard**	**Northern Grasshopper Mouse**
	Ferruginous Hawk	Prairie Vole
Generalists: 29	Upland Sandpiper	
Amphibians: 4	**Yellow-billed Cuckoo**	**TIER IV: 3 (0)**
Birds: 17	Red-headed Woodpecker	Broad-winged Hawk
Mammals: 6	Pinyon Jay	Ring-necked Pheasant
Reptiles: 2	**Blue-gray Gnatcatcher**	Barn Owl
	Veery	
Essentialists: 10	Mccown's Longspur	
Birds: 3	Bullock's Oriole	
Mammals: 5	**Dwarf Shrew**	
Reptiles: 2	**Eastern Cottontail**	
	Ord's Kangaroo Rat	
TIER 1: 7 (3)		
Western Hog-nosed Snake	**TIER III: 13 (2)**	
Milksnake	Boreal Chorus Frog	
Greater Sage-Grouse	Gopher Snake	
Mountain Plover	Gyrfalcon	
Burrowing Owl	**Chimney Swift**	
Spotted Bat	Western Kingbird	
Black-tailed Prairie Dog	Bank Swallow	
	Spotted Towhee	
TIER II: 16 (5)	Desert Cottontail	
Woodhouse's Toad	Least Chipmunk	
Pacific Treefrog	Western Harvest Mouse	
Plains Spadefoot	Deer Mouse	

Table 42. Riparian and Wetland Communities—Species Associations

Note: Essentially associated species are bolded in table. Total number of species essentially associated with each community type can be found in parenthesis.

TOTAL: 265 (196)	Black Tern	Redhead	Preble's Shrew	reat Basin Spadefoot
Generalists: 69	**Sedge Wren**	**Hooded Merganser**	**Vagrant Shrew**	**Painted Turtle**
Birds: 30	**Nelson's Sharp-tailed Sparrow**	Northern Harrier	**Arctic Shrew**	Racer
Mammals: 34	Townsend's Big-eared Bat	Cooper's Hawk	Merriam's Shrew	Gopher Snake
Reptiles: 5	**Northern Bog Lemming**	Upland Sandpiper	**Pygmy Shrew**	**Western Terrestrial Garter Snake**
	Meadow Jumping Mouse	**Marbled Godwit**	Hayden's Shrew	**Plains Garter Snake**
Essentialists: 196		**Franklin's Gull**	Yuma Myotis	**Pied-billed Grebe**
Amphibians: 16	**TIER II: 67 (41)**	**Caspian Tern**	Long-eared Myotis	**Eared Grebe**
Birds: 152	**Long-toed Salamander**	**Common Tern**	Fringed Myotis	**Clark's Grebe**
Mammals: 22	**Tiger Salamander**	**Forster's Tern**	Silver-haired Bat	**American White Pelican**
Reptiles: 6	**Tailed Frog**	**Yellow-billed cuckoo**	Big Brown Bat	**Double-crested Cormorant**
	Great Plains Toad	Northern Saw-whet Owl	**Eastern Red Bat**	**Great Blue Heron**
TIER I: 19 (17)	**Woodhouse's Toad**	**Black Swift**	**Eastern Cottontail**	**Cattle Egret**
Coeur d' Alene Salamander	**Pacific Treefrog**	**Lewis' Woodpecker**	White-tailed Jackrabbit	**Tundra Swan**
Western Toad	**Plains Spadefoot**	**Red-headed Woodpecker**	**Uinta Ground Squirrel**	**Snow Goose**
Northern Leopard Frog	**Columbia Spotted Frog**	Pileated Woodpecker	**Northern Flying Squirrel**	**Ross' Goose**
Snapping Turtle	Sagebrush Lizard	**Alder Flycatcher**	**Idaho Pocket Gopher**	**Canada Goose**
Spiny Softshell	**Common Garter Snake**	**Cassin's Kingbird**	White-footed Mouse	**Wood Duck**
Western Hog-nosed Snake	Western Rattlesnake	Chestnut-backed Chickadee	**Water Vole**	**Green-winged Teal**
Common Loon	**Horned Grebe**	American Redstart	American Marten	**Mallard**
Trumpeter Swan	**Red-necked Grebe**	**Yellow-breasted Chat**	Least Weasel	**Northern Pintail**
Harlequin Duck	**Western Grebe**	Clay-colored Sparrow	Western Spotted Skunk	**Blue-winged Teal**
Bald Eagle	**American Bittern**	Field Sparrow	**Northern River Otter**	**Cinnamon Teal**
Yellow Rail	**Black-crowned Night-heron**	**Le Conte's Sparrow**		**Northern Shoveler**
Piping Plover	**White-faced Ibis**	Baltimore Oriole	**TIER III: 128 (89)**	**Gadwall**
Interior Least Tern	**Canvasback**	Bullock's Oriole	**Boreal Chorus Frog**	**American Wigeon**

Lesser Scaup	**Red-necked Phalarope**	Common Yellowthroat	Heather Vole	**Yellow-crowned Night-heron**
White-winged Scoter	**Ring-billed Gull**	**Black-headed Grosbeak**	Long-tailed Vole	**Wood Stork**
Common Goldeneye	**California Gull**	American Tree Sparrow	Prairie Vole	**Mute Swan**
Ring-necked Duck	**Long-billed Dowitcher**	**Swamp Sparrow**	Western Jumping Mouse	**Black Scoter**
Greater Scaup	**Common Snipe**	**Lapland Longspur**	**Long-tailed Weasel**	**Surf Scoter**
Barrow's Goldeneye	**Herring Gull**	Bobolink	**Mink**	**Black-bellied Plover**
Bufflehead	**Mourning Dove**	**Red-winged Blackbird**	Striped Skunk	**American Golden-plover**
Common Merganser	**Eastern Screech-owl**	**Yellow-headed Blackbird**	Mule Deer	**Semipalmated Plover**
Red-breasted Merganser	**Belted Kingfisher**	**Rusty Blackbird**	**White-tailed Deer**	**Whimbrel**
Ruddy Duck	Downy Woodpecker	**Brewer's Blackbird**	**Moose**	**Hudsonian Godwit**
Osprey	**Willow Flycatcher**	**Common Grackle**	Pronghorn	**Ruddy Turnstone**
Ruffed Grouse	**Least Flycatcher**	Common Redpoll		**Black Turnstone**
Virginia Rail	**Eastern Kingbird**	**American Goldfinch**	**TIER IV: 51 (48)**	**Red Knot**
Sora	Tree Swallow	Masked Shrew	**Canadian Toad**	**Sanderling**
American Coot	Northern Rough-winged Swallow	Dusky Or Montane Shrew	**Bullfrog**	**Curlew Sandpiper**
Killdeer	Cliff Swallow	**Water Shrew**	**Wood Frog**	**Stilt Sandpiper**
Black-necked Stilt	Barn Swallow	Little Brown Myotis	**Red-throated Loon**	**Buff-breasted Sandpiper**
American Avocet	Black-billed Magpie	Snowshoe Hare	**Pacific Loon**	**Short-billed Dowitcher**
Greater Yellowlegs	American Crow	Least Chipmunk	**Yellow-billed Loon**	**Red Phalarope**
Lesser Yellowlegs	**House Wren**	Yellow-pine Chipmunk	**Least Bittern**	**Pomarine Jaeger**
Willet	**Marsh Wren**	Red-tailed Chipmunk	**Great Egret**	**Bonaparte's Gull**
Spotted Sandpiper	**American Dipper**	Richardson's Ground Squirrel	**Snowy Egret**	**Mew Gull**
Semipalmated Sandpiper	**Gray Catbird**	Columbian Ground Squirrel	**Little Blue Heron**	**Thayer's Gull**
Western Sandpiper	**Brown Thrasher**	Thirteen-lined Ground Squirrel	**Greater White-fronted Goose**	**Glaucous-winged Gull**
Least Sandpiper	**Northern Shrike**	**Eastern Fox Squirrel**	**Brant**	**Glaucous Gull**
White-rumped Sandpiper	Red-eyed Vireo	**American Beaver**	**American Black Duck**	**Arctic Tern**
Baird's Sandpiper	**Yellow Warbler**	Deer Mouse	**Garganey**	**Eastern Wood-pewee**
Pectoral Sandpiper	Ovenbird	Bushy-tailed Woodrat	**Eurasian Wigeon**	European Starling
Dunlin	Savannah Sparrow	**Muskrat**	**Long Tailed Duck**	Palm Warbler
Wilson's Phalarope	**Northern Waterthrush**	Southern Red-backed Vole	**Green Heron**	Mourning Warbler

Hooded Warbler
Canada Warbler
Northern Short-tailed Shrew
Common Raccoon

Table 43. Sagebrush and Salt Flat Communities—Species Associations

Note: Essentially associated species are bolded in table. Total number of species essentially associated with each community type can be found in parenthesis.

TOTAL: 78 (23)	TIER II: 31 (9)	**Idaho Pocket Gopher**	American Tree Sparrow
Generalists: 55	Tiger Salamander	Olive-backed Pocket Mouse	Vesper Sparrow
Amphibians: 3	Plains Spadefoot	Ord's Kangaroo Rat	Lark Sparrow
Birds: 32	Short-horned Lizard	**Sagebrush Vole**	**Sage Sparrow**
Mammals: 16	**Sagebrush Lizard**	American Badger	Savannah Sparrow
Reptiles: 4	Western Rattlesnake	**Western Spotted Skunk**	Western Meadowlark
	Northern Harrier		Brewer's Blackbird
Essentialists: 23	Swainson's Hawk	**TIER III: 35 (7)**	**Desert Cottontail**
Amphibians: 1	Ferruginous Hawk	Boreal Chorus Frog	Least Chipmunk
Birds: 8	Golden Eagle	**Great Basin Spadefoot**	Northern Pocket Gopher
Mammals: 13	Prairie Falcon	Racer	Deer Mouse
Reptiles: 1	Upland Sandpiper	Gopher Snake	Northern Grasshopper Mouse
	Blue-gray Gnatcatcher	American Kestrel	Montane Vole
TIER I: 10 (7)	Loggerhead Shrike	Short-eared Owl	Common Porcupine
Greater Sage-Grouse	**Indigo Bunting**	Say's Phoebe	Red Fox
Mountain Plover	**Green-tailed Towhee**	Western Kingbird	**Mule Deer**
Long-billed Curlew	**Brewer's Sparrow**	Eastern Kingbird	**Pronghorn**
Burrowing Owl	Grasshopper Sparrow	Horned Lark	
Spotted Bat	Baltimore Oriole	Violet-green Swallow	**TIER IV: 2 (0)**
Pallid Bat	Preble's Shrew	Cliff Swallow	Gray Partridge
Pygmy Rabbit	Merriam's Shrew	Barn Swallow	Chukar
Black-tailed Prairie Dog	Long-eared Myotis	Black-billed Magpie	
White-tailed Prairie Dog	**Western Small-footed Myotis**	**Rock Wren**	
Great Basin Pocket Mouse	Mountain Cottontail	Mountain Bluebird	
	Black-tailed Jackrabbit	**Sage Thrasher**	
	Wyoming Ground Squirrel	Bohemian Waxwing	

Table 44. Mountain Stream Communities—Species Associations

Note: Essentially associated species are bolded in table. Total number of species essentially associated with each community type can be found in parenthesis

TOTAL: 18 (17)	**Mottled Sculpin**
Generalists: 1 Fish: 1 **Essentialists: 17** Crayfish: 1 Mussels: 1 Fish: 15	**Slimy Sculpin** **Pygmy Whitefish** **Longnose Dace** Redside Shiner **Longnose Sucker** **Mountain Sucker**
	TIER IV: 2 (2)
	Rainbow Trout **Brook Trout**
TIER 1: 6 (6)	
Western Pearlshell **Yellowstone Cutthroat Trout** **Westslope Cutthroat Trout** **Columbia Basin Redband Trout** **Bull Trout** **Arctic Grayling**	
TIER II: 2 (2)	
Torrent Sculpin **Spoonhead Sculpin**	
TIER III: 8 (7)	
Signal Crayfish	

Table 45. Prairie Stream Communities—Species Associations

Note: Essentially associated species are bolded in table. Total number of species essentially associated with each community type can be found in parenthesis

TOTAL: 32 (25)	Emerald Shiner
Generalists: 7 Fish: 7	**Sand Shiner** **Northern Redbelly Dace**
	Fathead Minnow
Essentialists: 25 Crayfish: 2 Mussels: 2 Fish: 21	**Longnose Dace** **Creek Chub** **Flathead Chub** White Sucker
	Mountain Sucker
TIER I: 1 (1)	Smallmouth Buffalo
Pearl Dace	**Stonecat**
	Brook Stickleback
TIER II: 1 (1)	**Iowa Darter**
Northern Redbelly X Finescale Dace	
	TIER IV: 9 (6)
TIER III: 21 (17)	**Golden Shiner**
Calico Crayfish	Black Bullhead
Virile Crayfish	**Yellow Bullhead**
Fatmucket	**Plains Killifish**
Giant Floater	**Green Sunfish**
Lake Chub	**Bluegill**
Western Silvery Minnow	**Largemouth Bass**
Brassy Minnow	Black Crappie
Plains Minnow	Yellow Perch

Bibliography

A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountain Ecoregion: Report to the Nature Conservancy. 2001. R. Noss, G. Wuerthner, K. Vance-Borland, and C. Carroll. Conservation Science, Inc. 125 pp. + Executive Summary and Appendix D.

A Landowner's Guide to Montana Wetlands. Montana Watercourse.

Adelman, E. B. 1979. A survey of the nongame mammals in the Upper Rattlesnake Creek drainage of western Montana. M.S. thesis. University of Montana, Missoula, MT. 129 pp.

Agnew, W., D. W. Uresk, and R. M. Hansen. 1986. Flora and fauna associated with prairie dog colonies and adjacent ungrazed mixed-grass prairie in western South Dakota. Journal of Range Management 39:135–139.

Alden, W. C. 1953. Physiographic and glacial geology of western Montana and adjacent areas. Geological Survey Professional Paper 231. U.S. Government Printing Office.

Aldrich, D. F. 1972. Wilderness fire management planning guidelines and inventory procedures.

Aldrich, J. W. 1963. Geographic orientation of American Tetraonidae. Journal of Wildlife Management 27:529–545.

Ali, M. A., and M. Anctil. 1977. Retinal structure and function in the walleye (*Stizostedion vitreum vitreum*) and sauger (*S. canadense*). Journal of the Fisheries Research Board of Canada 34:1467–1474.

Allendorf, F. W., D. M. Esperlund, and D. T. Scow. 1980. Coexistence of native and introduced rainbow trout in the Kootenai River drainage. Proceedings of the Montana Academy of Sciences 39:28–36.

Altenbach, J. S., W. Amy, P. V. Bradley, P. E. Brown, K. Dewberry, D. B. Hall, J. Jeffers, B. Lund, J. E. Newmark, M. J. O'Farrell, M. Rahn, R. E. Sherwin, C. R. Tomlinson, and J. A. Williams. 2002. Nevada Bat Conservation Plan. Nevada Bat Working Group, Austin, NV. 188 pp.

Altman, B., and R. Sallabanks. 2000. Olive-sided flycatcher (*Contopus cooperi*). In The birds of North America, No. 502, A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, PA. 28 pp.

American Fisheries Society. Fisheries Management Section, publication number 1. Bethesda, MD.

American Fisheries Society Montana Chapter website: http://www.fisheries.org/AFSmontana/SSCpages/White%20Sturgeon%20Status.htm.

American Wildlands. 2003. Montana Mountain Ranges with American Wildland Corridors Map. 40 East Main Street, Suite #2, Bozeman, MT 59715.

Anders, P. J., and D. L. Richards. 1996. Implications of ecotype collapse on white sturgeon (*Acipenser transmontanus*) in the Kootenai River, Idaho, Montana, and British Columbia. Pp. 27–40 in Proceedings from the International Congress on the Biology of Fishes: Culture and Management of Sturgeon and Paddlefish Symposium Proceedings. San Francisco State University, July 14–18, 1996.

Anderson, M. E. et al. 1978. Black-footed ferret recovery plan. U.S. Fish and Wildlife Service Black-footed ferret recovery team. 150 pp.

Anonymous. 1999. Yellowstone cutthroat trout: current status and recommendations within the state of Montana. Gallatin and Custer National Forests, Regions 3 and 5, Montana Department of Fish, Wildlife & Parks, and U.S. Fish and Wildlife Service Montana Technical Assistance Office.

AOU. 1957. American Ornithological Union Check-list of North American Birds, pp. 137–139. The Lord Baltimore Press, Inc., Baltimore, MD.

Apperson, K. A., and P. J. Anders. 1991. Kootenai River white sturgeon investigations and experimental culture. Annual Progress Report FY 1990. Bonneville Power Administration. 75 pp.

Arndt, S. K. A., and J. Hutchinson. 2000. Characteristics of a tributary-spawning population of burbot from Columbia Lake, British Columbia. Pp. 48–60 in V. L. Paragamian and D. W. Willis, eds. Burbot: biology, ecology, and management.

Arno, Stephen F. 1979. Forest regions of Montana. Res. Pap INT-218. U.S.D.A. Forest Service, Intermountain Forest and Range Experiment Station, Odgen, UT. 39 pp.

Ashley, J. 1994. Progress report: harlequin duck inventory and monitoring in Glacier National Park, Montana. Unpublished report. Division of Research Management, Glacier National Park, MT. 14 pp.

Atkinson, E. C., and M. L. Atkinson. 1990. Distribution and status of flammulated owls (*Otus flammeolus*) on the Salmon National Forest. Unpublished report.

Idaho Natural Heritage Program, Idaho Department of Fish and Game, Salmon National Forest. 25 pp. + appendices.

Aune, K., T. Stivers, and M. Madel. 1984. Rocky Mountain Front grizzly bear monitoring and investigation. Montana Department of Fish, Wildlife & Parks, Helena, MT. 239 pp.

Bailey, R., and M. Allum. 1962. Fishes of South Dakota. Museum of Zoology, University of Michigan, Ann Arbor, MI.

Bartelt, P. E. 1998. Western toad (*Bufo boreas*). Mortality. Herpetological Review 29:96.

Bartos, Dale L., and Robert B. Campbell. February 1998. Decline of Quaking Aspen in the Interior West—Examples from Utah. Rangelands. Vol. 20, No. 1.

Baskins, Y. 1993. Trumpeter swans relearn migration. BioSci. 43(2):76–79.

Baxter, G., and J. Simon. 1970. Wyoming fishers. Bulletin Number 4. Wyoming Game and Fish Department, Cheyenne, WY.

Baydack, R. K., and D. A. Hein. 1987. Tolerance of sharp-tailed grouse to lek disturbance. Wildlife Society Bulletin 15:535–539.

Becker, G. C. 1983. Fishes of Wisconsin. The University of Wisconsin Press, Madison, WI.

Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6. Bethesda, MD.

Bent, A. C. 1939. Life histories of North American woodpeckers. U.S. National Museum Bulletin 174. Washington D.C.

Bergersen, E. P. and D. E. Anderson. 1997. The distribution and spread of *Myxobolus cerebralis* in the United States. Fisheries 22(8):6–7.

Berkey, G., R. Crawford, S. Galipeau, D. Johnson, D. Lambeth, and R. Kreil. 1993. A review of wildlife management practices in North Dakota: effects on nongame bird populations and habitats. Report submitted to USFWS Region 6. U.S. Fish and Wildlife Service, Denver, CO. 51 pp.

Bicknell, William. 2001. USFWS Federal Registry. Notice of 12-month petition finding to list the sicklefin chub (*Macrhybopsis meeki*) and the sturgeon chub (*Macrhybopsis gelida*) as endangered. 3425 Miriam Avenue, Bismarck, ND 58501. 10 pp.

Bissell, G. 2005. Third Annual Common Loon Report (draft). Unpublished report. March 2005. Montana Fish, Wildlife & Parks, Region One, 490 North Meridian Road, Kalispell, MT 59901.

Bissell, G. 2005. Personal communication.

Bissell, G. and C. A. Yde. 1985. Wildlife and wildlife habitat mitigation plan for Hungry Horse hydroelectric project. Final report. Montana Fish, Wildlife & Parks.

Bissell, G. and C. A. Yde. 1985. Wildlife and wildlife habitat mitigation plan for the Noxon Rapids and Cabinet Gorge hydroelectric project. Montana Fish, Wildlife & Parks.

Black, J. H. 1969. The frog genus *Rana* in Montana. Northwest Science 43:191–195.

Bock, C. E., and J. H. Bock. 1974. On the geographical ecology and evolution of the three-toed woodpeckers (*Picoides tridactylus* and *P. arcticus*). American Midland Naturalist 92(2):397–405.

Bond, C. E. 1992. Notes on the nomenclature and distribution of the bull trout and the effects of human activity on the species. Pp. 1–4 in P. J. Howell and D. V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, OR.

Bonham, C. D., and A. Lerwick. 1976. Vegetation changes induced by prairie dogs on short-grass range. Journal of Range Management 29:221–25.

Boundy, J. 2001. Herpetofaunal surveys in the Clark Fork Valley region, Montana. Herpetological Natural History 8:15–26.

Bownan, C. W. 1904. Nelson's sharp-tailed sparrow in North Dakota. Auk 21:385–386.

Boyer, L. F., R. A. Cooper, D. T. Long, and T. M. Askew. 1989. Burbot (*Lota lota*) biogenic sedimentary structure in Lake Superior. Journal of Great Lakes Research 15:174–185.

Bramblett, R. G. 1996. Habitats and movements of pallid and shovelnose sturgeon in the Yellowstone and Missouri rivers, Montana and North Dakota. Ph.D. dissertation. Montana State University, Bozeman, MT. 210 pp.

Braun, C. E. 1999b. Conservation plans. Presentation given to the Western Greater Sage-Grouse Status Conference, January 14–15, 1999, Boise, Idaho. Online. Available: http://www.rangenet.org/projects/grouse.html.

Brodie, E. D., Jr., and R. M. Storm. 1970. *Plethodon vandykei*. Cat. Am. Amph. Rep. 91.1–91.2.

Brown, C. 1976. Fishes of Montana. Big Sky Books, Montana State University, Bozeman, MT.

Brown, D. L., T. Musshel, and J. Gaffney. 1977. A strategic plan for the protection, perpetuation, and recreational use of the fish and wildlife resources in Montana.

Brown, G. P., and R. J. Brooks. 1994. Characteristics of and fidelity to hibernacula in a northern population of snapping turtles (*Chelydra serpentine*). Copeia 1994:222–226.

Brown, R. S., and W. C. Mackay. 1995. Fall and Winter Movements of and Habitat Use by Cutthroat Trout in the Ram River, Alberta. Transactions of the American Fisheries Society 124:873–885.

Brown, S., C. Hickey, B. Harrington, and R. Gill, eds. 2001. The U.S. Shorebird Conservation Plan, 2nd ed. Manomet Center for Conservation Sciences, Manomet, MA.

Brunson, R. B. 1952. Recent collections of *Bufo boreas* from western Montana. Proceedings of the Montana Academy of Sciences 11:17–19.

Brunson, R. B., and H. A. Demaree. 1951. The herpetology of the Mission Mountains, Montana. Copeia 1951:306–308.

Bull, E. L., A. L. Wright, and M. G. Henjum. 1990. Nesting habitat of flammulated owls in Oregon. Journal of Raptor Research 24:52–55.

Bull, E. L., and R. G. Anderson. 1978. Notes on flammulated owls in northeastern Oregon. Murrelet 59:26–28.

Bureau of Land Management, Big Dry Resource Area. 1993. Draft—Resource management plan and environmental impact statement for the Big Dry Resource Area, Miles City District. United States Department of the Interior.

Bureau of Land Management. 1991. Rangeland program summary update: Missouri Breaks grazing EIS, prairie potholes grazing EIS, Headwaters resource management plan (Great Falls Resource Area portion). 102 pp.

Bureau of Land Management. 1979. Habitat management plan for prairie dog ecotypes. USDI, BLM, Montana State Office. Wildlife Habitat Area MT-02-06-07-S1. 61 pp.

Bureau of Reclamation. 1993. Canyon Ferry Reservoir noxious weed management plan.

Burger, J., and M. Gochfeld. 1990. Nest site selection in least terns (*Sterna antillarum*) in New Jersey and New York. Colonial Waterbirds 13:31–40.

Byorth, P. A. 1993. Big Hole River arctic grayling recovery project: annual monitoring report 1992. Submitted to: Fluvial Arctic Grayling Workgroup. Montana Department of Fish, Wildlife & Parks, Bozeman, MT.

Cahn, A. R. 1936. Observations on the breeding of the lawyer (*Lota lota maculosa*). Copeia 1936:163–165.

Caire, W., et al. 1989. Mammals of Oklahoma. University of Oklahoma Press, Norman, OK. 567 pp.

Campbell, R. W., N. K. Dawe, I. McTaggart-Cowan, J. M. Cooper, G. W. Kaiser, and M. C. McNall. 1990. The birds of British Columbia, Vols. 1 and 2: non-passerines. Royal British Columbia Museum, Victoria, B.C. 518 and 636 pp.

Campbell, T. M., III. 1989. Prairie dog colony location surveys and black-footed ferret searches in Montana. Pp. 1–12 in the prairie dog ecotype: managing for biological diversity. Montana BLM Wildlife Technical Bulletin No. 2. 55 pp.

Cannon, R. W., and F. L. Knopf. 1981. Lek numbers as a trend index to prairie grouse populations. Journal of Wildlife Management 45:776–778.

Carlander, K. D. 1997. Handbook of freshwater fishery biology, Vol. 3: life history data on ichthyopercid and percid fishes of the United States and Canada. Iowa State University Press, Ames, IA.

Carlsen, Tom, and Rick Northrup. 1992. Canyon Ferry Wildlife Management Area Final Draft Management Plan.

Carnefix, G. 2002. Movement patterns of fluvial bull trout in relation to habitat parameters in the Rock Creek drainage, Missoula and Granite counties, Montana. M.S. thesis, University of Montana, Missoula, MT. 185 pp.

Carter, M. F., and K. Barker. 1993. An interactive database for setting conservation priorities for western neotropical migrants. U.S. Forest Service General Technical Report RM-229:120–144.

Casey, D. 2000. Partners in Flight Bird Conservation Plan Montana Version 1.0. Montana Partners in Flight. Kalispell, MT.

Casey, D., and P. Malta. 1990. Long-term habitat management plan for elk and mule deer winter range enhancement on Firefighter Mountain and Spotted Bear winter ranges.

Cassirer, E. F., J. D. Reichel, R. L. Wallen, and E. C. Atkinson. 1996. Harlequin duck (*Histrionicus histrionicus*) conservation assessment and strategy for the U.S. Rocky Mountains. Unpublished technical report. Idaho Department of Fish and Game, Lewiston, ID.

Cassirer, E. F., C. R. Groves, and D. L. Genter. 1994. Coeur d' Alene salamander conservation assessment. U.S.D.A. Forest Service, Region 1, Missoula, MT. 55 pp.

Cassirer, E. F, A. Breault, P. Clarkson, D. L. Genter, R. I. Goudie, B. Hunt, S. C. Latta, G. H. Mittelhauser, M. M. Schirato, and R. L. Wallen. 1993. Status of harlequin ducks in North America. Report on Harlequin Duck Working Group.

Cassirer, E. F., C. R. Groves, and D. L. Genter. 1993. Sensitive species management guide for the Coeur d' Alene salamander. Idaho Department of Fish and Game, Boise, ID, and the Montana Natural Heritage Program, Helena, MT.

Cassirer, E. F., G. Schirato, F. Sharpe, C. R. Groves, and R. N. Anderson. 1993. Cavity nesting by harlequin ducks in the Pacific Northwest. Wilson Bull 105:691–694.

Cassirer, E. F., and C. R. Groves. 1991. Harlequin duck ecology in Idaho, 1987–1990. Idaho Department of Fish and Game and U.S. Fish and Wildlife Service.

Caton, E. M. 1996. Cavity nesting birds in a post-fire habitat in northwestern Montana. Ph.D. dissertation, University of Montana, Missoula, MT.

Chadde, S. W., J. S. Shelly, R. J. Bursik, R. K. Moseley, A. G. Evenden, M. Mantas, F. Rabe, and B. Heidel. 1998. Peatlands on National Forests of the Northern Rockies.

Chamberlin, T. W., R. D. Harr, and F. H. Everest. 1991. Timber harvesting, silviculture, and watershed processes. Pp. 181–206 in W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Christie, D. A., and A. M. van Woudenberg. 1997. Modeling critical habitat for flammulated owls (*Otus flammeolus*). Pp. 97–106 in J. R. Duncan, D. H. Johnson, and T. H. Nicholls, eds. Biology and conservation of owls in the Northern Hemisphere. U.S.D.A. Forest Service.

Christopherson, D., R. Stoneberg, R. Matchett, D. Biggins, J. Grensten, A. Dood, and B. Haglan. 1994. Black-footed ferret reintroduction in Montana: project description and 1994 protocol. 31 pp. + appendix.

Christopherson, D. M., D. M. Prellwitz, and M.J. Rabenberg. 1992. Status of piping plovers and least terns in Montana.

Christy, R. E., and S. D. West. 1993. Biology of bats in Douglas-fir forests. General Technical Report PNW-GTR-308. U.S.D.A. Forest Service, Pacific Northwest Research Station, Portland, OR.

Clancy, C. G. 1988. Effects of dewatering on spawning by Yellowstone cutthroat trout in tributaries to the Yellowstone River, Montana. American Fisheries Society Symposium 4:37–41.

Clark, R. A. 1992. Influence of stream flows and stock size on recruitment of arctic grayling (*Thymallus arcticus*) in the Chena River, Alaska. Canadian Journal of Fisheries and Aquatic Sciences 49(5):1027–1034.

Clough, G. C., and J. J. Albright. 1987. Occurrence of the northern bog lemming (*Synaptomys borealis)* in the northeastern United States. Canadian Field-Naturalist 101:611–613.

Collette, B. B. and 7 co-authors. 1977. Biology of the percids. Journal of the Fisheries Research Board of Canada 34:1890–1899.

Confederated Salish and Kootenai Tribes and Montana Fish, Wildlife & Parks. 2003. Flathead Subbasin Plan Assessment: Executive Summary. Northwest Power and Conservation Council. Portland, OR.

Congdon, J. D., et al. 1987. Reproduction and nesting ecology of snapping turtles (*Chelydra serpentina*) in southeastern Michigan. Herpetologica 43:39–54.

Connelly, J. 2001. Field assessment. Greater sage-grouse habitats and populations—Big Sheep Creek Basin, Montana. Unpublished report on file. Beaverhead-Deerlodge National Forest, Dillon, MT.

Connelly, J. W., M. A. Schroeder, A. R. Sands, and C. E. Braun. 2000b. Guidelines to manage greater sage-grouse populations and their habitats. Wildlife Society Bulletin 28:967–985.

Conservation Management of America’s Public Lands: An Assessment and Recommendations for Progress 25 Years after FLPMA. 2001. National Wildlife Federation and the Natural Resources Defense Council.

Conservation Plan for Black-tailed and White-tailed Prairie Dogs in Montana (Montana Prairie Dog Working Group 2002).

Cooperative Conservation Agreement for Yellowstone Cutthroat Trout within Montana between Crow Tribe, Montana Department of Fish, Wildlife & Parks (FWP), Montana Department of Environmental Quality (DEQ), Montana Department of Natural Resources and Conservation (DNRC), U.S.D.A. Forest Service–Northern Region, Gallatin and Custer National Forests, USDI Bureau of Land Management–Montana (BLM), USDI Fish and Wildlife Service (FWS), USDI Bureau of Indian Affairs (BIA), Yellowstone National Park. 2000. Montana Department of Fish, Wildlife & Parks.

Cope, E. D. 1879. A contribution to and zoology of Montana. American Naturalist 13(7):432–441.

Corsi, C. 1988. The life history and status of the Yellowstone cutthroat trout (*Salmo clarki bouvieri*) in the Willow Creek drainage, Idaho. Master's thesis, Idaho State University, Pocatello, ID.

Craighead, J. J., J. Sumner, and G. Scaggs. 1982. A definitive system for analysis of grizzly bear habitat and other wilderness resources. Wildlife-Wildlands Institute Monograph 1. University of Montana, Missoula, MT. 279 pp.

Crance, J. H. 1987. Preliminary habitat suitability curves for sauger. Proceedings of the Annual Conference of Southeast Association Fish and Wildlife Agencies 41:159–167.

Cross, F. 1967. Handbook of fishes of Kansas. Museum of Natural History, University of Kansas, Lawrence, KS.

Cummins, K. S., A. C. Buchanan, and L. M. Koch, eds. The conservation and management of freshwater mussels II: initiatives for the future. Upper Mississippi River Conservation Committee, Rock Island, IL.

Dalsted, K. J., et al. 1981. Application of remote sensing to prairie dog management. Journal of Range Management 34:218–23.

Davis, W. B. 1937. Some mammals from western Montana and eastern Idaho. Murrelet 18:22–27.

Dechant, J. A., M. L. Sondreal, D. H. Johnson, L. D. Igl, C. M. Goldade, P. A. Rabie, and B. R. Euliss. 2000. Effects of management practices on grassland birds: long-billed curlew. Northern Prairie Wildlife Research Center, Jamestown, ND. Jamestown, ND: Northern Prairie Wildlife Research Center Home Page. http://www.npwrc.usgs.gov/resource/literatr/grasbird/fplbcu/fplbcu.htm (Version 29FEB2000).

Deeble, B. D. 1996. Conservation of Columbian sharp-tailed grouse, with special emphasis on the upper Blackfoot Valley, Montana. Unpublished M.S. thesis, University of Montana, Missoula, MT.

Diamond, S., and P. Finnegan. 1993. Harlequin duck ecology on Montana's Rocky Mountain Front. Unpublished report. Rocky Mountain District, Lewis and Clark National Forest, Choteau, MT. 45 pp.

Dickerman, R. W., and J. P. Hubbard. 1994. An extinct subspecies of sharp-tailed grouse from New Mexico. Western Birds 25:128–136.

Dieterman, D. J., and D. L. Galat. 2004. Large-scale factors associated with sicklefin chub distribution in the Missouri and Lower Yellowstone rivers. Transactions of the American Fisheries Society 133:577–587.

Digital Atlas of Idaho. http://imnh.isu.edu/digitalatlas (accessed June 5, 2004).

Dinsmore, Stephen J. 2001. Population Biology of Mountain Plovers in Southern Valley County, Montana. Dissertation, Colorado State University. 109 pp.

Dixon, R. D., and V. A. Saab. 2000. Black-backed woodpecker (*Picoides arcticus*). In The Birds of North America, No. 509, A. Poole and F. Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC. The Birds of North America Inc., Philadelphia, PA.

Dolan, P. M. 1994. The common loon (*Gavia immer*) in the northern region: biology and management recommendations. Unpublished report. U.S.D.A. Forest Service, Region 1. 76 pp.

Donald, D. B., and J. D. Stelfox. 1997. Effects of fisheries enhancement and access on adfluvial bull trout populations in mountain lakes of southern Alberta. Pp. 227–234 in W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Dood, A. R., R. D. Brannon, and R. D. Mace. 1986. Final Programmatic Environmental Impact Statement, the Grizzly Bear in Northwestern Montana. Montana Department of Fish, Wildlife & Parks.

Dood, A. R. 1980. Terry badlands nongame survey and inventory: final report. (BLM Contract #YA-512-CT8-217.) Montana Department of Fish, Wildlife & Parks. 70 pp.

Dryer, M. P., and A. J. Sandvol. 1993. Recovery plan for the pallid sturgeon (*Scaphirhynchus albus*). U.S. Fish and Wildlife Service. Bismarck, ND. 55 pp.

Dufek, D., K. Johnson, J. Kiefling, B. McDowell, R. McKnight, S. Roth, and S. Yekel. 1999. Status and management of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*). Wyoming Game and Fish Department, Cheyenne, WY.

Duke, S., P. Anders, G. Ennis, R. Hallock, J. Hammond, S. Ireland, J. Laufle, L. Lockard, B. Marotz, V. Paragamian, and R. Westerhof. 1999. Recovery plan for Kootenai River white sturgeon (*Acipenser transmontanus*). Journal of Applied Ichthyology (15):157–163.

Dunham J. B., G. L. Vinyard, and B. E. Rieman. 1997. Habitat fragmentation and extinction risk of Lahontan cutthroat trout. North American Journal of Fisheries Management 17:1126–1133.

Dunn, E. H., and D. J. Agro. 1995. Black tern (*Chlidonias niger*). In The Birds of North America, No. 147, A. Poole and F. Gill, eds. Philadelphia, PA: The Academy of Natural Sciences and Washington DC: The American Ornithologists' Union. 24 pp.

Eddy, S., and J. C. Underhill. 1974. Northern fishes. University of Minnesota Press, Minneapolis, MN.

Edsall, T. A., G. W. Kennedy, and W. H. Horns. 1993. Distribution, abundance, and resting microhabitat of burbot on Julian's Reef, southwestern Lake Michigan. Transactions of the American Fisheries Society 122:560–574.

Elis, Janet H., and Jim Richard. A planning guide for protecting Montana's wetlands and riparian areas. Montana Watercourse, Montana Department of Environmental Quality, and Montana Audubon Society.

Ellison, L. E., M. B. Wunder, C. A. Jones, C. Mosch, K. W. Navo, K. Peckham, J. E. Burghardt, J. Annear, R. West, J. Siemers, R. A. Adams, and E. Brekke. 2003. Colorado bat conservation plan. Colorado Committee of the Western Bat Working Group. Available at http://www.wbwg.org/colorado/colorado.htm.

Elser, A. A., M. W. Gorges, and L. M. Morris. 1980. Distribution of fishes in southeastern Montana. Montana Department of Fish, Wildlife & Parks, Helena, MT.

Engle, J. C., and C. E. Harris. 2001. Idaho species of special concern element state ranking reviews. Nongame and Endangered Wildlife Program. Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Environment Canada. 1997. Sustaining Canada's Forests: Timber Harvesting. National Environmental Indicator Series, SOE Bulletin No. 95-4. Online. Available at http://199.212.18.79/ind/English/Forest/Bulletin.

Erickson, K., and D. M. Prellwitz. 1999. Piping plover surveys for Nelson Reservoir, Bowdoin NWR, and Hewitt Lake NWR.

Ernst, C. H., J. E. Lovich, and R. W. Barbour. 1994. Turtles of the United States and Canada. Smithsonian Institution Press, Washington, DC. 578 pp.

Escano, R., D. Flath, R. Hazelwood, and B. Klaver, eds., for Bureau of Land Management. 1986. Montana eagle management plan. Montana Bald Eagle Working Group, BLM, Montana State Office. 61 pp.

Everest, F. H., R. L. Beschta, J. C. Scrivener, K. V. Koski, J. R. Sedell, and C. J. Cederholm. 1987. Fine Sediment and Salmonid Production: A Paradox. In Streamside Management: Forestry and Fishery Interactions. University of Washington, Seattle, WA. Pp. 98–142, E. O. Salo and T. W. Cundy, tech. eds.

Evers, D. C. 2004. Status Assessment and Conservation Plan for the Common Loon (*Gavia immer*) in North America. David C. Evers, BioDiversity Research Institute, April 12, 2004. Available at http://alaska.fws.gov/mbsp/mbm/loons/pdf/Common_Loon_Status_Assessment.pdf

Fairman, L. M., and V. E. Miller. 1990. Results of 1990 surveys for harlequin ducks on the Kootenai and Lolo national forests, Montana. Unpublished report. Montana Natural Heritage Program, Helena, MT.

Fargione, Joseph, Cynthia S. Brown, and David Tilman. 2003. Community assembly and invasion: an experimental test of neutral versus niche processes. PNAS. Vol. 100 (15):8916–8920.

FaunaWest Wildlife Consultants. 1998. Status of the black- and white-tailed prairie dog in Montana. Montana Fish, Wildlife & Parks, Helena, MT. 34 pp.

FaunaWest Wildlife Consultants. 1991. Status and breeding distribution of the mountain plover in Montana. Report to USDI Bureau of Land Management. FaunaWest Wildlife Consultants, Boulder, MT. 44 pp.

Fenton, M. B., D. C. Tennant, and J. Wyszecki. 1987. Using echolocation calls to measure distribution of bats: the case of *Euderma maculatum*. Journal of Mammalogy 68:142–144.

Figg, D. E. 1993. Missouri Department of Conservation wildlife diversity report, July 1992–June 1993. 75 pp.

Findlay, C. S., D. G. Bert, and L. Zheng. 2000. Effect of introduced piscivores on native minnow communities in Adirondack lakes. Canadian Journal of Fisheries and Aquatic Sciences 57:570–580.

Fisher, F. B, J. C . Winne, M. M. Thornton, T. P. Tady, Z. M. M. Hart, and R. L. Redmond. 1998. Montana Land Cover Atlas. Unpublished report. Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT. 50 pp + viii.

Flath, D. L. 1979. Status of the white-tailed prairie dog in Montana. Proceedings of the Montana Academy of Sciences 38:63–67.

Flathead Lake and River Co-Management Plan, 2001–2010. 2000. Montana Fish, Wildlife & Parks, Kalispell, MT, and Confederated Salish and Kootenai Tribes, Pablo, MT.

Flathead River Subbasin Executive Summary. 2004. A Summary of Flathead River Subbasin Assessment, Inventory, and Management Plan. Northwest Power and Conservation Council.

Flores, R., G. Stricker, J. Meyer, T. Doll, P. Norton, R. Livingston, and M. Jennings. 2001. A Field Conference on Impacts of Coal Bed Methane Development in the Powder River Basin, Wyoming. USGS Open File Report 01-126.

Foresman, K. R. 2001. The wild mammals of Montana. American Society of Mammalogists, Special Publication No. 12. 278 pp.

Fraley, J. J., and B. B. Shepard. 1989. Life history, ecology, and population status of migratory bull trout (*Salvelinus confluentus*) in the Flathead Lake and River system, Montana. Northwest Science 63:133–143.

Fraley, J., D. Read, and P. Graham. 1981. Flathead River fisheries study. Montana Department of Fish, Wildlife & Parks.

Frisina, Michael R., and John J. McCarthy. 2001. Montana Sagebrush Bibliography. Montana Fish, Wildlife & Parks. 69 pp.

Frissell, S. S. 1978. Nongame wildlife inventory. Prepared for: U.S. Department of the Interior, Bureau of Land Management, Dillon Resource Area, Dillon, MT. 194 pp.

Fuller, P. L., G. Nico, and J. D. Williams. 1999. Nonindigenous fishes introduced into inland waters of the United States. American Fisheries Society, Bethesda, MD.

Furniss, M. J., T. D. Roelofs, and C. S. Yee. 1991. Road construction and maintenance. Pp. 297–324 in W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Gardner, W. M., and P. A. Stewart. 1997. The fishery of the lower Missouri River, Montana. Montana Department of Fish, Wildlife & Parks report, FW-2-R.

Gardner, W. M., and R. Berg. 1982. An analysis of the instream flow requirements for selected fishes in the Wild and Scenic portion of the Missouri River. Montana Fish, Wildlife & Parks. Helena, MT. 111 pp.

Gardner, W. M., and R. K. Berg. 1980. An analysis of the instream flow requirements for selected fishes in the Wild and Scenic portion of the Missouri River. Montana Fish, Wildlife & Parks report, Great Falls, MT.

Genter, D. L. 1993. Harlequin duck status report 1992: Montana. Pp. 31–34 in E. F. Cassirer, A. Breault, P. Clarkson, D. L. Genter, R. I. Goudie, B. Hunt, S. C. Latta, G. H. Mittelhauser, M. M. Schirato, and R. L. Wallen, eds. Harlequin ducks in North America. Harlequin Duck Working Group.

Gervais, J. A., and R. G. Anthony. 2003. Chronic organochlorine contaminants, environmental variability, and demographics of a burrowing owl population. Ecological Applications 13:1250–1262.

Gibson, R. S. 1986. Environmental impact statement for the Helena National Forest, land and resource management plan. U.S.D.A. Forest Service.

Giesen, K. M., and J. W. Connelly. 1993. Guidelines for management of sharp-tailed grouse habitats. Wildlife Society Bulletin 21:325–333.

Gillies, K. E., and R. Dixon. 2004. Draft Idaho Bat Conservation Plan. Nongame and Endangered Wildlife Program technical report. Idaho Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Girard, C. 1856. Researches upon the cyprinoid fishes inhabiting the fresh waters of the United States, west of the Mississippi Valley, from specimens in the museum of the Smithsonian Institution. Proceedings of the Academy of Natural Science of Philadelphia 8:165–213.

Gitzen, R. A., S. D. West, and J. A. Baumgardt. 2001. A record of the spotted bat (*Euderma maculatum*) from Crescent Bar, Washington. Northwestern Naturalist 82:28–30.

Goetz, F. 1989. Biology of the bull trout (*Salvelinus confluentus*): a literature review. Willamette National Forest, Eugene, OR. 53 pp.

Goggans, R. 1989. Black-backed woodpecker. Pp. 88–89 in T. W. Clark, A. H. Harvey, R. D. Dorn, D. L. Genter, and C. Groves, eds. Rare, sensitive, and threatened species of the Greater Yellowstone Ecotype. Northern Rockies Conservation Cooperative.

Goggans, R. 1986. Habitat use by flammulated owls in northeastern Oregon. Master's thesis, Oregon State University, Corvallis, OR.

Gorman, J. D. 1984. Interagency Rocky Mountain Front Wildlife Monitoring & Evaluation Program.

Gould, W. 1994. The recent distribution of sturgeon chub (*Macrohybopsis gelida*) in Montana. Report to the Montana Department of Fish, Wildlife & Parks. Helena, MT.

Gould, W. R. 1981. First records of the rainbow smelt (*Osmeridae*), sicklefin chub (*Cyprinidae*) and white bass (*Percichthyidae*). Proceedings of the Montana Academy of Sciences 40:9–10.

Gould, W. R. 1969. First record of the trout-perch (*Percopsis omiscomaycus*) from Montana. Proceedings of the Montana Academy of Sciences 29:51.

Gould, W. R., and C. J. D. Brown. 1968. Fishes of the genus *Semotilus* (*Cyprinidae*) from Montana. Copeia 1968:628–629.

Green, J. S., and J. T. Flinders. 980. Habitat and dietary relationships of the pygmy rabbit. Journal of Range Management 33(2):136–142.

Greenlaw, J. S. 1993. Behavioral and morphological diversification in sharp-tailed sparrows (*Ammadramus caudacutus*) of the Atlantic coast. Auk 110:286–303.

Grensten, John. 2004. Personal communication with Stephen Dinsmore.

Gresswell, R. E. 1995. Yellowstone cutthroat trout. Pp. 36–54 in M. K. Young, tech. ed. Conservation assessment for inland cutthroat trout. U.S.D.A. Forest Service General Technical Report RM-GTR-256.

Gresswell, R. E., W. J. Liss, and G. L. Larson. 1994. Life history organization of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) in Yellowstone Lake. Canadian Journal of Fisheries and Aquatic Sciences 51 (Supplement 1): 298–309.

Grisak, G. G. 1996. The status and distribution of the sicklefin chub in the middle Missouri River, Montana. Master's thesis, Montana State University, Bozeman, MT.

Grover, P. B., and F. L. Knopf. 1982. Habitat requirements and breeding success of charadriiform birds nesting at Salt Plains National Wildlife Refuge, Oklahoma. Journal of Field Ornithology 53:139–148.

Groves, C., T. Frederick, G. Frederick, E. Atkinson, M. Atkinson, J. Shepard, and G. Servheen. 1997. Density, distribution, and habitat of flammulated owls in Oregon. Great Basin Naturalist 57:116–123.

Groves, C. R., E. F. Cassirer, D. L. Genter, and J. D. Reichel. 1996. Coeur d' Alene salamander (*Plethodon idahoensis*). Natural Areas Journal 16(3):238–47.

Groves, C. R. 1994. Effects of Timber Harvest on Small Mammals and Amphibians in Old-Growth Coniferous Forests on the Priest Lake Ranger District. Unpublished report to the Priest Lake Ranger District, Idaho Panhandle National Forest. The Nature Conservancy, Boulder, CO.

Groves, C. R., and C. Peterson. 1992. Distribution and population trends of Idaho amphibians as determined by mail questionnaire. Conservation Data Center, Idaho Department of Fish and Game, Boise, ID.

Groves, C. 1988, 1989. Status and distribution of the Coeur d' Alene salamander (*Plethodon vandykei idahoensis*) in Idaho, part II. Unpublished report. Idaho Department of Fish and Game, Boise, ID.

Gurevitch, J., P. S. Curtis, and M. H. Jones. 2001. Meta-analysis in ecology. Advances in Ecological Research 32:200–241.

Gustafson, D. L. 1996. http://www.esg.montana.edu/dlg/aim/mollusca/marfal.html

Haig, S., et al. 1994. Revised recovery plan for piping plovers (*Charadrius melodus*) breeding on the Great Lakes and northern Great Plains (technical/agency review draft). Great Lakes/Northern Great Plains Piping Plover Recovery Team. 121 pp.

Haig, S. M. 1992. Distribution and status of piping plovers in winter. Abstract, p. 69. 6th Annual Meeting of the Society for Conservation Biology.

Haig, S., et al. 1988. Recovery plan for piping plovers (*Charadrius melodus*) of the Great Lakes and northern Great Plains. U.S. Fish and Wildlife Service. 160 pp.

Hall, E. R. 1981. The Mammals of North America, Vols. I and II. John Wiley & Sons, New York, NY.

Hammerson, G. A. 1999. Amphibians and reptiles in Colorado. 2nd ed. University Press of Colorado, Boulder, CO. 484 pp + xxvi.

Handley, C. O., Jr. 1959. A revision of American bats of the genera *Euderma* and *Plecotus*. Proc. U.S. Natl. Mus. 110:95–246.

Hansen, A., J. Rotella, L. Klass, and D. Gyskiewicz. 2003. Riparian habitat Dynamics and Wildlife Along the Upper Yellowstone River. Technical Report #1. Landscape Biodiversity Lab, Montana State University, Bozeman, MT. In cooperation with the Governor's Upper Yellowstone River Task Force.

Hansen, Paul L., S. W. Chadde, and R. D. Pfister. 1988. Riparian Dominance Types of Montana. Miscellaneous Publication No. 49. Montana Forest and Conservation Experiment Station. School of Forestry, University of Montana, Missoula, MT.

Harlequin Duck Working Group. 1993. Status of harlequin ducks (*Histrionicus histrionicus*) in North America. Report of the Harlequin Duck Working Group.

Harris, M. A. 1982. Habitat use among woodpeckers in forest burns. M.S. thesis, University of Montana, Missoula, MT. 62 pp.

Hart, M. M., W. A. Williams, P. C. Thornton, K. P. McLaughlin, C. M. Tobalske, B. A. Maxell, D. P. Hendricks, C. R. Peterson, and R. L. Redmond. 1998. Long-billed curlew (*Numernius americanus*) in Montana atlas of terrestrial vertebrates. Unpublished report, pp. 269–271. Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT.

Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. In Birds of North America, No. 61, A. Poole and F. Gill, eds. The Academy of Natural Science, Philadelphia, PA, and The American Ornithologists' Union, Washington, DC.

Hawk Watch International. 2003. An online search for migration watch results, 1999–2002 data. http://www.hawkwatch.org/ (accessed 11 September 2003).

Hayward, G. D., and J. Verner. 1994. Flammulated, boreal, and great gray owls in the United States. General Technical Report RM-253, U.S.D.A. Forest Service, Rocky Mountain Research Station, Fort Collins, CO.

Heady, L. T., K. I. Gabler, and J. W. Laundre. 2001. Habitat selection by pygmy rabbits in southeast Idaho. Technical Bulletin No. 01-7. Idaho Bureau of Land Management.

Hejl, S. J., R. L. Hutto, C. R. Preston, and D. M. Finch. 1995. Effects of silvicultural treatments in the Rocky Mountains. Pp. 220–244 in T. E. Martin and D. M. Finch, eds. Ecology and management of neotropical migratory birds. Oxford University Press.

Hendricks, P., and M. Roedel. 2002. Preble's Shrew and Great Basin Pocket Mouse from the Centennial Valley Sandhills of Montana. Northwestern Naturalist 83:31–34.

Hendricks, P., and D. Kampwerth. 2001. Roost environments for bats using abandoned mines in southwestern Montana: a preliminary assessment. Report to the U.S. Bureau of Land Management. Montana Natural Heritage Program, Helena, MT. 19 pp.

Hendricks, P., and J. C. Carlson. 2001. Bat use of abandoned mines in the Pryor Mountains. Report to the Montana Department of Environmental Quality, Mine Waste Cleanup Bureau. Montana Natural Heritage Program, Helena, MT. 8 pp.

Hendricks, P., and M. Roedel. 2001. A faunal survey of the Centennial Valley sandhills, Beaverhead County, Montana. Report to the U.S. Bureau of Land Management and U.S. Fish and Wildlife Service. Montana Natural Heritage Program, Helena, MT.

Hendricks, P., D. L. Genter, and S. Martinez. 2000. Bats of Azure Cave and the Little Rocky Mountains, Montana. Canadian Field-Naturalist 114:89–97.

Hendricks, P. 1999. Amphibian and reptile survey of the Bureau of Land Management, Miles City District, Montana. Montana Natural Heritage Program, Helena, MT. 80 pp.

Hendricks, P. 1999. Amphibian and reptile surveys on Montana refuges: 1998–1999. December 1999.

Hendricks, P. 1999. Effect of gate installation on continued use by bats of four abandoned mine workings in western Montana. Unpublished report to Montana Department of Environmental Quality. Montana Natural Heritage Program, Helena, MT. 13 pp.

Hendricks, P., and J. D. Reichel. 1996. Preliminary amphibian and reptile survey of the Ashland District, Custer National Forest: 1995. Montana Natural Heritage Program. Helena, MT. 79 pp.

Hendricks, P., K. A. Jurist, D. L. Genter, and J. D. Reichel. 1996. Bats of the Kootenai National Forest, Montana. Unpublished report. Montana Natural Heritage Program, Helena, MT. 99 pp.

Hensler, M. E., and C. C. Muhlfeld. 1999. Spawning ecology of redband trout in Basin Creek, Montana. A report to the Whirling Disease Foundation. Montana Fish, Wildlife & Parks, Bozeman, MT.

Hensler, M. E., J. E. Huston, and G. K. Sage. 1996. A Genetic Survey of Lakes in the Cabinet Wilderness Area and Proposed Inland Rainbow Trout Recovery. Montana Fish, Wildlife & Parks, Kalispell, MT.

Hermanson, J. W., and T. J. O'Shea. 1983. *Antrozous pallidus*. Mammalian Species Account 213:1–8.

Hesse, L. W. 1994. The status of Nebraska fishes in the Missouri River. 6. Sauger (Percidae: *Stizostedion canadense*). Transactions of the Nebraska Academy of Sciences 21:109–121.

Hickman, G. R., B. G. Dixon, and J. Corn. 1999. Small mammals. Pp. 4.1–4.16 in the effects of recreation on Rocky Mountain wildlife: a review for Montana.

Hiebert, S. D., R. Wydoski, and T. J. Parks. 1999. Fish entrainment at the lower Yellowstone Diversion Dam, Intake Canal, Montana, 1996–1998. Technical Service Center Data Report. Bureau of Reclamation. In press. 52 pp.

Hill, N. P. 1968. Nelson's sharp-tailed sparrow. Pp. 815–819 in O. L. Austin, Jr., ed. Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. Dover Publications Inc., New York, NY.

Hillman, C. N., R. L. Linder, and R. B. Dahlgren. 1979. Prairie dog (*Cynomys ludovicianus*) distribution in areas inhabited by black-footed ferrets (*Mustela nigripes*). American Midland Naturalist 102:185–7.

Hinman, K. E., and T. K. Snow, eds. 2003. Arizona Bat Conservation Strategic Plan. Version 1.0. Nongame and Endangered Wildlife Program Technical Report (in progress). Arizona Game and Fish Department, Phoenix, AZ

Hoffman, N. J. 1997. Distribution of *Picoides* woodpeckers in relation to habitat disturbance within the Yellowstone area. M.S. thesis, Montana State University, Bozeman, MT. 74 pp.

Hoffmann, R. S., D. L. Pattie, and J. F. Bell. 1969. The distribution of some mammals in Montana. II. Bats. Journal of Mammalogy 50(4):737–741.

Holt, D. W., and J. M. Hillis. 1987. Current status and habitat associations of forest owls in western Montana. Pp. 281–288 in biology and conservation of northern forest owls: symposium proceedings, February 3–7, Winnepeg, Manitoba. General Technical Report RM-142.

Holton, G. D., and H. E. Johnson. 2003. A field guide to Montana fishes, 3rd ed. Montana Fish, Wildlife & Parks, Helena, MT.

Holton, G. D., and H. E. Johnson. 1996. A field guide to Montana fishes. Montana Fish, Wildlife & Parks, Helena, MT.

Holton, G. D. 1981. Identification of Montana's most common game and sport fishes. Montana Outdoors reprint.

Holton, G. 1980. The riddle of existence; fishes of special concern. Montana Outdoors 11:2–6.

Hornaday, W. T. 1913. Our vanishing wildlife: its extermination and preservation. New York Zoological Society, New York, NY.

Howard, J. 1993. Genetic variation and population divergence in the *Plethodon vandykei* species group. Herpetologica 49:238–247.

Howie, R. R., and R. Ritcey. 1987. Distribution, habitat selection, and densities of flammulated owls in British Columbia. Pp. 249–254 in B87NER01.

Hoyt, J. S, and S. J. Hannon. 2002. Habitat associations of black-backed and three-toed woodpeckers in the boreal forest of Alberta. Canadian Journal of Forest Research. 32:1881–1888.

Huston, J. E. 1995. A Report on the Kootenai River Drainage Native Species Search. A report to the U.S. Fish and Wildlife Service. Montana Fish, Wildlife & Parks, Kalispell, MT.

Hutto, R. L., and J. S. Young. 1999. Habitat relationships of land birds in the Northern Region, U.S.D.A. Forest Service. General Technical Report RMRS-GTR-32. U.S.D.A. Forest Service, Rocky Mountain Research Station, Ogden, UT.

Hutto, R. L. 1995a. USFS Northern Region Songbird Monitoring Program: distribution and habitat relationships. U.S.D.A. Forest Service–Northern Region internal report, Missoula, MT.

Hutto, R. L. 1995b. Composition of bird communities following stand-replacement fires in northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9:1041–1058.

Idaho Fish and Game. http://fishandgame.idaho.gov/tech/CDC/county_spp_lists (accessed April 26, 2004).

Ireland, S. C. 2000. Kootenai River White Sturgeon Studies and Conservation Aquaculture. Annual progress report. Prepared for U.S. Department of Energy, Bonneville Power Administration. Contract No. 88 BI 93743; Project No. 88-64. Portland, OR.

J. Mammal. 50:579–604. NatureServe Explorer: an online encyclopedia of life. 2002. Version 1.6. Arlington, VA. http://www.natureserve.org/explorer.http://MNHP.nris.state.mt.us/animalguide/ (accessed March 20, 2003).

Jean, C., P. Hendricks, M. Jones, S. Cooper, and J. Carlson. 2002. Ecological communities on the Red Rock Lakes National Wildlife Refuge: inventory and review of aspen and wetland systems. Report to the Red Rock Lakes National Wildlife Refuge, MT.

Jaeger, M. E. 2004. An empirical assessment of factors precluding recovery of sauger in the lower Yellowstone River: movement, habitat use, exploitation, and entrainment. Master's thesis.

Jewett, S. G. 1931. Nesting of the Pacific harlequin duck in Oregon. Condor 33:255.

Johnsgard, P. A. 1986. Birds of the Rocky Mountains with particular reference to national parks in the northern Rocky Mountain region. Colorado Associated University Press, Boulder. 504 pp. + xi.

Johnson, Wayne. 2005. Observations of northern leopard frog in Kootenai National Forest. Personal communication.

Jones, J. K., Jr., D. M. Armstrong, R. S. Hoffmann, and C Jones. 1983. Mammals of the northern Great Plains. University of Nebraska Press, Lincoln, NE. 379 pp.

Jones, M. S., J. P. Goettl, and L. J. Livo. 1999. Western toad (*Bufo boreas*). Predation. Herpetological Review 30:91.

Jones, W. M. 2003. Kootenai National Forest Peatlands: Description and Effect of Forest Management. Report to the Kootenai National Forest, Montana. Montana Natural Heritage Program, Helena, MT.

Jones, Z. F., and C. E. Bock. 2002. Conservation of grassland birds in an urbanizing landscape: a historical perspective. Condor 104: 643–651.

Jones-Wuellner, Melissa R., and Christopher S. Guy. 2004. Status of burbot in Montana. Prepared for Montana Fish, Wildlife & Parks. Montana Cooperative Fisheries Research Unit, Montana State University, Bozeman, MT.

Joslin, G. 1980. Mountain goat habitat management plan for the Cabinet Mountains, Montana. Montana Fish, Wildlife & Parks and Kootenai National Forest.

Joslin, G., and H. Youmans, coordinators. 1999. Committee on Effects of Recreation on Wildlife. Montana Chapter of The Wildlife Society, Helena, MT.

Kanda, N., R. F. Leary, and F. W. Allendorf. 1997. Population genetic structure of bull trout in the upper Flathead River drainage. Pp. 299–308 in W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Karl, J. 2000. Columbian sharp-tailed grouse (*Tympanuchus phasianellus columbianus*). Digital atlas of Idaho. http://imnh.isu.edu/digitalatlas (accessed May 25, 2004).

Katzner, T. E., and K. L. Parker. 1997. Vegetative characteristics and size of home ranges used by pygmy rabbits (*Brachylagus idahoensis*) during winter. Journal of Mammalogy 78:1063–1072.

Kaya, C. M. 1992a. Review of the decline and status of fluvial arctic grayling (*Thymallus arcticus*) in Montana. Proceedings of Montana Academy of Sciences 52:43–70.

Kaya, C. M. 1992b. Restoration of fluvial arctic grayling to Montana streams: assessment of reintroduction potential of streams in the native range, the upper Missouri River drainage above Great Falls. Prepared for Montana Chapter of the American Fisheries Society and Montana Department of Fish, Wildlife & Parks, Bozeman, MT.

Kaya, C. M. 1990. Status report on fluvial arctic grayling (*Thymallus arcticus*) in Montana. Biology Department, Montana State University, Bozeman, MT. Prepared for Montana Fish, Wildlife & Parks, Helena, MT.

Keenlyne, K. D. 1989. A report on the pallid sturgeon. Unpublished report. U. S. Fish and Wildlife Service, Pierre, SD.

Keiter, R. B. 1997. Greater Yellowstone's bison: unraveling of an early American wildlife conservation achievement. Journal of Wildlife Management 61:1–11.

Kelly, L. M. 1992. The effects of human disturbance on common loon productivity in northwestern Montana. M.S. thesis, University of Montana, Missoula, MT. 65 pp.

Kelsall, J. P., E. S. Telfar, and T. D. Wright. 1977. The effects of fire on the ecology of the boreal forest, with particular reference to the Canadian north: a review and selected bibliography. Canadian Wildlife Service, Occasional Paper No. 32. Ottawa, Canada.

Kessler, W. B., and R. P. Bosch. 1982. Sharp-tailed grouse and range management practices in western rangelands, 1982. Pp. 133–136 in proceedings of wildlife-livestock relationships symposium, J. M. Peek and P. Dallce, eds. University of Idaho, Moscow, ID.

Kincaid, M. L. 1993. A breeding plan to preserve the genetic variability of the Kootenai River white sturgeon. Contract No. DE-AI79-93BP02886. Bonneville Power Administration, Portland, OR.

Kirby, V. C. 1980. An adaptive modification in the ribs of woodpeckers and piculets (*Picidae*). Auk 97:521–532.

Kitano, S., K. Maekawa, S. Nakano, and K. D. Fausch. 1994. Spawning behavior of bull trout in the upper Flathead drainage, Montana, with special reference to hybridization with brook trout. Transactions of the American Fisheries Society 123:988–992.

Klatt, L. E., and D. Hein. 1978. Vegetative differences among active and abandoned towns of black-tailed prairie dogs (*Cynomys ludovicianus*). Journal of Range Management 31:315–7.

Klott, James H., and Frederick G. Lindzey. 1990. Brood habitats of sympatric sage grouse and Columbian sharp-tailed grouse in Wyoming. Journal of Wildlife Management 54(1):84–88.

Klute, D. S., L. W. Ayers, M. T. Green, W. H. Howe, S. L. Jones, J. A. Shaffer, S. R. Sheffield, and T. S. Zimmerman. 2003. Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States. U.S. Department of the Interior, Fish and Wildlife Service. Biological Technical Publication FWS/BTP-R6001-2003, Washington, DC.

Knapton, R. W. 1979. Birds of the Gainsborough-Lyleton region. Saskatchewan Natural History Society Special Publication 10. 72 pp.

Knopf, F. L. 1991. Status and conservation of mountain plovers: the evolving regional effort. Report of research activities. USFWS National Ecology Research Center, Fort Collins, CO. 9 pp.

Knowles, C. J. 2002. Status of the white-tailed and Gunnison's prairie dog. Environmental Defense and National Wildlife Federation. FaunaWest Wildlife Consultants. Boulder, MT.

Knowles, C., and P. Knowles. 1997. Mountain Plover Numbers, Reproduction, and Habitat Use in Montana: A Summary of Six Survey Years. FaunaWest Wildlife Consultants. Prepared for the Montana Department of Fish, Wildlife & Parks, Great Falls, MT, and the Bureau of Land Management, Billings, MT. April 22, 1997.

Knowles, C., P. Knowles, M. Maj, and D. Hinckley. 1995. Mountain Plover Numbers, Reproduction, and Habitat Use in Three Areas of Montana. Prepared by FaunaWest Wildlife Consultants for the Bureau of Land Management, Billings, MT.

Knowles, C. J., and P. R. Knowles. 1993. Mountain plover numbers, reproduction, and habitat use in three areas of Montana. Unpublished report for the Bureau of Land Management, Billings, MT. 50 pp.

Knowles, C. J., and P. R. Knowles. 1984. Additional records of mountain plovers using prairie dog towns in Montana. Prairie Naturalist 16:183–186.

Knowles, C. J., C. J. Stoner, and S. P. Gieb. 1982. Selective use of black-tailed prairie dog towns by mountain plovers. Condor 84:71–74.

Knudsen, K., C. Muhlfeld, K. Sage, and R. Leary. In-prep. Genetic differences among populations of redband trout in the Kootenai River drainage, Montana. Transactions of the American Fisheries Society.

Koch, E. D., and C. R. Peterson. 1995. Amphibians and reptiles of Yellowstone and Grand Teton national parks. University of Utah Press, Salt Lake City, UT. 188 pp. + xviii.

Koehler, G. M., and J. D. Brittell. 1990. Managing spruce-fir habitat for lynx and snowshoe hares. Journal of Forestry, October 1990.

Koehler, G. M., M. G. Hornocker, and H. S. Hash. 1979. Lynx movements and habitat use in Montana. Canadian Field-Naturalist 93(4):441–442.

Koford, C. B. 1958. Prairie dogs, whitefaces, and blue grama. Wildlife Monograph 3:1–78.

Kootenai Tribe of Idaho and Montana Fish, Wildlife & Parks. 2004. Public Review Draft Kootenai Subbasin Plan. Executive Summary. Report prepared for the Northwest Power and Conservation Council. Portland, OR.

Korman, J., and C. J. Walters. 1999. Summary of the Kootenai River Adaptive Environmental Assessment modeling exercise. Prepared for the Kootenai Tribe of Idaho. Ecometric Research Inc., Vancouver, B.C., Canada.

Kotliar, N. B., S. Heil, R. L. Hutto, V. A. Saab, C. P. Melcher, and M. E. McFadzen. 2002. Effects of fire and post-fire salvage logging on avian communities in conifer-dominated forests of the western United States. Studies in Avian Biology 25:49–64.

Kovalak, W. P., S. D. Dennis, and J. M. Bates. 1986. Sampling effort required finding rare species of freshwater mussels. Pp. 34–45 in B. G. Isom, ed. Rationale for sampling and interpretation of ecological data in the assessment of freshwater ecotypes. American Society for Testing and Material, Special Technical Publication No. 894.

Krapu, G. L., and R. K. Green. 1978. Breeding bird populations of selected semi-permanent wetlands in south-central North Dakota. American Birds 32:110–112.

Krentz, Steven. 1997a. Stocking/augmentation plan for the pallid sturgeon (*Scaphirhynchus albus*) in Recovery Priority Management Areas 1 and 2 in Montana and North Dakota. U.S. Fish and Wildlife Service. Bismarck, ND. 38 pp.

Kruse, C. G., W. A. Hubert, and F. J. Rahel. 2000. Status of Yellowstone cutthroat trout in Wyoming waters. North American Journal of Fisheries Management 20:693–705.

Krutzsch, P. H. 1954. North American jumping mice (genus *Zapus*). University of Kansas Publications, Museum of Natural History 7:349–472.

Kuchel, C. R. 1977. Some aspects of the behavior and ecology of harlequin ducks breeding in Glacier National Park, Montana. M.S. thesis, University of Montana, Missoula, MT. 160 pp.

Kushlan, James A., Melanie J. Steinkamp, Katherine C. Parsons, Jack Capp, Martin Acosta Cruz, Malcolm Coulter, Ian Davidson, Loney Dickson, Naomi Edelson, Richard Elliot, R. Michael Erwin, Scott Hatch, Stephen Kress, Robert Milko, Steve Miller, Kyra Mills, Richard Paul, Roberto Phillips, Jorge E. Saliva, Bill Sydeman, John Trapp, Jennifer Wheeler, and Kent Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, Version 1. Waterbird Conservation for the Americas, Washington, DC. 78 pp.

Lampe, R. P., J. K. Jones Jr., R. S. Hoffman, and E. C. Birney. 1974. The mammals of Carter County, southeastern Montana. Occasional Paper. Museum of Natural History, University of Kansas 25:1–39.

Leach, J. H., and 5 co-authors. 1977. Responses of percids and their habitats to eutrophication. Journal of the Fisheries Research Board of Canada 34:1964–1971.

Leary, R. F., F. W. Allendorf, and N. Kanda. 1998. Lack of Genetic Divergence between Westslope Cutthroat Trout from the Columbia and Missouri River Drainages. Wild Trout and Salmon Genetics Laboratory Report 97/1. Missoula, MT.

Leary, R. F., F. W. Allendorf, and S. H. Forbes. 1993. Conservation genetics of bull trout in the Columbia and Klamath River drainages. Conservation Biology 7:856–865.

Leary, R. F. 1991. Establishment, maintenance, and use of a genetic reserve of Big Hole River arctic grayling. Wild Trout and Salmon Genetics Laboratory Report 91/5. University of Montana, Missoula, MT.

Leary, R. F, F. W. Allendorf, and K. G. Sage. 1991. Genetic analysis of trout populations in the Yaak River drainage, Montana. Wild Trout and Salmon Genetics Laboratory Report 91/3. University of Montana, Missoula, MT.

Leathe, S. A., and M. D. Enk. 1985. Cumulative effects of micro-hydro development on the fisheries of the Swan River drainage, Montana. Report prepared for Bonneville Power Administration, Division of Fish and Wildlife. 114 pp. + appendices.

Lee, S., et al. 1980. Atlas of North American freshwater fishes. North Carolina State Museum of Natural History. Raleigh, NC.

Lehmkuhl, J. F. 1984. Determining size and dispersion of minimum viable populations for land management planning and species conservation. Environmental Management 8(2):167–176.

Lenard, S., J. Carlson, J. Ellis, C. Jones, and C. Tilly. 2003. P. D. Skaar's Montana Bird Distribution, 6th ed. Montana Audubon Society, Helena, MT. 144 pp + vi.

Leonard, M. L., and M. B. Fenton. 1983. Habitat use by spotted bats (*Euderma maculatum*, Chiroptera: Vespertilionidae): roosting and foraging behavior. Canadian Journal of Zoology 61:1487–1491.

Lesica. 2005. Restoring green ash regeneration from seed in declining hardwood draws. Unpublished report.

Lewis, S. E. 1994. Night roosting ecology of pallid bats (*Antrozous pallidus*) in Oregon. American Midland Naturalist 132:219–226.

Li, H. W., and P. B. Moyle. 1981. Ecological analysis of species introductions into aquatic systems. Transactions of the American Fisheries Society 110:772–782.

Licht, D. S., and K. D. Sanchez. 1993. Association of black-tailed prairie dog colonies with cattle point attractants in the northern Great Plains. Great Basin Naturalist 53:385–389.

Liebelt, J. E. 1996. Lower Missouri River and Yellowstone River pallid sturgeon study, 1994–1995. Montana Department of Fish, Wildlife & Parks. Helena, MT.

Linkhart, B. D., and R. T. Reynolds. 1997. Territories of flammulated owls (*Otus flammeolus*): is occupancy a measure of habitat quality? Pp. 150–154. J. R. Duncan, D. H. Johnson, and T. H. Nicholls, eds. Biology and conservation of owls in the Northern Hemisphere.

Linkhart, B. D. 1984. Range, activity, and habitat use by nesting flammulated owls in a Colorado ponderosa pine forest. Master's thesis, Colorado State University, Fort Collins, CO.

Lohr, S. C., P. A. Byorth, C. M. Kaya, and W. P. Dwyer. 1996. High temperature tolerances of fluvial arctic grayling and comparisons with summer water temperatures of the Big Hole River, Montana. Transactions of the American Fisheries Society 125:933–939.

Long, M. H. 1997. Sociological implications of bull trout management in northwest Montana: illegal harvest and game warden efforts to deter poaching. Pp. 71–73. W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Lowe, C. H. Jr. 1950. The systematic status of the salamander (*Plethodon hardii*) with a discussion of problems in Aneides. Copeia 1950:92–99.

MacRae, P. S. D., and D. A. Jackson. 2000. The influence of smallmouth bass (*Micropterus dolomieui*) predation and habitat complexity on the structure of littoral zone fish assemblages. Canadian Journal of Fisheries and Aquatic Sciences 58:342–351.

Magee, J. P. 2000. Montana fluvial arctic grayling recovery project: annual monitoring report.

Magee, J. P., and P. A. Byorth. 1995. Competitive interactions of fluvial arctic grayling and sympatric species in the Big Hole River drainage, Montana. Submitted to Fluvial Arctic Grayling Workgroup. Montana Fish, Wildlife & Parks, Bozeman, MT.

Magee, J. P., and P. A. Byorth. 1994. Competitive interactions of fluvial arctic grayling (*Thymallus arcticus*) and brook trout (*Salvelinus fontinalis*) in the upper

Big Hole River, Montana. Submitted to Fluvial Arctic Grayling Workgroup. Montana Fish, Wildlife & Parks, Bozeman, MT.

Marcuson, P. E. 1977. Overgrazed streambanks depress fishery production in Rock Creek, Montana, pp. 143–156. In: Proceedings of the workshop on livestock and wildlife-fisheries relationships in the Great Basin. University of California, Agricultural Station, Sci. Spec. Publ. 3301, Berkeley, CA.

Marks, Jeffrey S., and Victoria Saab Marks. 1988. Winter habitat use by Columbian sharp-tailed grouse in western Idaho. Journal of Wildlife Management 52(4):743–746.

Marnell, Leo. 2004. NPS, personal communication.

Marnell, L. F. 1997. Herpetofauna of Glacier National Park. Northwest Naturalist 78:17–33.

Marnell, L. F. 1985. Bull trout investigations in Glacier National Park, Montana. Pp. 33–35 in D. D. MacDonald, ed. Proceedings of the Flathead River Basin bull trout biology and population dynamics modeling information exchange. Fisheries Branch, British Columbia Ministry of Environment, Cranbrook, B.C.

Marti, C. 1997. Flammulated owls (*Otus flammeolus*) breeding in deciduous forests. Pp. 262–266 in J. R. Duncan, D. H. Johnson, and T. H. Nicholls, eds. Biology and conservation of owls in the Northern Hemisphere. U.S.D.A. Forest Service General Technical Report.

Matthews, W. L., and J. E. Swenson. 1982. The mammals of east-central Montana. Proceedings of the Montana Academy of Sciences 39:1–13.

Matthews, W. L. 1980. The meadow jumping mouse in southeastern Montana. Prairie Naturalist 12(2):63–64.

Maxell, B. A., G. Hokit, J. Miller, and K. Werner. 2004 (unpublished). Detection of *Batrachochytrium dendrobatidis*, the chytrid fungus associated with global amphibian declines, in Montana amphibians. Unpublished memo. University of Montana, Missoula, MT.

Maxell, B., K. Werner, P. Hendricks, and D. Flath. 2003. Herpetology in Montana: a history, status summary, checklists, dichotomous keys, accounts for native, potentially native, and exotic species, and indexed bibliography. Olympia, WA: Society for Northwestern Vertebrate Biology. Northwest Fauna 5:1–138.

Maxell, B. A., K. J. Nelson, and S. Browder. 2002. Record clutch size and observations on breeding and development of the western toad (*Bufo boreas*) in Montana. Northwestern Naturalist 83:27–30.

Maxell, B. A. 2002. Geographic Distribution. *Plethodon idahoensis*. Herpetological Review 33(2):144.

Maxell, B. A. 2002. Database file of herpetological observations from 2001.

Maxell, B. A. 2000. Management of Montana's amphibians: a review of factors that may present a risk to population viability and accounts on the identification, distribution, taxonomy, habitat use, natural history, and the status and conservation of individual species. Contract No. 43-0343-0-0224. September 20, 2000.

May, B. E., W. Urie, and B. B. Shepard. 2003. Montana Cooperative Fishery Research Unit. Range-wide status of Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*): 2001.

May, B. E. 1998. Yellowstone cutthroat trout: current status and conservation recommendations with the state of Montana. U.S.D.A. Forest Service, Gallatin National Forest, Bozeman, MT.

May, B. E. 1996. Yellowstone cutthroat trout. Pp. 11–34 in D. Duff, ed. Conservation assessment for inland cutthroat trout: distribution, status and habitat management implications. U.S.D.A. Forest Service–Northern, Rocky Mountain, Intermountain, and Southwestern regions.

MBTRT (Montana Bull Trout Restoration Team). 2000. Restoration plan for bull trout in the Clark Fork River basin and Kootenai River basin, Montana. Montana Department of Fish, Wildlife & Parks, Helena, MT. 116 pp.

McCallum, D. A. 1994a. Flammulated owl (*Otus flammeolus*). In The Birds of North America, No. 93, A. Poole and F. Gill, eds. Philadelphia, PA: The Academy of Natural Sciences and Washington, DC: The American Ornithologists' Union. 24 pp.

McCallum, D. A. 1994b. Review of technical knowledge: flammulated owls. Pp. 14–46 in G. D. Hayward and J. Verner, eds. Flammulated, boreal and great gray owls in the United States: a technical conservation assessment. U.S.D.A. Forest Service General Technical Report.

McClelland, B. R., S. S. Frissell, W. C. Fischer, and C. H. Halvorson. 1979. Habitat management for hole-nesting birds in forests of western larch and Douglas-fir. Journal of Forestry 77:480–483.

McGowan, T. A. 1970. Antelope management and BLM's wildlife habitat management planning system.

McIntyre, J. D., and B. E. Rieman. 1995. Westslope Cutthroat Trout. Pp. 1–15 in Conservation Assessment for Inland Cutthroat Trout. M. K. Young, tech. ed. General Technical Report RM-256. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

McIntyre, J. W., and J. F. Barr. 1997. Common loon (*Gavia immer*). In The Birds of North America., No. 313, A. Poole and F.Gill, eds. The Academy of Natural Sciences, Philadelphia, PA, and the American Ornithologists' Union, Washington, DC.

McIver, J. D, and L. Starr. 2001. A literature review on the environmental effects of post fire. Western Journal of Applied Forestry 16:159–168.

McMahon, T. E. 1999. Status of sauger in Montana. Montana Fish, Wildlife & Parks report, Helena, MT.

McMahon, T. E., and W. M. Gardner. 2001. Status of sauger in Montana. Intermountain Journal of Sciences 7:1–21.

McPhail, J. D., and V. L. Paragamian. 2000. Burbot biology and life history. Pp. 11–23 in V. L. Paragamian and D. W. Willis, eds. Burbot: biology, ecology and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda, MD.

Mech, L. D. 1989. Wolf population survival in an area of high road density. American Midland Naturalist 121:387–389.

Mech, L. D., et al. 1988. Wolf distribution and road density in Minnesota. Wildlife Society Bulletin 16:85–87.

Meehan, W. R., and T. C. Bjornn. 1991. Salmonid distributions and life histories. Pp. 76–78 in influences of forest and rangeland management on salmonid fishes and their habitats, W. R. Meehan, ed. American Fisheries Society Special Publication 19, Bethesda, MD.

Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout (*Onchorhynchus clarki lewisi*) in Montana. 1999. Montana Fish, Wildlife & Parks.

Merriam, C. H. 1902. The prairie dog of the Great Plains. Pp. 257–270 in USDA Yearbook Agriculture for 1901. U.S. Government Printing Office, Washington, DC.

Miller, B., R. P. Reading, and S. Forrest. 1996. Prairie Night. Smithsonian Institute Press. Washington DC. 320 pp.

Miller, B., G. Ceballos, and R. Reading. 1994. The prairie dog and biotic diversity. Conservation Biology 8(3):677–681.

Miller, J. D. 1978. Observations on the diet of *Rana pretiosa, Rana pipiens*, and *Bufo boreas* from western Montana. Northwestern Science 52:243–249.

Mississippi and Central Flyway Councils. 1997. Subcommittee on the Interior Population of Trumpeter Swans. Mississippi and central flyway management plan for the interior population of trumpeter swan. Mississippi and Central Flyway Councils, c/o USFWS, Migratory Bird Coordinator, Twin Cities, MN.

Mitchell, C. D. 1994. Trumpeter swan (*Cygnus buccinator*). In The Birds of North America, No. 105, A. Poole and F. Gill, eds. Philadelphia, PA: The Academy of Natural Sciences and Washington, DC: The American Ornithologists' Union.

Molini, W. A., and G. K. Tsukamoto. 1979. Individual species management plans.

Molini, W. A. 1976. Chukar Partridge, Species Management Plan. Montana Fish, Widlife & Parks.

Montagne, C., L. C. Munn, G. A. Nielsen, J. W. Rogers, and H. E. Hunter. 1982. Soils of Montana (including 1:1,000,000 General Soils Map). Bulletin 744. Montana Agricultural Experiment Station and U.S. Department of Agriculture, Soil Conservation Service, Bozeman, MT.

Montana Bald Eagle Working Group. 1994. Montana Bald Eagle management plan. 2nd ed. Bureau of Reclamation. 104 pp.

Montana Bald Eagle Working Group. 1991. Habitat management guide for bald eagles in northwestern Montana. 29 pp.

Montana Bird Distribution Committee. 1996. Skaar's Montana Bird Distribution, 5th ed. Special Publication No. 3. Montana Natural Heritage Program, Helena, MT. 130 pp.

Montana Bird Distribution Online Database. 2003. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Montana Bird Distribution Online Database (web application). 2002. Helena, MT. Montana Audubon Society. Available at http://MNHP.nris.state.mt.us/mbd/ (accessed October 7, 2002).

Montana Bird Distribution Online Database. 2001. Helena, MT. April–September 2003. http://MNHP.nris.state.mt.us/mbd/.

Montana Department of State Lands. Flathead County Park Board. 1988. Proposed Master Plan for Owen Sowerwine State Natural Area.

Montana Fish, Wildlife & Parks. 2004. Memorandum of Understanding and Conservation Agreement for Sauger (*Sander canadensis*) in Montana. 23 pp. Draft—in progress.

Montana Fish, Wildlife & Parks. 2003. Montana Gray Wolf Conservation and Management Plan.

Montana Fish, Wildlife & Parks. 2003. Online information search on least tern in Montana. http//www.fwp.state.mt.us/wildthings/t&e/threatened.asp (accessed May 19, 2003).

Montana Fish, Wildlife, and Parks. 2003. Online information search on piping plovers in Montana. http://www.fwp.state.mt.us/wildthings/t&e/threatened.asp.

Montana Fish, Wildlife & Parks. 2002. Grizzly Bear Management Plan for Southwestern Montana, 2002–2012.

Montana Fish, Wildlife & Parks. 2001. Conservation Plan for Grizzly Bear in Montana. Pursuant to Section 6(C)(1) of the Endangered Species Act and Montana Fish, Wildlife & Parks Endangered Wildlife Program E-6. Montana Department of Fish, Wildlife & Parks, 1420 East Sixth Avenue, P.O. Box 200701, Helena, MT 59620.

Montana Fish, Wildlife & Parks. 1999. Memorandum of Understanding and Conservation Agreement for Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) in Montana. Helena, MT.

Montana Fish, Wildlife & Parks. 1996. Management of Mountain Lions in Montana: Final EIS.

Montana Fish, Wildlife & Parks. 1994. Hauser Reservoir: fisheries management plan: September 1989–September 1994. 16 pp.

Montana Fish, Wildlife & Parks. 1994. Statewide Habitat Plan. Implementation of Fish, Wildlife & Parks Commission Habitat Montana Policy. 44 pp.

Montana Fish, Wildlife & Parks. 1992. North-central Montana black-footed ferret reintroduction and management plan. Prepared by North Central Montana Working Group. 59 pp.

Montana Fluvial Arctic Grayling Workgroup. 1995. Montana Fluvial Arctic Grayling Restoration Plan. Montana Department of Fish, Wildlife & Parks, Helena, MT.

Montana Greater Sage-Grouse Work Group. 2004. Management plan and conservation strategies for greater sage-grouse in Montana.

Montana Natural Heritage Program Online Database. http://MNHP.nris.state.mt.us/animalguide (accessed April 26, 2004).

Montana Natural Heritage Program. Montana Field Guide. Northern leopard frog. Online database. http://fwp.state.mt.us/fieldguide (accessed November 19, 2003).

Montana Natural Heritage Program (MNHP): Biological and Conservation Database. 2002. Helena, MT. (Accessed: October 7, 2002.)

Montana Natural Heritage Program. 1987. Status report on the Coeur d' Alene salamander (*Plethodon idahoensis*) in Montana. Unpublished mimeo. U.S.D.A. Forest Service, Kootenai National Forest and Lolo National Forest, Libby, MT.

Montana Online Animal Field Guide. 2004. http://www.fwp.state.mt.us/fieldguide/help.aspx#overview (accessed May 27, 2004). Montana Heritage Program and Montana Department of Fish, Wildlife & Parks. Helena, MT.

Montana Online Animal Field Guide. 2004. Montana Heritage Program and Montana Department of Fish, Wildlife & Parks, Helena, MT. http://www.fwp.state.mt.us/fieldguide/help.aspx#overview (accessed May 18, 2004).

Montana Partners for Fish & Wildlife. 2000. Big Hole River Watershed. 4 pp. More information at http://www.r6.fws/gpv/pfw/montana/mt3c.htm.
Montana Partners in Flight Online Database. http://biology.dbs.umt.edu/landbird/mbcp/mtpif (accessed April 26, 2004).

Montana Piping Plover Recovery Committee. 1995. 1994 Surveys for Piping Plover (*Charadrius melodus*) and Least Tern (*Sterna antillarum*) in Montana. 117 pp. + appendices.

Montana Piping Plover Recovery Committee. 1994. 1993 Surveys for Piping Plover (*Charadrius melodus*) and Least Tern (*Sterna antillarum*) in Montana. Unpublished report. 116 pp. + appendices.

Montana Piping Plover Working Group. 2003. Montana Piping Plover Management Plan. Unpublished report. 35 pp.

Montana-North Dakota Paddlefish Management Plan. 1995. A cooperative venture between North Dakota Game & Fish Department, Montana Department of Fish, Wildlife & Parks, and University of Idaho. 45 pp.

Mosimann, J. E., and G. B. Rabb. 1952. The herpetology of the Tiber Reservoir area, Montana. Copeia 1952:23–27.

Moss, R. E., J. W. Scanlan, and C. S. Anderson. 1983. Observations on the natural history of the blue sucker (*Cycleptus elongatus LeSueur*) in the Neosho River. The American Midland Naturalist 109(1):15–22.

Mueggler, W. F., and W. L. Stewart. 1980. Grassland and Shrubland Habitat Types of Western Montana. U.S.D.A. Forest Service.

Muhlfeld, C. C., D. H. Bennett, and B. Marotz. 2001 (in press). Summer habitat use by redband trout in the Kootenai River drainage, Montana. North American Journal of Fisheries Management (February).

Muhlfeld, C. C. 1999. Seasonal habitat use by redband trout (*Oncorhynchus mykiss gairdneri*) in the Kootenai River drainage, Montana. Master's thesis, University of Idaho, Moscow, ID.

Murray, B. G., Jr. 1969. A comparative study of Le Conte's and sharp-tailed sparrows. Auk 86:199–231.

Mussehl, T., P. Schladweiler, and R. Weckwerth. 1971. Forest grouse. Pp. 143–151 in T. W. Mussehl and F. W. Howell, eds. Game management in Montana. Montana Fish and Game Department, Game Management Division, Helena, MT.

Nagorsen, D., and R. M. Bringham. 1993. Bats of British Columbia. University of British Columbia Press, Vancouver, B.C. 164 pp.
National Academy of Sciences. 1998. Brucellosis in the Greater Yellowstone Area, by N. F. Cheville, D. R. McCullough, and L. R. Paulson. Washington, DC: National Academy Press.

National Wildlife Federation and the Natural Resources Defense Council. 2001. Conservation Management of America's Public Lands: An Assessment and Recommendations for Progress 25 Years after FLPMA.

NatureServe Explorer. http://www.natureserve.org/explorer (accessed June 5, 2004). Montana Animal Field Guide. http://MNHP.nris.state.mt.us/animalguide/ (accessed June 5, 2004).

NatureServe Explorer. 2004. An online encyclopedia of life. Version 3.0. http://www.natureserve.org/explorer (accessed April 22, 2004).

Nelson, J. S., and M. J. Paetz. 1992. The fishes of Alberta, 2nd ed. The University of Alberta Press, Edmonton, and the University of Calgary Press.

Nelson, R. L., M. L. McHenry, and W. S. Platts. 1991. Mining. Pp. 425–458. W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19, Bethesda, MD.

Nelson, W. R., and C. H. Walburg. 1977. Population dynamics of yellow perch (*Perca flavescens*), sauger (*Stizostedion candense*), and walleye (*S. vitreum vitreum*) in four Missouri River reservoirs. Journal of the Fisheries Research Board of Canada 34:1748–1763.

Nelson, W. R. 1968. Reproduction and early life history of sauger (*Stizostedion canadense*) in Lewis and Clark Lake. Transactions of the American Fisheries Society 97:159–166.

Nesser, J. A., G. L. Ford, C. L. Maynard, D. S. Page-Dumroese. 1997. Ecological Units of the Northern Region Subsection. General Technical Report INT-GTR-369. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 88 pp.

Nicholson, A. J. 1950. A record of the spotted bat (*Euderma maculatum*) for Montana. Journal of Mammalogy 31:197.

North American Waterfowl Management Plan. 1998. Expanding the Vision (update). 32 pp.

Northcote, T. G. 1973. Some impacts of man on Kootenay Lake and its salmonids. Great Lakes Fisheries Commission Technical Report 25. Northern Prairie Wildlife Research Center: Biological Resources—Eastern Bluebird. United States Geological Survey: http://www.npwrc.usgs.gov (last updated February 21, 2003).

Northern Rocky Mountain Wolf Recovery Team. 1980. Northern Rocky Mountain wolf recovery plan interagency report. 67 pp.

Noss, R., G. Wuerthner, K. Vance-Borland, and C. Carroll. 2001. A Biological Conservation Assessment for the Utah-Wyoming Rocky Mountain Ecoregion: Report to The Nature Conservancy. Conservation Science, Inc. 125 pp. + Executive Summary and Appendix D.

Novinger, D. C., and F. J. Rahel. 1999. Exploring Competitive Mechanisms That Allow Nonnative Brook Trout to Displace Native Cutthroat Trout in a Rocky Mountain Stream. American Fisheries Society 129th Annual Meeting Abstracts. Charlotte, NC.

Nussbaum, R. A., E. D. Brodie, Jr., and R. M. Storm. 1983. Amphibians and reptiles of the Pacific Northwest. University Press of Idaho. 332 pp.

Olsen, David L. 1980. Whooping Crane Recovery Plan. Whooping Crane Recovery Team (USFWS, Nebraska Game and Parks Commission, Texas Parks & Wildlife Department, National Audubon Society). 206 pp.

Olson, S. L. 1985. Mountain plover food items on and adjacent to a prairie dog town. The Prairie Naturalist 17(2):83–90.

Olson, S. L., and D. Edge. 1985. Nest site selection by mountain plovers in north-central Montana. Journal of Range Management 38(3):280–282.

Olson-Edge, S. L., and W. D. Edge. 1987. Density and distribution of the mountain plover on the Charles M. Russell National Wildlife Refuge. The Prairie Naturalist 19(4):233–238.

Ormiston, J. H. 1973. Fleecer Mountain game range. Game management plan. Montana Fish and Game.

Orth, P. B., and P. L. Kennedy. 2001. Do land-use patterns influence nest site selection by burrowing owls (*Athene cuncularia hypugaea*) in northeastern Colorado. Canadian Journal of Zoology 79:1038–1045.

Osborn, B. 1942. Prairie dogs in shinnery (oak scrub) savannah. Ecology 23:110–5.

Ostlie, W. R, R. E. Schneider, J. M. Aldrich, T. M. Faust, R. L. B. McKim, and S. J. Chaplin. 1997. The status of biodiversity in the Great Plains. The Nature Conservancy, Arlington, VA. 326 pp. + XII.

Pacific Flyway Council and USFWS. 2003. Pacific Flyway Implementation Plan for the Rocky Mountain Population of Trumpeter Swans 2003 Annual Report. 29 pp.

Paige, L. C. 2000. America's Wildlife: The Challenge Ahead. International Association of Fish and Wildlife Agencies, Washington, DC.

Paragamian, V. L. 2000. The effects of varying flows on burbot spawning migrations in the Kootenai River, Idaho and British Columbia, Canada, after construction of the Libby Dam. Pp. 111–123 in V. L. Paragamian and D. W. Willis, eds. Burbot: biology, ecology and management. American Fisheries Society, Fisheries Management Section, Publication Number 1, Bethesda, MD.

Parker, T., and M. Scott. 1985. Bighorn Sheep Management Plan.

Parkinson, E. A. 1984. Genetic variation in populations of steelhead trout (*Salmo gairdneri*) in British Columbia. Canadian Journal of Fisheries and Aquatic Sciences 41:1412–1420.

Partners in Amphibian and Reptile Conservation. 1999. Conserving Amphibians and Reptiles in the New Millennium. Conference: June 2–4, 1999, Atlanta, Georgia. http://www.parcplace.org (accessed May 20, 2004).

Pattie, D. L., and R. S. Hoffmann. 1992. Mammals of the North American Parks and Prairies. Self-published.

Paulson, D. D. 1988. *Chaetodipus hispidus*. American Society of Mammalogists, Mammalian Species 320:1–4.

Pavelka, Greg. 2003. Threatened and Endangered Species Specialist. U.S. Army Corps of Engineers, Operations Division, Omaha District, Gavings Pt. Project Office. Personal communication regarding recent river censuses of least terns in Montana. August 12, 2003.

Payne, B. S., A. C. Miller, and R. Whiting. 1997. Designing a riverine mussel survey. Pp. 150–156 in K. S. Cummings, A. C. Buchanan, C. A. Mayer, and T. J. Naimo, eds. Conservation and management of freshwater mussels II: initiatives for the future. Proceedings of a UMRCC symposium, October 16–18, 1995, St. Louis, Missouri. Upper Mississippi River Conservation Committee, Rock Island, IL.

Pearson, Dean E. 1999. Small mammals of the Bitterroot National Forest: a literature review and annotated bibliography. General Technical Report RRS-GTR-25. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 63 pp.

Pefaur, J. E., and R. S. Hoffman. 1971. Merriam's shrew and hispid pocket mouse in Montana. American Midland Naturalist 86:247–248.

Pegg, M. A., P. W. Bettoli, and J. B. Layzer. 1997. Movement of saugers in the lower Tennessee River determined by radio telemetry, and implications for management. North American Journal of Fisheries Management 17:763–768.

Penkal, R. F. 1992. Assessment and requirements of sauger and walleye populations in the lower Yellowstone River and its tributaries. Montana Department of Fish, Wildlife & Parks report, Helena, MT.

Perkinson, R. D. 1993. Presentation to the American Fisheries Society, Montana Chapter, February 17, 1993.

Perry, T. W., P. M. Cryan, S. R. Davenport, and M. A. Bogan. 1997. New locality for *Euderma maculatum* (Chiroptera: Vespertilionidae) in New Mexico. Southwestern Naturalist 42:99–101.

Petranka, J. W., M. E. Eldridge, and K. E. Haley. 1993. Effects of timber harvesting on southern Appalachian salamanders. Conservation Biology 7:363–370.

Pfister. R. D., B. L. Kovalchik, S. F. Arno, and R. C. Presby. 1977. Forest habitat types of Montana. U.S.D.A. Forest Service.

Pflieger, W. L. 1997. The fishes of Missouri. Missouri Department of Conservation, Jefferson City, MO.

Pflieger, W. 1975. The fishes of Missouri. Missouri Department of Conservation. Jefferson City, MO.

Pierson, E. D., M. C. Wackenhut, J. S. Altenbach, P. Bradley, P. Call, D. L. Genter, C. E. Harris, B. L. Keller, B. Lengus, L. Lewis, B. Luce, K. W. Navo, J. M. Perkins, S. Smith, and L. Welch. 1999. Species conservation assessment and strategy for Townsend's big-eared bat (*Corynorhinus townsendii townsendii* and *Coynorhinus townsendii pallescens*). Idaho Conservation Effort, Idaho Department of Fish and Game, Boise, ID.

Pierson, E. D., and W. E. Rainey. 1998. Distribution of the spotted bat (*Euderma maculatum*) in California. Journal of Mammalogy 79:1296–1305.

Platts, W. S. 1991. Livestock grazing, pp. 389–424. In: W. R. Meehan, ed. Influences of forest and rangeland management on salmonid fishes and their habitats. American Fisheries Society Special Publication 19:389–423.

Platts, W. S. 1989. Compatibility of livestock grazing strategies with fisheries, pp. 103–110. In: R. E. Gresswell, B. A. Barton, J. L. Kershner, eds. Practical approaches to riparian resource management. U.S. Bureau of Land Management, P.O. Box 36800, Billings, MT.

Platts, W. S. 1981b. Influence of forest and rangeland management on anadromous fish habitat in western North America: 7. Effects of livestock grazing. U.S.D.A. Forest Service General Technical Report PNW-124.

Priday, J., and B. Luce. 1997. Inventory of bats and bat habitat associated with caves and mines in Wyoming. Endangered and nongame bird and mammal investigations annual completion report, pp. 50–109. Nongame Program, Biological Science.

Rabe, M. J., M. S. Siders, C. R. Miller, and T. K. Snow. 1998. Long foraging distance for a spotted bat (*Euderma maculatum*) in northern Arizona. Southwestern Naturalist 43:266–269.

Rahel, F. J. 2002. Homogenization of freshwater faunas. Annual Review of Ecology and Systematics 33:291–315.

Rahel, F. J. 2000. Homogenization of fish faunas across the United States. Science 288:854–856.

Rahel, F. J. 1990. The hierarchical nature of community persistence: a problem of scale. American Naturalist 136:328–334.

Ratliff, D. E. 1992. Bull trout investigations in the Metolius River-Lake Billy Chinook system. Pp. 37–44 in P. J. Howell and D. V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, OR.

Ratliff, D. E., and P. J. Howell. 1992. The status of bull trout populations in Oregon. Pp. 10–17 in P. J. Howell and D. V. Buchanan, eds. Proceedings of the Gearhart Mountain bull trout workshop. Oregon Chapter of the American Fisheries Society, Corvallis, OR.

Rauscher, R. 1997. Status and distribution of the pygmy rabbit in Montana. Montana Department of Fish, Wildlife & Parks, nongame program. Unpublished report. 19 pp. + appendices.

Rawson, M. R., and R. L. Scholl. 1978. Reestablishment of sauger in western Lake Erie. Pp. 261–265 in R. L. Kendall, ed. Selected cool water fishes of North America. American Fisheries Society Special Publication 11. Bethesda, MD.

Redmond, R. L., M. M. Hart, J. C. Winne, W. A. Williams, P. C. Thornton, Z. Ma, C. M. Tobalske, M. M. Thornton, K. P. McLaughlin, T. P. Tady, F. B. Fisher, and S. W. Running. 1998. The Montana Gap Analysis Project: Final Report. Unpublished report. Montana Cooperative Wildlife Research Unit, University of Montana, Missoula, MT.

Redmond, R. L., and D. A. Jenni. 1986. Population ecology of the long-billed curlew (*Numernius americanus*) in western Idaho. Auk 103:755–767.

Reed, J. M. 1995. Relative vulnerability to extirpation of montane breeding birds in the Great Basin. Great Basin Naturalist 55:342–351.

Rehwinkle, B. 1978. Powder River aquatic ecology project. Report to Utah International, Inc. Salt Lake City, UT.

Reichel, J. D., and J. G. Corn. 1997. Northern bog lemmings: survey, population parameters, and population analysis. Unpublished report to the Kootenai National Forest. Montana Natural Heritage Program, Helena, MT. 27 pp.

Reichel, J. D. 1995. Montana Species of Special Concern. Montana Natural Heritage Program, Helena, MT. 10 pp.

Reichel, J. D. 1995. Preliminary amphibian and reptile survey of the Lewis and Clark National Forest: 1994. March 1995.

Reichel, J. D., and D. Flath. 1995. Identification of Montana's amphibians and reptiles. Montana Outdoors 26:15–34.

Reichel, J. D. and D. L. Genter. 1995. Harlequin duck surveys in western Montana: 1994. Montana Natural Heritage Program, Helena, MT.

Reichel, J. D. and S. G. Beckstrom. 1994. Northern bog lemming survey: 1993. Unpublished report. Montana Natural Heritage Program. Helena, MT. 87 pp.

Reynolds, R. T., and B. D. Linkhart. 1992. Flammulated owls in ponderosa pine: evidence of preference for old growth. In M. R. Kaufmann, W. H. Moir, and R. L. Bassett (tech. coord.). Old-growth forests in the Southwest and Rocky Mountain regions. U.S.D.A. Forest Service General Technical Report RM-213. 201 pp.

Reynolds, R. T., R. A. Ryder, and B. D. Linkhart. 1989. Small forest owls. Pp. 131–143 in National Wildlife Federation. Proceedings of the western raptor management symposium and workshop. National Wildlife Federation Scientific and Technical Series No.

Reynolds, R. T., and B. D. Linkhart. 1987. The nesting biology of flammulated owls in Colorado. Pp. 239–248 in R. W. Nero et al., eds. Biology and conservation of northern forest owls. U.S.D.A. Forest Service General Technical Report RM-142.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Inigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, and T. C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology, Ithaca, NY.

Richardson, L. 1986. On the track of the last black-footed ferrets. Nat. Hist. 95(2): 69–77.

Riehle, M., W. Weber, A. M. Stuart, S. L. Thiesfeld, and D. E. Ratliff. 1997. Progress report of the multi-agency study of bull trout in the Metolius River system, Oregon. Pp. 137–144 in W. C. Mackay, M. K. Brewin, and M. Monita, eds. Friends of the bull trout conference proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Canada, Calgary.

Rieman, B. E., and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. U.S.D.A. Forest Service General Technical Report INT-302. 40 pp.

Riley, Shawn J. Cougars in Montana: a review of biology and management and a plan for the future.

Roberts, H. B. 2001. Survey of pygmy rabbit distribution, numbers and habitat use in Lemhi and Custer counties, Idaho. Technical Bulletin No. 01-11. Idaho Bureau of Land Management.

Rodgers, T. L., and W. L. Jellison. 1942. A collection of amphibians and reptiles from western Montana. Copeia 1942:10–13.

Rolfe, E. S. 1899. Nesting of Nelson's sharp-tailed sparrow (*Ammodramus nelsoni*) in North Dakota. Auk 16:356–357.

Ross, C. P., D. A. Andrews, I. J. Witkind. 1955. Geologic Map of Montana, 1:500,000. U.S. Geological Survey.

Ross, R. L., and H. E. Hunter. 1976. Climax vegetation of Montana based on soils and climate (includes 1:1,000,000 map). U.S. Department of Agriculture, Soil Conservation Service, Bozeman, MT.

Ruediger, Bill, and 14 others on Lynx Biology Team. 2000. Canada Lynx Conservation Assessment and Strategy. 120 pp.

Ruelle, R., and K. D. Keenlyne. 1991. A contaminant evaluation of Missouri River pallid sturgeon. U.S. Fish and Wildlife Service. Pierre, SD. 25 pp.

Ruggles, M. P. 1997. Sections 2 and 3: Upper Inter-Reservoir I and Lower Yellowstone River, Montana. In: D. J. Dieterman, M. P. Ruggles, M. L. Wildhaber, and D. L. Galat, eds. Population structure and habitat use of benthic fishes along the Missouri and lower Yellowstone Rivers. 1997 Annual Report of Missouri River Benthic Fish Study PD-95-5832 to U.S. Army Corps of Engineers and U.S. Bureau of Reclamation.

Russell, A. P., and A. M. Bauer. 1993. The amphibians and reptiles of Alberta. University of Calgary Press, Calgary, Alberta, and University of Alberta Press, Edmonton, Alberta. 264 pp.

Saab, V. A., and J. S. Marks. 1992. Summer habitat use by Columbian sharp-tailed grouse in western Idaho. Great Basin Naturalist. 52:166–173.

Schmetterling, D. A., and M. H. Long. 1999. Montana anglers' inability to identify bull trout and other salmonids. Fisheries 24:24–27.

Schroeder, Michael A., Cameron L. Aldridge, Anthony D. Apa, Joseph R. Bohne, Clait E. Braun, S. Dwight Bunnell, John W. Connelly, Pat A. Deibert, Scott C. Gardner, Mark A. Hilliard, Gerald D. Kobriger, Susan M. McAdam, Clinton W. McCarthy, John J. McCarthy, Dean L. Mitchell, Eric V. Rickerson, and San J. Stiver. 2004. Distribution of greater sage-grouse in North America. Condor 106: 363–376.

Schulenberg, J., and M. Ptacek. 1984. Status of the interior least tern in Kansas. American Birds 38:975–981.

Schultz, L. P. 1941. Fishes of Glacier National Park, Montana. U.S. Department of the Interior Conservation Bulletin, No. 22. Washington, DC.

Schulz, T. T., and W. C. Leininger. 1990. Differences in riparian vegetation structure between grazed areas and exclosures. Journal of Range Management 43:295–299.

Scott, W. B., and E. J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada Bulletin 184.
Seabloom, R. W. 2002. Additional records of the hispid pocket mouse in North Dakota. The Prairie Naturalist 34:61–62.

Sergio, I., and I. Newton 2003. Occupancy as a measure of territory quality. Journal of Animal Ecology 72:857–865.

Servheen, C. 1993. Grizzly bear recovery plan. Unpublished report to the U.S. Fish and Wildlife Service. University of Montana, Missoula, MT. 181 pp.

Servheen, C. 1983. Grizzly bear food habits, movements and habitat selection in the Mission Mountains, Montana. Journal of Wildlife Management 47:1026–1035.

Shaffer, M. 1992. Keeping the grizzly bear in the American West: an alternative recovery plan. The Wilderness Society, Washington, DC.

Shaw, J. A., and T. S. Carter. 1990. Bison movements in relation to fire and seasonality. Wildlife Society Bulletin 18:426–430.

Shepard, B. B., B. E. May, W. Urie. 2003. Status of westslope cutthroat trout (*Onchorhyncus clarki lewisi*) in the United States: 2002. Westslope Cutthroat Conservation Team.

Shepard, B. B., and R. A. Oswald. 1989. Timing, location, and population characteristics of spawning Montana arctic grayling (*Thymallus arcticus montanus* [Milner]) in the Big Hole River drainage, 1988. Montana Department of Fish, Wildlife & Parks, Bozeman, MT.

Shepard, B. B., K. L. Pratt, and P. J. Graham. 1984. Life histories of westslope cutthroat trout and bull trout in the upper Flathead River Basin, Montana. Montana Department of Fish, Wildlife & Parks, Helena, MT.

Shryer, J. S., and D. S. Flath. 1980. First record of the pallid bat (*Antrozous pallidus*) from Montana. Great Basin Naturalist 40(2):115.

Skaar, D. 1989. Distribution, relative abundance, and habitat utilization of arctic grayling (*Thymallus arcticus*) in the upper Big Hole River drainage, Montana, July 5 to September 8, 1988. Report to Montana Natural Heritage Program, Beaverhead National Forest, and Montana Department of Fish, Wildlife & Parks, Bozeman, MT.

Skaar, D. 1990. Montana common loon management plan. Unpublished report prepared for U.S.D.A. Forest Service, Region 1. 61 pp.

Skaar, D. 1988. Creation of a management plan for the common loon in Montana. Pp. 101–102 in North American Loon Fund conference report.

Skaar, P. D. 1969. Birds of the Bozeman lat-long. P. D. Skaar, Pub., Bozeman, MT. 132 pp.

Slater, J. R., and J. W. Slipp. 1940. A new species of *Plethodon* from northern Idaho. Occasional papers of D. S. Smith. 1984. Habitat use, home range, and movements of bobcats in western Montana. M.S. thesis, University of Montana, Missoula, MT. 58 pp.

Smith, C. A., and G. N. Boz. 1977. Management plans for alternative uses of wildlife.

Snow, C. 1974. Habitat management series for endangered species Report No. 4. Spotted bat (*Euderma maculatum*). USDI Bureau of Land Management Technical Note TN 170.

Snyder, B. and R. Oswald. 2004. Status of native lake trout in Montana. Draft (in progress). Montana Fish, Wildlife & Parks. Helena, MT.

Spahr, R., L. Armstrong, D. Atwood, and M. Rath. 1991. Threatened, endangered, and sensitive species of the Intermountain Region. U.S.D.A. Forest Service, Ogden, UT.

Spruell, P., B. E. Rieman, K. L. Knudsen, F. M. Utter, and F. W. Allendorf. 1999. Genetic population structure within streams: microsatellite analysis of bull trout populations. Ecology of Freshwater Fish 8:114–121.

Stagliano, D. M. 2005. Aquatic Community Classification and Ecosystem Diversity in Montana's Missouri River Watershed. Report to the Bureau of Land Management. Montana Natural Heritage Program, Helena, Montana. 65 pp. plus appendices.

Stagliano, D. 2004. Systematic Survey Plan for the Freshwater Mussels in Montana. Montana Natural Heritage Program, Helena, MT. 10 pp.

Stash, S. W. 2001. Distribution, relative abundance, and habitat association of Milk River fishes related to irrigation diversion dams. Master's thesis, Montana State University, Bozeman, MT.

Statewide Habitat Plan. 1994. Implementation of Fish, Wildlife & Parks Commission. Habitat Montana Policy.

Stebbins, R. C. 2003. A field guide to western reptiles and amphibians. 3rd ed. Houghton Mifflin Company, Boston, MA. 533 pp.

Stebbins, R. C. 1985. Peterson Field Guides: Western Reptiles and Amphibians. Houghton Mifflin Company, Boston, MA.

Stewart, D. 1981. The biology of the sturgeon chub (*Hybopsis gelida Girard*) in Wyoming. Master's thesis, University of Wyoming, Laramie, WY.

Stewart, R. E. 1975. Breeding birds of North Dakota. Tri-College Center for Environmental Studies, Fargo, ND. 295 pp.

Stohlgren, T. J. 1998. Rocky Mountains. Pp. 473–504 in M. J. Mac, P. A. Opler, C. E. Puckett Haecker, and P. D. Doran, eds. Status and Trends of the Nation's Biological Resources. USDI U.S. Geological Survey, Washington, DC.

Storz, J. 1995. Local distribution and foraging behavior of the spotted bat (*Euderma maculatum*) in northwestern Colorado and adjacent Utah. Great Basin Naturalist 55(1):78–83.

Street, R. 1999. *Histrionicus histrionicus*. Animal Diversity Web. http://animaldiversity.ummz.umich.edu/accounts/information/Histrionicus histrionicus.html (accessed May 13, 2004).

Swanberg, T. R. 1996. The movement and habitat use of fluvial bull trout in the upper Clark Fork River drainage. Master's thesis, University of Montana, Missoula, MT. 61 pp.

Swenson, J. E., and G. F. Shanks, Jr. 1979. Noteworthy records of bats from northeastern Montana. Journal of Mammalogy 60:650–652.

Taylor, A. R., and R. L. Knight. 2003. Wildlife responses to recreation and associated visitor perceptions. Ecological Applications 13:951–963.

Taylor, E. B., S. Pollard, and D. Louie. 1999. Mitochondrial DNA variation in bull trout (*Salvelinus confluentus*) from northwestern North America: implications for zoogeography and conservation. Mol. Ecol. 8:1155–1170.

Teberg, E. K. 1965. Range extensions of the salamander *Plethedon vandykei idahoensis*. Copeia 1965:244.

Teberg, E. K. 1963. An extension into Montana of the known range of the salamander *Plethodon vandykei idahoensis*. Herpetologica 19:287.

Tennant, Donald. Instream Flow Regimes for Fish, Wildlife, Recreation, and Related Environmental Resources (Billings, Mont.: U.S. Fish and Wildlife Service, 1975).

Tews, A., M. Enk, S. Leathe, W. Hill, S. Dalbey, and G. Liknes. 2000. Overview of Status and Restoration Strategies for Westslope Cutthroat Trout (*Oncorhynchus clarki lewisi*) in North-central Montana. Special report by Montana Fish, Wildlife & Parks in collaboration with the Lewis and Clark National Forest. Great Falls, MT.

Tews A. 1993. Pallid sturgeon and shovelnose sturgeon in the Missouri River from Fort Peck Dam to Lake Sacagawea and in the Yellowstone from Intake to its mouth. Report submitted to the U.S. Army Corps of Engineers, Planning Branch, Omaha, NE.

The Nature Conservancy. 2005. Unpublished report.

The Nature Conservancy. 2004. Canadian Rocky Mountains Ecoregional Assessment. Four volumes, including Report, Appendices, Conservation Area Descriptions and Maps.

The Nature Conservancy. 2000. Middle Rockies-Blue Mountains Ecoregional Conservation Plan. Prepared by the Middle Rockies-Blue Mountains Planning Team. 58 pp + appendices.

The Nature Conservancy. 1999. Ecoregional Conservation in the Northern Great Plains Steppe. Northern Great Plains Steppe Ecoregional Planning Team. 76 pp.

The Nature Conservancy. 1996. Statewide conservation plan. Prepared by The Nature Conservancy of Montana and Montana Natural Heritage Program. 48 pp.

The North American Management Plan for Trumpeter Swans. 1984.

Thiel, R. P. 1985. Relationship between road densities and wolf habitat suitability in Wisconsin. American Midland Naturalist 113:404–407.

Thompson, I. D., H. A. Hogan, and W. A. Montevecchi. 1999. Avian communities of mature balsam forests in Newfoundland: age-dependence and implications for timber harvest. Condor 99:311–323.

Thompson, L. 1985. A harlequin romance. Montana Outdoors 16:21–25.

Thorp, J. 1949. Effects of certain animals that live in soils. Scientific Monthly 68:180–91.

Thurow, R. F., C. E. Corsi, and V. K. Moore. 1988. Status, ecology, and management of Yellowstone cutthroat trout in upper Snake River drainage, Idaho. American Fisheries Society Symposium 4:25–36.

Todd, L. D., R. G. Poulin, T. I. Wellicome, and R. M. Brigham. 2003. Post fledging survival of burrowing owls in Saskatchewan. Journal of Wildlife Management 67:512–519.

Tsai, C., and J. A. Fava. 1982. Habitats and distribution of the pearl dace (*Semotilus margarita* [Cope]), in the Potomac River drainage. Virginia Journal of Science 33:201–205.

Tsukamoto, G. K. 1983. Pronghorn antelope species management plan.

Ulliman, M. J., A. Sands, and T. Hemker. 1998. Conservation Plan for Columbian Sharp-tailed Grouse and its Habitat in Idaho (draft). Draft document on file at the forest supervisor’s office, Idaho Falls, ID.

U.S. Fish and Wildlife Service. 2004. Conservation Focus Areas of the Great Divide: a vast region encompassing the Upper Missouri, Yellowstone and upper Columbia watersheds. Publisher: USFWS, Benton Lake Wildlife Refuge, Great Falls, MT. 77 pp.

U.S. Fish and Wildlife Service. 2003. Online informational search on piping plovers in Montana. http://mountain-prairie.fws.gov/pipingplover/Piping_Plover_Q&A_Sept5.htm.

U.S. Fish and Wildlife Service. 2002a. Endangered and threatened wildlife and plants; bull trout (*Salvelinus confluentus*) draft recovery plan. Available at http://pacific.fws.gov/bulltrout/recovery/Default.htm.

U.S. Fish and Wildlife Service. 2002b. Endangered and threatened wildlife and plants; proposed designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout. Federal Register 67: 71235–71284. Available at http://pacific.fws.gov/bulltrout/criticalhab.htm.

U.S. Fish and Wildlife Service. 1999. White sturgeon; Kootenai River population recovery plan. Region 1, USFWS, Portland, OR.

U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and plants: 90-day finding on a petition to list the Columbian sharp-tailed grouse as threatened. Federal Register: October 26, 1999. Vol. 64, No. 206, pp. 57620–57623.

U.S. Fish and Wildlife Service. 1998. Endangered and threatened wildlife and plants; determination of threatened status for the Klamath River and Columbia River distinct population segments of bull trout. Federal Register 63:31647–31674.

U.S. Fish and Wildlife Service, Office of Migratory Bird Management. 1995. Migratory nongame birds of management concern in the United States: the 1995 list. U.S. Government Printing Office:1996-404-911/44014. 22 pp.

U.S. Fish and Wildlife Service. 1994. Endangered and threatened wildlife and plants: establishment of a nonessential experimental population of black-footed ferrets in north-central Montana; final rule. Federal Register 59:42696–42715.

U.S. Fish and Wildlife Service. 1990. Recovery plan for the interior population of the least tern (*Sterna Antillarum*). Twin Cities, MN. 90 pp.

U.S. Fish and Wildlife Service.1988. Black-footed ferret recovery plan. Denver, CO. 154 pp.

U.S. Fish and Wildlife Service. 1987. Northern Rocky Mountain wolf recovery plan. U.S. Fish and Wildlife Service, Denver CO. 119 pp.

U.S. Fish and Wildlife Service. 1985. Charles M. Russell National Wildlife Refuge, Montana: Final Environmental Impact Statement.

U.S. Fish and Wildlife Service. 1984. American peregrine falcon recovery plan (Rocky Mountain/southwest population). Prepared in cooperation with American peregrine falcon recovery team. USFWS, Denver, CO.

U.S. Fish and Wildlife Service. 1984. Selkirk mountain caribou management and recovery plan. U.S. Fish Wildlife Service, Portland, OR. 121 pp.

U.S. Fish and Wildlife Service. 1982. Grizzly bear recovery plan. Unpublished report prepared in cooperation with recovery team leader Don L. Brown of the Montana Department of Fish, Wildlife & Parks. 195 pp.

U.S. Fish and Wildlife Service. 1981. Draft western golden eagle management plan. Washington, DC.

U.S. Fish and Wildlife Service. 1970. A summary of the northern Rocky Mountain wolf recovery plan.

U.S. Fish and Wildlife Service. 1955. Missouri River basin studies: a preliminary report on fish and wildlife resources in relation to the water development plan for the Sun-Teton division, Missouri River basin project, Montana.

U.S. Forest Service. 2004. Draft Multiple Species Inventory and Monitoring Technical Guide. Ecotype Management Coordination. U.S.D.A. Forest Service, Washington, DC.

U.S. Forest Service. 2004. Beaverhead National Forest Lake Inventory. Available at http://www.fs.fed.us/r1/b-d/ (accessed August 27, 2004).

U.S. Forest Service. 1994. Neotropical Migratory Bird Reference Book. U.S.D.A. Forest Service–Pacific Southwest Region. 832 pp.

U.S. Forest Service. 1993. Helena National Forest, Townsend Ranger District and Bureau of Land Management, Headwaters Resource Area. Environmental assessment of vegetation treatment and allotment management plan revisions for the Greater Crow Creek and Indian Creek watershed.

U.S. Forest Service. 1977. Western spruce budworm management plan.

U.S. Geological Survey. November 2001. Fact Sheet FS-110-01. Online at http://pubs.usgs.gov/fs/fs-0110-01/.

U.S. Geological Survey. 1988. Cumulative Potential Hydrologic Impacts of Surface Coal Mining in the Eastern Powder River Structural Basin, Northeastern Wyoming. USGS Water Resources Investigations Report 88-4046. Prepared by L. J. Martin, D. L. Naftz, H. W. Lowham, and J. G. Rankl in cooperation with the Wyoming Department of Environmental Quality and the U. S. Office of Surface Mining, Cheyenne, WY.

USDI National Park Service. 2000. Bison Management for the State of Montana and Yellowstone National Park. Final Environmental Impact Statement for the Interagency Bison Management Plan for the State of Montana and Yellowstone National Park. Vol. I. August 2000.

USDI National Park Service, Yellowstone National Park. 1963. 1963–1964 northern Yellowstone wildlife and range management plan.

Van Eimeren, P. 1996. Westslope cutthroat trout (*Oncorhynchus clarki lewsi*). In Conservation Assessment for Inland Cutthroat Trout. Distribution, Status and Habitat Management Implications. D. A. Duff, tech. ed. Pp. 1–10. U.S. Department of Agriculture, Forest Service, Intermountain Region, Ogden, UT.

Van Woudenberg, A. M. 1999. Status of the flammulated owl (*Otus flammeolus*) in British Columbia. Working Report No. 96, British Columbia Ministry of Environment, Lands, and Parks, Victoria, B.C. 45 pp.

Van Zyll de Jong, C. G. 1985. Handbook of Canadian mammals, Vol. 2: bats. National Museums of Canada, Ottawa.

Varley, J. D., and R. E. Gresswell. 1988. Ecology, status, and management of the Yellowstone cutthroat trout. American Fisheries Society Symposium 4:13–24.

Vashro, J., et al. 1989. Upper Flathead system fisheries management plan: 1989–1994. Unpublished report. Montana Department of Fish, Wildlife & Parks and the Confederated Salish and Kootenai Tribes. 47 pp.

Vaughn, C. C., C. M. Taylor, and K. J. Eberhard. 1996. A Comparison of the Effectiveness of Timed Searches vs. Quadrate Sampling in Mussel Surveys. K. S. Cummins, A. C. Buchanan, and L. M. Koch, eds. The conservation and management of freshwater mussels II: initiatives for the future. Upper Mississippi River Conservation Committee, Rock Island, IL.

Verts, B. J., and L. N. Carraway. 1998. Land mammals of Oregon. University of California Press, Berkeley, CA. 668 pp.

Verts, B. J., and G. L. Kirkland, Jr. 1988. *Perognathus parvus*. American Society of Mammologists, Mammalian Species 318:1–8.

Vincent, R. E. 1962. Biogeographical and biologic factors contributing to the decline of arctic grayling (*Thymallus arcticus* [Pallus]) in Michigan and Montana. Ph.D. dissertation, University of Michigan, Ann Arbor, MI.

Vinton, M. A., D. C. Hartnett, E. J. Finck, and J. M. Briggs. 1993. Interactive effects of fire, bison (*Bison bison*) grazing and plant community composition in tallgrass prairie. American Midland Naturalist 129:10–18.

Wagner, R. 2004. USFWS, personal communication.

Wai-Ping, V., and M. B. Fenton. 1989. Ecology of spotted bat (*Euderma maculatum*) roosting and foraging. Journal of Mammalogy 70:617–622.

Walburg C. H. 1972. Some factors associated with fluctuation in year-class strength of sauger, Lewis and Clark Lake, South Dakota. Transactions of the American Fisheries Society 101:311–316.

Wallen, R. L., and C. R. Groves. 1989. Distribution, breeding biology and nesting habitat of harlequin ducks (*Histrionicus histrionicus*) in northern Idaho. Natural Heritage Section. Nongame Wildlife/Endangered Species Program, Bureau of Wildlife.

Wallen, R. L. 1987. Habitat utilization by harlequin ducks in Grand Teton National Park. Unpublished M.S. thesis, Montana State University, Bozeman, MT.

Warheit, K. I., and M. A. Schroeder. 2001. Genetic analysis of Columbian sharp-tailed grouse: a preliminary study. Submitted to U.S. Department of the Interior, Bureau of Land Management, Spokane, WA. WDFW Contract No. 39001257. 16 pp.

Welker, T. L., and D. L. Scarnecchia. Habitat use and population structure of four native minnows (family Cyprinidae) in the upper Missouri and lower Yellowstone rivers, North Dakota. Ecology of Freshwater Fish 2004:13:8–22.

Werdon, S. 1993. Status report on sturgeon chub (*Macrhybopsis gelida*), a candidate endangered species. U.S. Fish and Wildlife Service, Ecological Services, North Dakota State Office, Bismarck, ND.

Werdon, S. 1992. Population status and characteristics of *Macrhybopsis gelida, Platygobio gracilis* and *Rhinichthyes cataractae* in the Missouri River Basin. Master's thesis, South Dakota State University, Brookings, SD.

Werner, J. K., B. A. Maxell, D. Flath, and D. P. Hendricks. 2004. Amphibians and reptiles of Montana. Missoula, MT: Mountain Press Publishing Company. 262 pp.

Werner, J. K. 2003. Status of the northern leopard frog (*Rana pipiens*) in western Montana. Northwestern Naturalist 84:24–30.

Werner, J. K., T. Plummer, and J. Weaselhead. 1998. Amphibians and reptiles of the Flathead Indian Reservation. Intermountain Journal of Science 4:33–49.

Werner, J. K., and J. D. Reichel. 1996. Amphibian and reptile monitoring/survey of the Kootenai National Forest: 1995. Montana Natural Heritage Program, Helena, MT.

Werner, J. K., and J. D. Reichel. 1994. Amphibian and reptile monitoring/survey of the Kootenai National Forest: 1994. Montana Natural Heritage Program, Helena, MT.

Wershler, C. R. 1989. A management strategy for mountain plovers in Alberta. Proc. Prairie Cons. Endangered Species Workshop, Saskatchewan Natural History Society and Canadian Plains Resource Center. 5 pp.

West, S. D. 1999. Northern bog lemming (*Synaptomys borealis*). Pp. 655–656 in the Smithsonian book of North American mammals, D. E. Wilson and S. Ruff, eds. Smithsonian Institution Press, Washington, DC.

Wheaton, J., and J. J. Metesh. 2002. Potential groundwater drawdown and recovery for coal bed methane development in the Powder River Basin, Montana. Montana Bureau of Mines and Geology Open File Report 458. 59 pp.

Whitaker, J. O., Jr. 1972. *Zapus hudsonius*. American Society of Mammologists, Mammalian Species No. 11. 7 pp.

Whitewater Wetlands Conservation Area Plan. 2004. B. Martin and J. Stutzman. 16 pp + appendices.

Whittier, T. R., D. B. Halliwell, and S. G. Paulsen. 1997. Cyprinid distributions in northeastern U.S.A. lakes: evidence of regional-scale minnow biodiversity losses. Canadian Journal of Fisheries and Aquatic Sciences 54:1593–1607.

Wikstrom, J. H., and S. B. Hutchison. 1971. Stratification of forest land for timber management planning on the western national forests.

Will, G. C. January 1986. Waterfowl, sandhill crane and snipe management plan.

Williams, J. D., and M. Zimmer. 1992. First sharp-tailed sparrow South Dakota nesting record. South Dakota Bird Notes 44:84–85.

Williams, J. E., J. E. Johnson, D. A. Hendrickson, S. Contreras-Balderas, J. D. Williams, M Avarro-Mendoza, D. E. McAllister, and J. E. Deacon. 1989. Fishes of North America endangered, threatened, or of special concern: 1989. Fisheries 14(6):2–20.

Wilson, A. G., E. Simon, and J. H. Larsen, Jr. 1989. Range extension for the Coeur d' Alene salamander (*Plethodon vandykei idahoensis*) to the Canada-U.S. border. Canadian Field-Naturalist 103:93–94.

Wilson, C. C., and P. D. N. Hebert. 1998. Phylogeography and postglacial dispersal of lake trout (*Salvelinus namaycush*) in North America. Canadian Journal of Fish and Aquatic Sciences 55:1010–1024.

Wilson, D. E., and S. Ruff. 1999. The Smithsonian book of North American mammals. The Smithsonian Institution, Washington, DC. 750 pp.

Wisdom, M. J., R. S. Holthausen, B. C. Wales, C. D. Hargis, V. A. Saab, D. C. Lee, W. J. Hann, T. D. Rich, M. M. Rowland, W. J. Murphy, and M. R. Eames. 2000. Source habitats for terrestrial vertebrates of focus in the Interior Columbia Basin: broad-scale trends and management implications. Vols. 1–3. General Technical Report PNW-GTR-485. U.S.D.A. Forest Service, Pacific Northwest Research Station, Portland OR.

Wood, M. 1991. Management plan for Columbian sharp-tailed grouse in western Montana.

Worthington, D. J. 1991. Abundance and distribution of bats in the Pryor Mountains of south-central Montana and northeastern Wyoming. Montana Natural Heritage Program. Helena, MT. 23 pp.

Wright, J. C., and E. A. Wright. 1948. Grassland types of south-central Montana. Ecology 29(4):449–460.

Wright, P. L. 1997. Status of rare birds in Montana, with comments on known hybrids. Northwestern Naturalist 77:57–85.

Wright, P. L. 1950. *Synaptomys borealis* from Glacier National Park, Montana. Journal of Mammalogy 31(4):460.

Wright, V. 2000. The Aldo Leopold Wilderness Research Institute: A National Wilderness Research Program in Support of Wilderness Management. In Stephen F. McCool, David N. Cole, William T. Borrie, Jennifer O'Loughlin, comps. Wilderness Science in a Time of Change Conference Vol. 3: Wilderness as a place for scientific inquiry, May 23–27, 1999, Missoula, MT. Proc. RMRS-P-15-VOL-3. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Pp. 260–268.

Wright, V., S. Hejl, and R.L. Hutto. 1997. Conservation implications of a multi-scale study of flammulated owl (*Otus flammeolus*) habitat use in the northern Rocky Mountains, USA. Pp. 506–516 in J. R. Duncan, D. H. Johnson, and T. H. Nicholls, eds.

Wright, V. 1996. Multi-scale analysis of flammulated owl habitat use: owl distribution, habitat management, and conservation. Unpublished M.S. thesis, University of Montana, Missoula, MT.

Wyoming Game and Fish Department. 2000. Yellowstone cutthroat trout management summary. Wyoming Game and Fish Department, Fish Division, Cheyenne, WY.

Yellowstone Cutthroat Trout Working Group. 1994. Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) management guide for the Yellowstone River drainage. Montana Department of Fish, Wildlife & Parks, Helena, MT, and Wyoming Game and Fish Department, Cheyenne, WY.

Young, L. 1995 (unpublished). Range Permit Re-issuance: Columbian Sharp-tailed grouse. Kootenai National Forest, Eureka, MT.

Yunick, R. P. 1985. A review of recent irruptions of the black-backed woodpecker and three-toed woodpecker in eastern North America. Journal of Field Ornithology 56:138–152.

Zickefoose, J. 1985. Least tern/piping plover recovery program. Final report to The Nature Conservancy, Connecticut Chapter. 22 pp.

Zubik, R. J. 1988. A site specific management plan for the lower Stillwater bald eagle territory. Unpublished report. Montana Department of Fish, Wildlife & Parks, Kalispell, MT. 43 pp.

Appendices

Appendix A: Guiding Principles for States to Consider in Developing Comprehensive Wildlife Conservation Plans

(and Wildlife Conservation Strategies (Plans-Strategies) for the State Wildlife Grant and Wildlife Conservation and Restoration Program)

Final: September 27, 2002

The International Association of Fish and Wildlife Agencies recommends the following guiding principles for the states, the U.S. Fish and Wildlife Service, and their conservation partners to consider and apply while developing Comprehensive Wildlife Conservation Plans to meet their obligations under the State Wildlife Grant (SWG) program and Wildlife Conservation Strategies under the Wildlife Conservation and Restoration Program (WCRP).

These guiding principles identify goals, objectives, and actions to strive for over time. Few if any will be fully realized in any state under what is hopefully just the first round of conservation program development under SWG and WCRP. Some things must occur from the outset, because they are legally required and/or because they are essential to success. Clearly, broad-scale public participation is an example of one such area. Among the diverse stakeholders in this effort are private, local, state, and federal agencies and governments, NGOs, etc.
The Plan-Strategy provides an opportunity for the state wildlife agency to provide effective and visionary leadership in conservation. The Plan-Strategy can identify the measures that will be used, the results achieved, and the threats and needs that remain with regard to wildlife and wildlife habitat. It is also an opportunity to address broader issues and programs, including environmental and wildlife-related education, outdoor recreation, and wildlife-related law enforcement. These other areas can either constrain or enhance wildlife conservation efforts, and funding and public support for wildlife conservation can be increased, or at least stretched, by involving partners that share those interests.

A: Planning Process and Partnerships

1. Involve multiple staff levels within each agency and broad public-private partnerships to develop and implement the Plan-Strategy.
2. Involve partners that have the authority necessary to ensure that the Plan-Strategy addresses the full range of issues at hand.
3. Build capacity for cooperative engagement among all partners in the effort and make sure it is productive, so that trust and confidence grow, and organizational and interpersonal relationships become strengths of the Plan-Strategy.

4. Share responsibility and credit for planning and implementation among all partners, who collectively share responsibility for success of the Plan-Strategy.
5. Focus on efficiency and effectiveness, so the value added in planning and implementation is commensurate to the funds invested.
6. Ensure that the planning processes and the resultant Plan-Strategy is dynamic—so it can be improved and updated efficiently as new information is gained.
7. Communicate effectively with stakeholders, other partners, and the public, early and often.
8. The planning processes and the decisions made during planning should be obvious to those who read and use the Plan-Strategy—and repeatable: document the processes and the decisions so the next planning cycle can build on the current one.

B. Focus and Scope

1. Base the Plan-Strategy in the principles of "best science," "best management practices," and "adaptive management," with measurable goals, objectives, strategies, approaches, and activities that are complete, realistic, feasible, logical, and achievable. Describe these processes and practices sufficiently so that partners understand what they entail and how they should function.
2. Address the broad range of wildlife and associated habitats, with appropriate priority placed on those species of greatest conservation need, and taking into account the relative level of funding available for conservation of those species.
3. Integrate and address wildlife-related issues statewide, across jurisdictions and interests, and coordinate with parallel efforts in other states and countries.
4. Combine landscape/ecotype/habitat-based approaches and smaller scale approaches (e.g., focal, keystone, and/or indicator species; guilds; species of special concern) for planning and implementation.
5. Make the Plan-Strategy an effective, long-lasting blueprint for conservation that provides a broad vision and priorities, so a broad array of organizations, including other government agencies and NGOs, can help realize the vision. The Plan-Strategy should have sufficient flexibility to respond to the full spectrum of conditions and circumstances likely to be encountered within the planning area.

C. Format and Content

1. Make the Plan-Strategy readable, understandable, and useful, with well-defined issues, short- and long-term goals and objectives, strategies, and realistic measures of performance that enable state agencies and their partners to demonstrate accountability.
2. Make full and effective use of relevant existing information; in particular, integrate appropriate elements of other plans and initiatives (such as Partners in Flight and the many regional and other plans), databases, GIS layers, records, reports, other information sources, and management information systems that overlap or complement this Plan-Strategy.
3. Identify knowledge gaps as well as areas of knowledge to help focus future efforts to improve understanding and planning, but do not allow a lack of information to inappropriately limit necessary short-term application of the best available science and good judgment in decision making.
4. Make the Plan-Strategy spatially explicit, to the extent feasible and appropriate, with a full complement of GIS and other maps, figures, and other graphics, as well as appropriate text to provide sufficient detail and consistency in describing species and habitat conditions, conservation needs, conservation recommendations, and other issues/actions, so it can be used effectively by all partners.
5. Use “threats analyses,” “risk and stressor assessments,” and other techniques to help set priorities for goals, objectives, strategies, and activities.
6. In addition to wildlife, address factors that can have substantial impact on wildlife conservation, such as management of invasive species, wildlife-related and conservation-related education, law enforcement, and outdoor recreation.
7. Include a comprehensive glossary, so partners and the public have a shared and common understanding of key terms used in the Plan-Strategy.
8. Develop an updateable information system to monitor Plan-Strategy implementation and the status and trends of wildlife and habitat.
9. Consider wildlife conservation-related education and wildlife-associated recreation as tools that can help accomplish conservation goals.

D. Completion, Outcomes, and Availability

1. Provide annual written progress updates on the planning effort and progress to IAFWA’s CARA Implementation Committee each September, in addition to annual performance reports that must be submitted to the U.S. Fish and Wildlife Service pursuant to Federal Aid guidelines.

2. Ensure that the Plan-Strategy clearly and definitively meets state obligations to Congress under the WCRP and SWG legislation, and to the U.S. Fish and Wildlife Service with regard to Federal Aid administration.
3. Provide sufficient documentation in or with the Plan-Strategy to facilitate public understanding of the decisions that are made, and how and why they were made.
4. Make the Plan-Strategy a driving force in guiding activities under diverse wildlife and habitat conservation initiatives, and usable for helping to inform land-use decision making.
5. Make the Plan-Strategy readily available to the public in a variety of media.
6. Provide a mechanism for reporting accomplishments and tracking progress so local partners are aware of both.
7. Ensure that the Plan-Strategy can be implemented, i.e., it is administratively and politically feasible and there are sufficient resources (funding and staff) among the partners to accomplish significant gains at a large scale and within an appropriate time frame to preserve our nation's wildlife heritage.

Appendix B: Process for Allocating Annual State Wildlife Grant Funds

This framework applies to the allocation of Montana's State Wildlife Grant funds only until the approval of the Comprehensive Fish and Wildlife Strategy. Following that approval, project selection and fund allocation will be based on the Strategy.

1. Appropriation passes Congress and apportionment to Montana is determined.
2. Chief of staff determines if spending authority is available for fiscal year and alerts technical committee if paperwork needed. Overhead portion is determined and total amount available is provided to technical committee.
3. Within one month after apportionment is determined: Steering committee establishes program-level allocation of funds, if necessary. (Program-level allocations could include a percentage to conservation and education, if appropriate, or tribal subgrants.)
4. Development of recommended projects (completed within three months after program-level allocations are set). Technical committee recommended projects will be generated by:
    - Review of proposals provided in previous year that were not funded
    - Review of projects that were "multiyear" from previous allocations
    - Generate list of conservation needs
    - Solicit new projects
        - Internal solicitation—List of conservation needs and request for proposals (Appendix A) is sent to FWP staff; division leads contact the appropriate staff in their divisions for proposals and help fleshing out ideas (fleshing out needs to include a general discussion of match opportunities for the project).
        - External solicitation—Project leads will contact partners to solicit projects that will align with conservation needs
    - Determine feasibility through follow-up contacts to identify match, personnel needs, etc. and enter into Table 1.
    - Develop recommendations based on selection criteria (Appendix B)

5. Three months after program-level allocations are set: Steering committee reviews and acts on technical committee's recommendations on projects and revises program-level allocations of uncommitted funds.

Appendix C: Fish, Wildlife & Parks State Wildlife Grant Program Request for Proposals

FWP has received their third allocation of funds from Congress for State Wildlife Grants (SWG) in the amount of $840,000 (after overhead has been removed). The director's office has allocated $250,000 each to the Fisheries and Wildlife divisions. An additional $300,000 is available for projects that may be solicited internally/externally, can be multidisciplinary in nature, and will be ranked on a competitive basis. Projects will be solicited from outside the agency, and all projects will be based on merit; this is just a request for proposals, not a guarantee that funding will be received.

Congress has directed that SWG funds be used to address the state's greatest conservation needs that are currently unmet. Typically, projects to be funded with SWG dollars will involve Montana's Species of Concern and/or other nongame species for which funding is very limited or unavailable. Wildlife projects that have been funded with previous allocations include greater sage-grouse surveys (identification of leks and wintering areas); evaluation of recreational shooting on prairie dogs, surveys of small animals associated with sagebrush and grassland habitats, bird monitoring efforts, planning processes, loon monitoring and research, expansion of Montana's coordinated land bird monitoring program, and prairie-riparian habitat surveys of eastern Montana. Fisheries projects have included prairie fish surveys in Regions 4 through 7, sauger telemetry study in the Powder and Tongue rivers, native species creel, cutthroat restoration in Region 4, and burbot status assessment.

Please provide the following information by (date):

- A brief project proposal including the location, the objectives, and deliverables (one page)
- An estimated budget
- Staffing needs (additional FTE would have to be "modified FTE," and while getting modified FTE is not a sure thing, the Fisheries Division has been successful in the past for SWG projects)
- Projects can be for more than one year (please reflect that in the proposal)
- Submit fisheries projects to Ken McDonald or wildlife projects to Heidi Youmans by (insert date)

When considering potential projects, be mindful of the following information:

- "Interdivisional" projects such as amphibian work or riparian-associated work is especially welcome but not mandatory.
- A nonfederal match (between 33 percent and 100 percent depending on the type of project) is required for all projects. *At this time, we are not requiring you to have the match in hand, but do ask that you think about sources of nonfederal match.* Sources of funds that we *cannot* use include D-J or P-R–funded projects, BPA, USFS, and other federal funds. We also can't use the

same nonfederal funds to match more than one source of federal money. We will work with you on lining out the match if your proposal is selected.

- SWG is administered through the Federal Aid Program, so a project needs to meet all Federal Aid requirements. We can assist with the necessary paperwork, but you will have to ensure enough time so that it can be completed, approved, and the project set up prior to initiation of the project (i.e., plan well ahead of field season for the project).
- Projects that are eligible for other funding sources will not be scored as high as those without any other potential sources of funding.
- After ranking projects based on a set of criteria, the SWG technical committee will make recommendations to the SWG steering committee, who will give final approval to projects.

Appendix D: SWG Project Selection Ranking Criteria

Project (number or title):_____

Ranking Criteria: Each proposal is to be scored according to the following criteria (this calculation must be done in an Excel spreadsheet).

Indicate with a "1" for each that apply. Leave blank those that don't apply.

1. _____ Project results will reduce the immediacy and/or severity of threats to one or more of Montana's native species.

2. _____ Is the species a Species of Concern or a USFWS Threatened or Endangered Species?

3. _____ Conservation needs identified in project currently are not being addressed by any existing programs or other funding sources (excluding SWG funding).

4. _____ Project will benefit the public.

5. _____ The project will yield occurrence/distribution data and/or can be used for comprehensive planning efforts.

6. _____ Budget total is appropriate for the scope of the project.

7. _____ Partnerships outside the agency are being used in the project.

8. _____ Degree to which project results can benefit multiple native species (species assemblages or wildlife communities).

From the average of the technical committee's scoring, projects will be prioritized and funding recommendations will be provided to the steering committee based on available funding.

Appendix E: Montana Fish, Wildlife & Parks Staff Exploratory Group

The following FWP staff participated:

Thomas Baumeister	Conservation Education
Dianne Tipton	Conservation Education
T.O. Smith	CFWCS Coordinator
Andrew Jakes	CFWCS Planning Team
Chris Smith	Director's Office
Marc Scow	Facilitation
Mark Deleray	Fisheries
Mark Sweeney	Fisheries
Ken McDonald	Fisheries
Tom Flowers	Law Enforcement
Pat Flowers	Regional Management
Carolyn Sime	Wildlife
Bill Semmons	Wildlife
Kristi Dubois	Wildlife
Allison Puchniak	Wildlife
Pat Gunderson	Wildlife
Howard Burt	Wildlife

Working Statement 1

"What are some of the strategies, processes, and actions that would foster the best possible outcome of broadening FWP's focus to try and more completely achieve its vision and mission statement?"

Participation

- Develop a strategy that includes FWP employees and commission, legislators, and community groups
- Do a public survey to measure the extent of public knowledge and familiarity with funding and management needs and opinion of what we should be doing
- Make intra-agency participation a priority
- Create partnership with other agencies
- Collaborate with other agencies and within FWP
- Bring the public along as we plan and move our paradigm
- Continue the regional and cross-regional discussions
- Involve the public early and often

Outreach/Education and Marketing

- Use focus groups
- Work with Con/Ed to develop a message and delivery method
- Use bottom-up approach for internal buy-in
- Find ways to sell the program to landowners through positive example
- Tailor outreach messages to specific audiences
- Plan to meet MEPA and NEPA (a plan that doesn't require these isn't worth having)
- Meet with traditional hunter and angler groups to get their feedback and ideas (e.g., MWF, TU, etc.)
- Legislative outreach
- Prepare a public involvement strategy and encourage as much public involvement as is feasible
- Get buy-in through marketing
- Revise the road map as needed
- Keep hunters, anglers, and legislators informed via website and e-mail
- Use facilitated meetings to include biologists and public
- Use lots of education and outreach
- Develop a way to "sell" the program to traditional constituents
- Emphasis the importance of in-reach and outreach efforts
- Provide outreach for private landowners
- Use Internet, radio, TV, and newspapers to get the word out to the public
- Need to let the public know that we are not using license dollars for broadening focus, but need additional funding
- Identify and inform the public about the financial risks and rewards
- Need education to get everyone on the same page
- Prepare a historical account of where we have come from and where we need to go
- Try and eliminate misconceptions from the beginning
- Answer the question: Why do we need to do this, and then tell the public
- Identify the goals and priorities of the plan and then gauge the public's response to those goals and priorities
- Develop a statement of 50 words or less that explains why comprehensive management is necessary and makes sense, then educate the public
- Provide information to the public about how FWP funding really works and why we need additional funding
- Identify a "hook" to get people to buy in
- Seek buy-in both internally and outside FWP
- Sell the program internally
- Discuss how SWG funds would be allocated
- Use landowner incentives
- Public outreach

Planning

- Use leadership to keep process moving
- Set a modest agenda
- Use caution as plan develops
- Be flexible during the planning process in order to amend the road map as needed
- Develop a clear statement of intent with other partners for what the plan will be
- Use innovative methods
- Develop a planning goal with partners and among FWP employees
- Identify alternative funding sources that can be used as a match
- Write the plan by habitat type, not by species
- Through […planning…], identify specific projects for funding at the regional level
- Use existing plans
- Identify knowledge gaps
- Formulate a plan that is measurable, quantifiable, and has real objectives
- Formulate a plan that includes the needed resources of funding and staffing to meet objectives
- Incorporate all plans currently available (elk, wolf, prairie dog, etc.)
- Plan should focus on federal threatened or endangered species and Species of Special Concern, then expand to include communities and systems, rather than focus on a single species approach
- Use habitats as the foundation for all planning
- Develop a timeline
- Create a statement of intent
- Develop a road map
- Find ways to broaden management protocol to including monitoring of all species
- Provide future SWG funding at the regional level
- Plan should be the framework for decision making, not the decision itself
- Plan must provide enough direction to be meaningful but not obligate FWP to guarantee future funding for specific things
- Identify goals and objectives for plan within a time frame

Working Statement 2

"What would be the best possible outcomes of broadening FWP's focus to try and more completely achieve its vision and mission statement?"

Constituents or Other Agencies

Primary finding: FWP employees thought that one of the best outcomes would be acceptance by and support from the public, private landowners, and other agencies for FWP's comprehensive programs.

- Hunters and anglers would have a broader ownership commitment
- Engagement of the nonhunting public with FWP that results in their support for its programs
- A truly comprehensive plan for all wildlife that is accepted by the public
- Strong partnership with interest groups and the public
- Cooperation among all agencies so that FWP can manage comprehensively
- Increased support for FWP from diverse constituencies
- Landowners participate in habitat incentives that come from the plan
- Hunters and anglers realize the benefits of comprehensive management
- A better land ethic where people respect the biological community
- Improved public perception of all FWP programs
- Everyone accepts overall plan
- No political ramifications to broadening the focus

Funding and Staff

Primary finding: Participants were clear in pointing out that increased funding to FWP could be a best possible outcome, but that increased funding must be accompanied by increased staffing.

- Funding and staff for increased management and monitoring of all species
- Increased long-term permanent funding
- Funding and personnel available for management of all species
- Increased staff
- More staff to accomplish goals
- Additional funding to manage all species
- SWG is a funded federal mandate
- Increased funding
- Secure funding and responsible spending by FWP toward conservation of all species
- FWP gains support and ability to protect resources
- Sufficient funds to implement the plan so it becomes permanent

- More FTEs to accomplish comprehensive management

Management Paradigm

Primary finding: Participants expressed that a shift in the way FWP and its constituents view wildlife and wildlife management to a more comprehensive approach could be a best possible outcome. *Note:* This outcome indicates that there is a perception that FWP and its constituents currently do not view wildlife and wildlife management in a comprehensive enough manner.

- Sportsmen and FWP acceptance of multispecies approach
- Constituents shift the way they think, from species specific to comprehensive
- Public would accept new way of managing
- Everyone sees the big picture of management
- A greater appreciation of regional ecotypes
- Hunters and anglers realize the benefits that come from comprehensive management
- Move the paradigm of management to all species management
- Shift FWP's approach to management and view all fish and wildlife in an integrated way
- Management by FWP for all species regardless of game classification

Multispecies

Primary finding: Comments were made that being able to focus on more of Montana's species could be a best possible outcome of broadening FWP's focus.

- More efficient use of dollars to manage all species, not just a single species
- FWP would have a true ecotype approach
- Integration of all species management
- Game and nongame species benefit
- Increased management and monitoring of all species
- Recover all threatened and endangered species and stabilize sensitive species
- All outdoor activities perceived as important
- Better information about species and habitat relationships
- Better comprehensive management of all species
- Fewer listings under ESA

Montana Fish, Wildlife & Parks

Primary finding: Broadening FWP's focus could lead to achieving its mission.

- Gap between Helena office and the field is bridged
- All FWP's vision and mission statements are met
- FWP advances the conservation agenda
- Fulfill our FWP mission
- Move away from crisis management and Species of Special Concern

Environment or Habitat

Primary finding: Healthier habitats and environment could be a best possible outcome.

- Healthier natural environment for all species
- Healthy ecotypes across Montana that support the fish and wildlife that live in all habitats
- Plan creates better habitat resulting in increased hunting opportunities

Working Statement 3

"What are the worst possible outcomes of broadening FWP's focus to try and more completely achieve its vision and mission statement?"

Constituents

Primary finding: More comments were received concerning constituent relations than any other category. By far the largest concern was that by broadening its focus, FWP would lose the community support of its traditional hunters and anglers.

- Outside stakeholder groups might not participate
- FWP alienates one or more groups of constituents
- FWP actually causes less support for its programs
- FWP loses traditional support from sportsmen
- Constituent groups become divided
- FWP promises the public something it can't deliver
- Public does not understand the plan
- Game and nongame constituents are divided
- FWP alienates its sportsmen and traditional supporters
- FWP loses its traditional constituents
- If FWP uses habitat approach, agency might be accused of taking authority from land managers and private landowners
- Backlash from the public about Species of Concern
- Private landowners will oppose the agency
- Loss of traditional constituent support

- Wedge driven between game and nongame supporters and managers
- Sportsmen perceive FWP is moving game dollars to nongame issues

Biology

Primary finding: FWP employees were concerned that moving from an individual species approach to a comprehensive approach could create conflicts in management needs. This problem was somewhat addressed by comments that the plan should focus on quality habitat management for communities.

- Potential for ecological conflict between species and between native and non-native
- Plan does not result in biological actions and further degrades support for planning efforts
- Plan is not habitat based enough
- Conflicting management mandates for different species
- Loss of focus on community habitat
- Plan will not be habitat based and will continue to promote species management
- There is no change in how FWP manages habitats and species
- Data collected will be misused

Money

Primary finding: FWP employees were concerned that either permanent funding would not materialize, or that additional work would be created without the funding to acquire additional FTEs, which would result in additional workload.

- Other states do not participate fully and derail the opportunity for long-term permanent funding
- Waste of time and money
- Legislators divert funding
- Develop plan in anticipation of funding that doesn't come
- Creates more work with no additional FTEs or money
- FWP can't match federal funds and lose funding
- Adds more work with no additional FTEs or funding
- Creates work with no meaningful outcome

Politics

Primary finding: FWP employees were concerned that legislators would not approve of FWP's actions and would create difficulties for the agency.

- FWP embraces a comprehensive management approach, but the public and legislators do not

- SWG becomes an unfunded federal mandate
- Legislators attempt to punish the agency because they do not support the plan
- FWP's actions create political fallout

Montana Fish, Wildlife & Parks

Primary findings: FWP employees were concerned that FWP would be divided among by management interest or by field versus the staff

- Division within FWP
- Department becomes divided
- Increases the division between field and headquarters

General

Primary finding: FWP employees commented that by further addressing the needs of all species, recreational opportunities and thus quality of life could actually be lost while enhancing Montana's wildlife communities.

- Loss of recreational opportunities
- Quality of life is lost

Working Statement 4

Participants were informed that even if SWG became a long-term permanent funding source, FWP would need alternative funding sources to fulfill its mission. They were asked to brainstorm all possible ways that FWP could gather additional new funds.

- .01 percent sales tax
- License plates
- Coal bed methane tax
- Property tax surcharge
- Tax on RVs
- Federal land use tax
- Soda pop tax such as in Arkansas
- Nonresident entry tax
- University cooperation
- Lottery
- Interest from a one-time investment of hunters' and anglers' dollars
- Auction grizzly, wolf, and other unique animal tags
- Nongame stamp
- Wild trout stamp
- Real estate transaction tax

- Gambling or other sin tax
- NGO donations
- Outfitters and guides tax
- Private donations
- Develop a line of nongame products (maps, etc.) for sale
- Old CARA-type tax (birdseed, etc.)
- An endowed foundation
- Oil and gas taxation
- Coal tax trust fund
- Sell state lands to create an endowment
- Remove SWG and or D-J and P-R match requirements
- Nongame activities license or stamps (e.g., bird watching and mountain biking stamps)
- FWP foundation dollars
- Solicit contributions through NGO-type organization
- Canoe and kayak fees
- Off-road vehicle tax
- Bed tax
- Public lands fee
- Local options tax
- Birdathon and other nonsporting competitions
- State highway funds mitigation
- Travel Montana
- Surcharge on all new construction permits

Federal Requirement #1

"Information on the distribution and abundance of species of wildlife (including low and declining populations) as the state fish and wildlife agency deems appropriate that are indicative of the diversity and health of the state's wildlife."

Participants were asked about what data, resources, or methods should be considered or used to meet this requirement.

- Gather information from all databases into one location
- State databases
- Use information from MNHP Species of Concern List
- Include professional judgment at the regional level in concert with the MNHP and USFWS list
- MFISH database
- Game database
- Furbearer database (harvest/tracking surveys)
- Wildlife collection permits
- Migratory bird permits (bird banding lab)
- Other agencies and tribal data

- (Caution that much of this data will be observational not abundance data that could provide historical trends/data we have is not population trend data and will ultimately be subjective)
- GAP analysis data
- Baseline data from conservation easements
- Observations taken during game surveys
- Raptor routes
- Incidental observations by biologists
- Incidental observations by public
- Make use of NGO lists of low and declining populations (birds especially)

Federal Requirement #2

"Descriptions of locations and the relative condition of key habitats and community types essential to the conservation of species identified in (1)."

Participants were asked about what data, resources, or methods should be considered or used to meet this requirement.

- Agricultural statistics service data could be used to determine percentage of habitat not currently providing habitat
- Use GIS layers and maps of species identified in #1, then expand those locations to access that total habitat
- Use species richness to determine what habitat types are most essential
- Use GAP-type analysis to identify habitat types with greatest richness of species that FWP determines to be of concern in #1 (will be dependant on past surveys)
- Look for communities that are still composed of native species containing a species that FWP identifies as of concern in #1 and give priority to that related habitat
- Need to review life history and habitat needs of species FWP identifies in #1
- Intersect species information with all related habitat layers in a matrix (e.g., wolf grassland=yes, mountain=yes, etc.)
- Use current distribution layers of species FWP identifies in #1 overlaid on different scales of habitat
- Develop a list of specialist versus generalist species and use their related habitats to identify those essential for conservation
- Use different habitat scales depending on species range size and number of habitats used
- Have a broad-scale habitat map, then have all less pronounced habitat type within each of the broad categories (1 montane forest/ 2 meadow complex/ montane riparian etc…)
- Rely heavily on professional judgment
- Make sure to relate small-scale habitat types to the public

- Scale will be dependant on species
- *Group concluded to use three scales of habitat type 1) broad habitat types, 2) smaller scale within each habitat type, 3) GAP-type fine detail (if necessary for species)

Federal Requirement #3

"Descriptions of problems that may adversely affect species identified in (1) or their habitats, and priority research and survey efforts needed to identify factors that may assist in restoration and improved conservation of these species and habitats."

Participants were asked about what data, resources, or methods should be considered or used to meet this requirement.

- Use local biologists' expertise
- Use existing management and recovery efforts
- Wholesale damage to habitat
- Describe habitat-related problems
- Describe invasive or exotic species
- Describe harvest/poaching/collecting problems
- Identify contaminants issues
- Disease and climate change issues
- Describe the FTE and funding issues needed to address problems
- Include genetic information about hybridization
- Use GIS to target habitats
- Allow biologists to help identify problems

Federal Requirement #4

"Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions."

Participants were asked about what data, resources, or methods should be considered or used to meet this requirement.

- Ask for local biologists' expertise
- Cost share with private groups on purchases of habitat
- Develop a good ownership boundary on habitats FWP is concerned with
- Pull people together on each specific species to determine
- Prioritize habitats versus critical value that is intact and those that are in jeopardy
- Develop lists of species/groups of species and habitats
- Protect what is left, stop the bleeding, recover the degraded

Federal Requirement #5

"Proposed plans for monitoring species identified in (1) and their habitats, for monitoring the effectiveness of the conservation actions proposed in (4), and for adapting these conservation actions to respond appropriately to new information or changing conditions."

Participants were asked about what data, resources, or methods should be considered or used to meet this requirement.

- Continue ongoing monitoring efforts
- Identify monitoring gaps
- Question if FWP is monitoring the right things
- Look at assemblages of species
- Don't duplicate efforts of other agencies
- Do more habitat and vegetation monitoring
- Use aerial photography
- Develop new monitoring methods for species not being monitored
- FTEs will be a huge issue determining if this is even feasible
- Assess current monitoring plans that aren't being implemented
- Include monitoring protocols for groups of target species
- Use peer review
- Set a follow-up for monitoring to determine if it is having effect
- Identify desired outcomes and monitor to see if they are being met
- Set a number of places and species to survey and measure over the long term
- Get commitment of staff to actually do it
- Plan must be flexible to change monitoring plan if it isn't meeting objectives
- Use adaptive management
- Define trigger points (at what point do you start doing something)

Federal Requirement #6

"Descriptions of procedures to review the Plan-Strategy at intervals not to exceed ten years."

Participants were asked about what data, resources, or methods should be considered or used to meet this requirement.

- Revise actions and priorities every five years
- Compare accomplishments with objectives annually
- Internal committee review of progress
- Special projects bureau chief conducts review
- Provide summary of annual accomplishments to public

- Newsletter
- Report how much money is spent annually and on what
- Identify key interest groups and methods to communicate progress

Federal Requirement #7

"Plans for coordinating, to the extent feasible, the development, implementation, review, and revision of the Plan-Strategy with federal, state, and local agencies and Indian tribes that manage significant land and water areas within the state or administer programs that significantly affect the conservation of identified species and habitats."

Participants were asked about what data, resources, or methods should be considered or used to meet this requirement.

- Create working groups oriented toward species/habitats
- Require management attendance at technical meetings, then have them report back to administrative level meeting groups and vice versa
- Establish oversight committee for each region (multi-agency) at the administrative level
- Base the technical committee on habitats
- Make sure to invite all experts in habitat or species from each region
- Private landowners should be considered at the oversight level
- Use MOU to finalize the coordination between agencies
- Coordinate monitoring with other agencies
- Make sure other agencies know what FWP is responsible for and have sideboards
- Use an e-mail list to communicate a newsletter

Appendix F: Law Enforcement Exploratory Group

The following staff participated.

Jim Kropp	Chief of Law Enforcement
T.O. Smith	CFWCS Coordinator
Mark Anderson	Warden Sergeant
Tom Flowers	Warden
John Lesofski	Warden
Jim Conner	Warden

Law enforcement officers were asked what activities they currently perform that benefit the species and habitats identified through the Strategy as in greatest need of conservation.

Survey/Inventory/Monitoring

- Furbearer and game animal tagging
- Predator tagging
- Investigation of illegal kills
- Road kills
- Wolf sightings, kills, and enforcement
- Public request for identification of nongame species
- Falcon/hawk (falconer enforcement)
- Incidental encounters with species during checks/stations, etc.
- CWD and West Nile monitoring
- Transfer of DNA samples

Species Specific Involvement (including Con/Ed, survey, disease issues, reintroduction, and management and enforcement activities)

- Waterfowl
- Westslope Cutthroat
- Bull Trout
- Sauger
- Native Lake Trout
- Paddlefish
- Greater Sage-Grouse
- Pallid Sturgeon
- Grizzly Bear
- Wolf
- Lynx
- Bald Eagle
- Prairie Dog
- Bison

- Numerous Nongame
- Loon
- Bobcat
- Swan
- Pelican
- Harlequin Duck
- Great Blue Heron
- Black-Footed Ferret

Habitat

- Snowmobile and ATV issues with habitat
- Animal feeding (bears, deer, turkeys, pheasants)
- No-wake zone enforcement
- Fish ponds
- Exotic introductions
- Human/bear and wolf habitat conflicts
- Aquatic habitat restoration for westslope cutthroat
- Public point of contact for most current FWP habitat programs
- Fire season restriction enforcement in critical and all habitat
- 310 violations/motorhomes/fuel storage
- Enforcement of habitat easements
- Drought restriction enforcement for aquatic habitat
- Eeed issues/weed-free hay
- Focus already existing Con/Ed activities to better meet SWG priorities

Ideas for the Future

- Fund current FTEs for survey/inventory work on SWG tier species
- Additional funding could be used for saturation patrols to focus staff support needed on SWG projects
- Integrate current patrols and habitat assessments (e.g., whitebark pine, water conditions in critical areas). Wardens cover large amounts of habitat.
- Determine which wardens in the state have a greater proportion of their duties that are SWG related and consider funding and match benefits to agency.
- Increase overtime to allow for flexibility to support more SWG activities
- Serve on SWG committees so enforcement can collaborate with future projects from the beginning
- Seek compensation from SWG projects for work performed
- Emphasize the importance of law enforcement being included in future SWG legislative appropriation language

Appendix G: Invitees to Advisory Group Meeting, October 1, 2003

Agency or Organization	Contact	Title	Address	City	Zip
BLM	Roxanne Falise	Wildlife Biologist	P.O. Box 36800	Billings	59107
USFS	Cindy Swanson	Director, Watershed Wildlife, Fisheries and Rare Plants	Federal Building, P.O. Box 7669	Missoula	59807
USFWS	Lori Nordstrom	Biologist	100 North Park, Suite 320	Helena	59601
USFWS	Mark Wilson				
MNHP	Sue Crispin	Director	Montana State Library	Helena	59620
Montana and Wyoming Tribal Fish and Wildlife Commission	Gayle Skunk Cap	Vice Chairman	Blackfeet Nation	Browning	59417
NRCS	Dave White	State Conservationist	10 East Babcock Street, Room 443	Bozeman	59715
DNRC	Tom Schultz	Administrator	1625 11th Avenue	Helena	59620
DNRC	Pete Van Sickle	Forest Management Bureau Chief	2705 Spurgeon Road	Missoula	59804
MSU	Dr. Scott Creel	Department of Ecology	310 Lewis Hall	Bozeman	59717
UM	Dr. Dan Pletcher	Director, Wildlife Biology	School of Forestry	Missoula	59812
Turner Endangered Species Fund	Mike Phillips	Executive Director	1123 Research Drive	Bozeman	59718

The Nature Conservancy	Jamie Williams	State Director	32 South Ewing, Suite 215	Helena	59601
National Wildlife Federation	Tom France	Director	240 North Higgins, Suite 2	Missoula	59802
Trout Unlimited	Bruce Farling	Executive Director	P.O. Box 7186	Missoula	59807
Montana Wildlife Federation	Craig Sharpe	Executive Director	P.O. Box 1175	Helena	59624
Walleye Unlimited	Bob Gilbert	Executive Director	P.O. Box 1228	Sidney	59270
Montana Stockgrowers	Steve Pilcher	Executive Vice President	420 North California	Helena	59601
Montana Association of Counties	Harold Blattie	Assistant Director	2715 Skyway Drive	Helena	59620
Montana Petroleum Association	Gail Abercrombie	Executive Director	601 Euclid Avenue	Helena	59624
Montana Wood Products Association	Ellen Engsted	Executive Vice President	P.O. Box 1149	Helena	59624
Montana State Government	Honorable Walter McNutt	Chairman EQC	110 12th Avenue	Sidney	59270
Montana State Government	Todd O'Hair	Natural Resources Policy Advisor	Montana State Capitol	Helena	59620
Montana State Government	Todd Everts	Legislative Analyst	P.O. Box 201704	Helena	59620
Rocky Mountain Elk Foundation	J. Dart	President	2291 West Broadway	Missoula	59807
Montana Farm Bureau	John Youngberg	Vice President of Gov. Affairs	502 South 19th Avenue, Suite 104	Bozeman	59718
Western Environmental Trade Association	Don Allen	Executive Director	33 South Last Chance Gulch	Helena	59601

USGS	Dick Jackowski	Center Director	Room 211, AJM Johnson Hall, Montana State University	Bozeman	59717
Private Landowner	Barbara Cowen			Havre	59501
Defenders of Wildlife	Minette Johnson		114 West Pine Street	Missoula	59802
Boone and Crockett Club	George Bettas	Executive Officer	250 Station Drive	Missoula	59801

Questions and Input of Participants of October 1, 2003, Advisory Group

Attendance

Montana State University	Scott Creel
Montana Natural Heritage Program	Sue Crispin
Stockgrowers Association	Steve Pilcher
WETA	Don Allen
Walleyes Unlimited	Mike Sedlock
	Greg Heil
Farm Bureau	John Youngberg
Boone and Crockett	George Bettas
USGS	Dick Jackowski
University Of Montana	Dick Hutto
DNRC	Gary Frank
	Tom Schultz
	Pete Vansickle
The Nature Conservancy	Brian Martin
BLM	Katie Baltrusch
USFS	Skip Kawolski
NRCS	Pete Husby
MACO	Ellen Allestad
For Barbara Cowan	Scott Wink
National Wildlife Federation	Tom France

Questions for Discussion

- What role does your agency or organization want to play in the development of Montana's Comprehensive Fish and Wildlife Plan?

- Is there a representative from your organization other than you who should be the contact for becoming involved with planning or receiving

information about planning activities? (Please provide contact information, if possible.)

- Are there any other agencies and organizations you think should be involved in the planning process?

Participant Input

Collaboration with agencies, organizations, and the public.

May be difficult to get enough conservationists in some parts of the state (e.g., north-central and eastern portions).

NPS should be informed of where they fit in and should be a part of collaborative efforts, instead of only looking inward as an island.

Involve Indian tribes.

Involve more people with economic interest (e.g., outfitters and guides).

Make efforts to be sure large private landowners, especially ranchers and farmers, feel included and have opportunities to be involved.

Farmers and ranchers feed 75 percent of Montana's wildlife and therefore will want input into the plan.

FWP needs to include private landowners in the process. The recommendations coming out of the plan could have implications for them. Conduct meetings in small eastern communities to be sure FWP gets their input.

Most of the land-use impacts are not going to come from agriculture but from other groups.

Most of wildlife issues will be land use/growth related; consequently land-use planning efforts need to be incorporated.

Groups that should be included in the process include real estate, oil and gas, city/county planners, and others involved in land-use planning issues.

Should think about how the plan will fit into the growth policy debate and development that is going on statewide.

Need to get legislators involved.

FWP needs to be able to develop trust in the agency and in the process if it is going to succeed.

Information and Education

More people can be involved if organizations are used as an information conduit (the Farm Bureau could get the word out via its newsletter, which goes out to 11,000 members).

Needs to be taken (by FWP) out to the people. Open houses/listening sessions are best and will result in participation by more people including those who do not want to speak in front of large groups.

Montana is experiencing dramatic changes in user groups (e.g., growing interest in birds and birding) and FWP needs to be thinking about how to tie this in with traditional hunting and fishing. There is an upcoming segment of the population with no connection to hunting and fishing but an interest in wildlife. In addition, as ethnicity changes, FWP should look at how user trends are changing, which could put us in a position to better address the needs of Montanans. FWP needs to be looking at nature trails as well as shooting ranges, giving maps to floaters, etc.

Need to be sensitive to landowners feeling things may be shoved down their throats as well as being expensive (e.g., if species get listed).

Place more emphasis on why the SWG plan must be done (especially if we want to engage landowners or others not as familiar with the process).

There are wildlife recreation/tourism/economic diversification aspects to Montana's wildlife that should be incorporated (similar to how Montana has capitalized on Lewis and Clark).

Conduct a series of open houses such as FWP did with the wolf plan. In the first round of open houses have a dog and pony show to explain what we are doing, benefits, etc. Treat these as a kind of scoping session. When a draft plan is completed, return to those same places to present the draft and get local input.

There are a lot of organizations with newsletters and other publications that would be willing to print information on the plan and process if FWP provides it to them, for example, in a press release format. Some of these include Stockgrowers, Farm Bureau, grain growers.

Produce maps showing land ownership and species present so landowners could see the distribution and better understand the implications for them.

Many people will feel that frogs and snakes are not important and that FWP is wasting its time and theirs. FWP needs to overcome this mindset somehow.

Use phone inquiries and advertise in newspapers or other means; don't just have meetings as a means to make participation easier for more people.

Once the plan is completed and the information is available to the public, there will be great expectations of the agency.

People will expect FWP to do something about the issues identified. FWP needs to address their expectations in the plan, especially the question of what will be done if FWP doesn't get any more SWG funding.

There was some concern expressed that USFWS approval of the plan somehow constitutes an expansion of USFWS authority. Due to negativity toward ESA by landowners, this could be a difficult problem to overcome.

The whole deal comes down to the public trusting FWP and what the agency will do with the data.

Planning

No participants desired to be actively involved in the technical aspects of the plan but preferred to be informed of progress and have future opportunities to support planning efforts and review drafts.

The strength of the plan is in setting up monitoring programs.

Advantage of organizing the plan by three or four regions of the state is that it is easier for people to participate and take advantage of information from existing plans; disadvantage is combining them into one plan, and ensuring statewide view and interest from groups with a statewide instead of regional perspective.

USGS has a heritage of data collection from the time of the 1885 Biological Survey to mapping by Merriam. Those functions live on within USGS today. The plan could help us prioritize/plan research that will have the strength of a partnership with the state. It would also help USGS align our priorities with state priorities.

FWP should make a concerted effort to spend time with NRCS staff, learn about their programs, see what NCRS spends money on and how, identify opportunities and build synergies, avoid duplications; five- to ten-year funding is available from Farm Bill programs gets spent.

SWG plan needs to complement the work the National Wildlife Federation and others are doing and not duplicate efforts of other agencies; SWG plan will be a failure if this is not accomplished.

Be sure to keep the process open.

Consider including incentives for private landowners in the plan.

Think about how will habitat be addressed and how we can develop a comprehensive plan for animals when the habitat is owned by others?

The shorter and tighter the planning process the better (get it done in a matter of months, not years like Canyon Ferry; bull trout was endless and unrewarding, grizzly planning had good facilitation).

FWP is already oriented toward a successful model in garnering public comment; the difficulties will be in defining “comprehensive,” setting priorities, and dealing with groups/individuals who are focused on specific conservation issues and feel like their focus is not garnering the prioritization that it deserves.

The plan is an opportunity to establish comprehensive surveys—including coordinated statewide surveys and inventories. To get information more quickly, there could be a coordinated statewide survey every year to address a particular issue.

DNRC would find the comp plan helpful in layout and design of its forest management activities. It also would establish communication links between DNRC and FWP biologists, and would help reduce conflicts and assist with conservation plans.

It might be difficult to please everyone.

We have a varied knowledge base where we know a lot about one species and not much about another and how that will impact the prioritization process.

There is a planning conflict with managing species that live in the same areas but have different habitat needs (e.g., mountain plover and greater sage-grouse both live in eastern Montana where one prefers grazed-over lands and the other prefers “old-growth” sagebrush.

Need to assess whether we’ve “restored” something and determine how that will be done even for more localized efforts such as the Milltown Dam project.

The explicit differences between species are important to recognize upfront.

Organize review groups taxonomically rather than geographically, or by method or approach (by type of data needed for all groups: first determine species, then associated habitat, then associated threats).

Perhaps a quid pro quo approach would be helpful. We are asking landowners and others for their help with this process. In exchange, perhaps we can provide some help with other wildlife issues.

FWP should make tentative decisions on topics such as lists of species and habitat types (e.g., say here's what we think is an endangered habitat and what species are viable), then have an advisory committee test the reality.

The plan is a great opportunity to join with partners.

The plan should stay away from using SWG money for habitat acquisition. We should tell the public right up front that the funding would not be used for that purpose.

Limit the scope of the plan either geographically or by species. It might be too big.

Limit the range of activities that would be undertaken as part of the plan and make this clear to the public. For example, if we are going to seek additional regulatory authority to implement the plan the public should know that (if we aren't they should know that as well).

Given the number of species, the plan has to focus on habitat.

Plan should be adaptive and flexible including flexibility in scale, meaning that one can "zoom in" if needed, and remain "zoomed out" the rest of the time.

Plan should be used for setting priorities and addressing suites of species.
The plan should be geographically based because Montana is diverse in terms of habitat and people (local areas have different customs, etc.)

The planning process is a good opportunity to learn more about Montana's fish and wildlife resources and prioritize conservation needs.

We need to look at dimensions of the plan: 1) figure out what is out there, 2) gather presence/absence information, 3) monitor trends, 4) identify what is driving these trends, 5) adaptive management, 6) work from the level of individuals to populations to communities to ecotypes.

Another, more rapid, way for the plan to take us where we need to go would be to: 1) find out what is out there, 2) identify habitat relationships (including land uses) which provide insight into issues for the species, and then 3) move directly

into adaptive management including incentives. (The model for this approach is the land bird–monitoring program at University of Montana.)

During planning sit down with leadership and get them on board, then identify potentially affected parties and who will be most impacted. Solicit their involvement and determine where you are going to concentrate efforts. Develop creative solutions to get consensus and focus on collaboration.

Look at PIF plan. All bird—good process-habitat driven-coarse scale; also look at PPJV and BBS plans.

Must be careful of prioritizing based on popularity rather than on biological resources; good planning effort that she has been involved with is the “YES” committee- structure is blend of science and agency working group. GB Management Plan; different groups but concepts blended together.

Look at systems and how to manage and conserve them.

Geographic means of organizing the plan would include “ecotypes,” “biomes,” and/or “hot spots.”

To be successful, the USFWS needs to give up some control to landowners. Landowners have management objectives for their lands, and the plan has to be compatible with those landowner goals in meeting species needs. Most landowners want to support critters out there to some degree. FWP needs to be seen as a partner instead of an enforcer.

Plan needs to have the full range of tools including public education.

Plan needs to take into consideration what FWP has authority for and what it doesn’t. It needs to recognize parties who do have the authority to take actions (that FWP does not have authority to take).

FWP should develop the strategy (plan for the plan), then later, organizations can decide how much involvement they want, and at what points.

Utilize existing plans and fit them into the SWG plan (e.g., prairie dog or greater sage-grouse/sage-steppe); don’t reinvent them. Use indicator species where possible.

Funding options and implementing existing plans should be integral to the SWG plan because people will be more energetic about how they can influence spending of money from various sources, not just be involved in a planning effort.

Match and Alternative Funding

Identify focus areas and use FWP programs like Habitat Montana as a match.

The Boone and Crockett Club is interested in funding for good research and in partnering with FWP in any areas that would lend themselves to conservation education and working with teachers and schools.

University will be able to help describe low and declining populations and threats; already a strong emphasis at MSU on threatened and endangered species, species assemblages, and landscape projects; nationwide trend with conservation planning; universities just part of that trend. Providing match beyond deferring overhead is difficult because most is federal dollars.

The plan needs to consider the issue that if SWG money dries up, how much game money will FWP have to use to support the new efforts.

Align project priorities with various sources of funds and integrate opportunities from all applicable (federal and state) funding sources available to FWP (e.g., SWG, LIP, Section 6 competitive funds are some of the federal opportunities) as well as other agencies.

Groups like Walleyes Unlimited have grant programs and may be able to help with matching funds.

DNRC has threatened and endangered species as well as Species of Special Concern on their lands. If we are match limited they could provide match and use the SWG funds. DNRC is working on a habitat conservation plan for threatened and endangered species and other species (30 total; e.g., wolverine, woodpecker, goshawk, westslope cutthroat) on its forested land, and are developing strategies to conserve species and identify data gaps.

The SWG plan could be valuable in filling in data gaps; if the plan identified species that were of concern to DNRC, it could possibly match SWG funds for survey, inventory, and research. DNRC is a major landowner in the state; CFWP plan could fit into DNRC plan depending on project suitability. Their plan will be very prescriptive in solutions; tiered down to activities that are being conducted on the ground but will not just be metrics but also ID information needs.

General

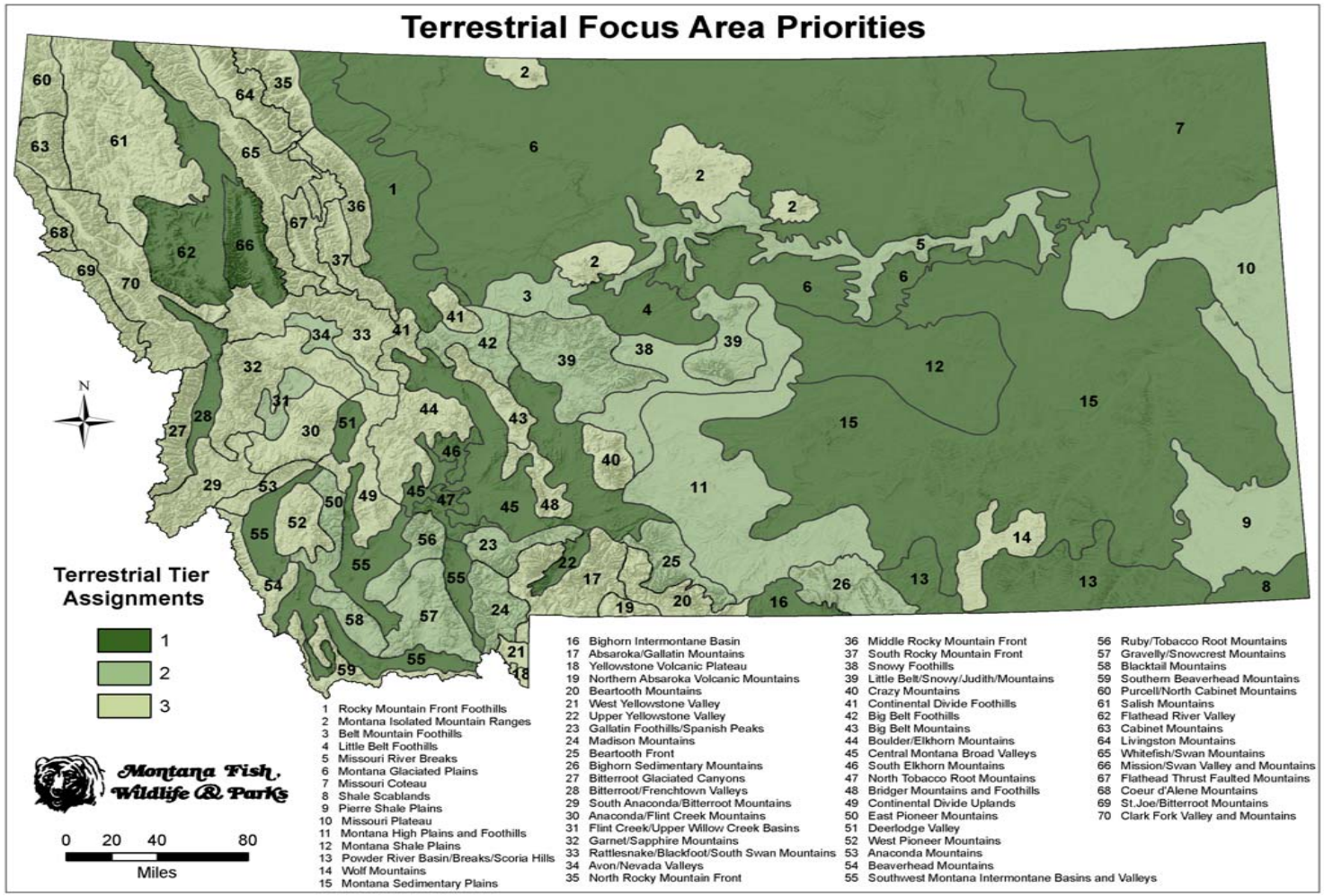
Emphasis on wildlife in addition to elk and rainbow trout (e.g., sauger, eastern Montana surveys) is good.

Congress and others are tired of train wrecks with threatened and endangered species listings; being able to avoid listings to begin with would be helpful.

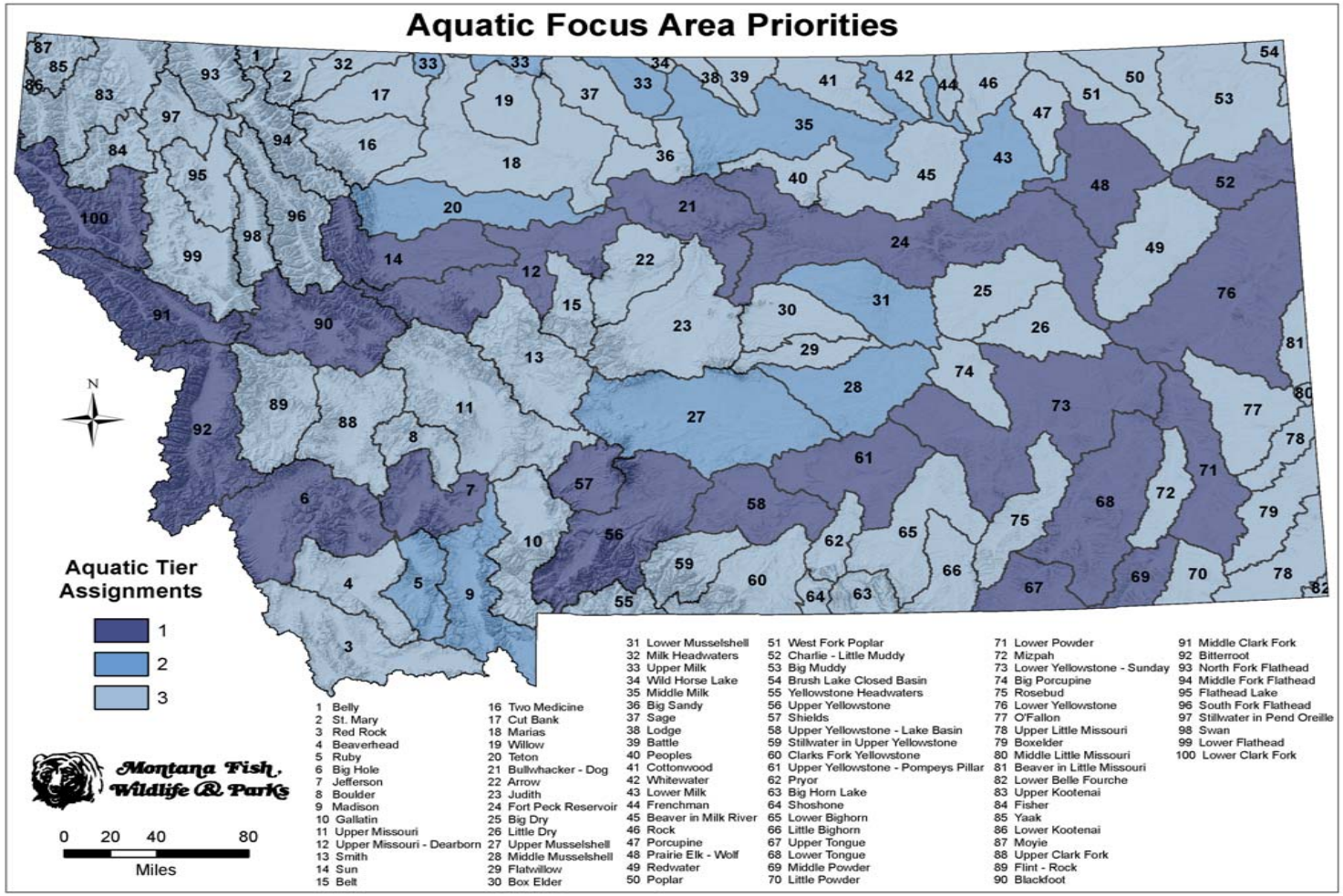
Comment was made that the expectation is that FWP will do more of what we are doing now (efforts like collection of greater sage-grouse information and cutthroat trout restoration), which will help Montana get ahead of the curve.

This plan would help federal land management agencies deal with land management issues in concert with surrounding lands (in context with those lands and on an ecological basis with them). DNRC could use some of the SWG money to complete projects such as the HCP they are preparing for state lands and a culvert survey currently in progress.

Appendix H: Terrestrial Focus Area Priorities



Appendix I: Aquatic Focus Area Priorities



Glossary

Bog: standing water, acidic.

Calcareous: Soil containing calcium carbonate, calcium or limestone; chalky.

Community Type: A group of associated plantsa, animals and the related geo-climatic characteristics.

Comprehensive Conservation: A term used to describe how fish and wildlife and their related habitats are interconnected and how conservation concerns common to all of these can be addressed on a broad-scale giving equal importance to all components.

Conservation Concern: Description of the critical threats that have, are or could adversely affect the populations of fish and wildife and their related habitats.

Conservation Strategies: Strategic guidance that address conservation concerns.

Critical Habitat (As defined by the Endangered Species Act): (i)The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

Critical Habitat (As used not in relation to the Endangered Species Act): A habitat deemed essential to support healthy fish and wildlife communities.

Cryic: Very cold soils

Ecotype: Georgraphic reference to broad-scale areas of Montana that have similar landscape, geoclimatic and vegetation characteristics.

Essentially Associated: An association between geographic area, vegetation, or fish and wildlife species that is critical to the existence of a population of fish or wildlife.

Fen: continuous groundwater, alkaline

Focus Area: A terrestrial or aquatic area based on geographic features or the drainage of water that are used to frame locations where comprehensive conservation will occur.

Generally Associated: An association between geographic area, vegetation, or fish and wildlife species that is important to the existence of a population of fish or wildlife

Greatest Conservation Need: Focus areas, community types and species that are low or declining, federally listed species as either “threatened” or “endangered” or individual/groups of species that lack distribution and occurance information to asses their status or trends

Mass Wasting: the downslope movement of rock, regolith, and soil, under the influence of gravity. Also called mass movement.

Mesic: Shrubs, grasslands or combination of both that are adapted to a moderately moist habitat.

Oligotrophic: Low in nutrients and in primary production.

Tier: Three levels of Conservation need assigned to focus areas, community types, species, and Inventory Needs. (a fourth Tier was used for just the species component that identifies non-native or peripheral species)

Udic: Moist soils most of the year.

Ustic: A soil moisture regime that occurs with a limited amount of water available for plants but occurs at times when the soil temperature is optimum for plant growth.

Xeric: Shrubs, grasslands or combination of both that are adapted to an extremely dry habitat.

Species Index