Draft Environmental Assessment and Land Protection Plan

Proposed Bear River Watershed Conservation Area

Idaho, Utah, and Wyoming

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Prepared by

U.S. Fish and Wildlife Service
Region 1, Pacific Region
Division of Planning and Visitor Services
911 NE 11th Avenue
Portland, Oregon 97232
503/872 2086

U.S. Fish and Wildlife Service
Region 6, Mountain-Prairie Region
Division of Refuge Planning
134 Union Boulevard, Suite 300
Lakewood, Colorado 80228
303/236 8145

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Summary

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Mountains and marshes at Bear River Migratory Bird Refuge, Utah

The U.S. Fish and Wildlife Service is proposing a conservation area for the Bear River watershed in Idaho, Utah, and Wyoming. The proposed Bear River Watershed Conservation Area project would work with private landowners to establish up to 920,000 acres of voluntary conservation easements:

- to conserve aquatic, riparian, wetland, and upland habitats;
- to provide wildlife habitat connectivity and migratory corridors;
- to maintain healthy populations of native wildlife species;
- to protect and maintain water quality and quantity;
- to increase the watershed's resiliency during climate and land use changes;
- to conserve the area's working landscapes;
- to promote partnerships for coordinated watershed-level conservation.

To successfully implement the proposed Bear River Watershed Conservation Area, the Service would work with the three landscape conservation cooperatives that encompass the proposed project area—Great Northern, Great Basin, and Southern Rockies Landscape Conservation Cooperatives. In addition, the Service would coordinate conservation efforts throughout the Bear River watershed with numerous partners: The Nature Conservancy, Trout Unlimited, Ducks Unlimited, local Audubon chapters, PacifiCorp, conservation districts, State agencies, and other Federal agencies.

The Service has developed a draft environmental assessment and land protection plan for the proposed Bear River Watershed Conservation Area. The document:

- highlights the resource values of the proposed project area;
- presents alternatives for the project that address issues the Service, its conservation partners, and the public have identified;

- evaluates the environmental and socioeconomic effects projected to occur if the conservation area were established.

The Bear River Watershed

The Bear River is the largest river in the Western Hemisphere that flows into an inland sea—the Great Salt Lake. The river originates in the Uinta Mountains and flows north and west in an arc from Utah, through Wyoming and Idaho, and back into Utah. In the course of its 500-mile journey, the Bear River passes through three national wildlife refuges: Cokeville Meadows National Wildlife Refuge, Bear Lake National Wildlife Refuge, and Bear River Migratory Bird Refuge.

The wide range of altitudes in the Bear River watershed allow for diverse habitats. Grassland and shrubland dominate the flats and the lowlands, while pinyon–juniper woodland and pine forest cover the higher slopes. Big sagebrush is common on much of the landscape, although other shrubs such as rabbitbrush, saltbush, and greasewood may dominate some areas.

Most of the lower elevation areas are privately owned, with much of the land in the wide valleys used for agriculture and grazing. Bear River water is used extensively to irrigate alfalfa, small grain crops, and ranchland.

Future activity in the Bear River watershed is expected to include commercial oil and gas development, mining, wind energy development, and residential development, along with an associated increase in water demand.

How Conservation Easements Work

To protect habitat, the Service recognizes that it is essential to work with private landowners on conservation matters of mutual interest. The proposed project would use voluntary conservation easements on privately owned land throughout the Bear River watershed to protect wetland, grassland, and agricultural land from conversion to other uses. As a voluntary legal agreement between a landowner and the Service, an easement is a perpetual conservation agreement that the Service would purchase from willing landowners.

- A conservation easement typically contains habitat protection measures that prohibit subdivision but allow for the continuation of traditional activities such as livestock grazing and haying.

- Alteration of the natural topography and conversion of native grassland, shrubland, or wetland to cropland would be prohibited on a conservation easement.

- Conservation easement land would remain in private ownership, and property tax and land management, including invasive weed control, would remain the responsibility of the landowner.

- Control of public access to a conservation easement would remain under the control of the landowner.

The Service would purchase conservation easements with money generated by the Land and Water Conservation Fund Act of 1965. These funds are derived from oil and gas leases on the Outer Continental Shelf, motorboat fuel tax revenues, and sale of surplus federal property. The U.S. Congress appropriates money for a specific project, such as the proposed Bear River Watershed Conservation Area. Easement prices offered to willing sellers would be determined by an appraisal completed by an appraiser familiar with the local market.

Service staff at the three wildlife refuges in the Bear River watershed would administer and monitor the conservation easement program.

Resources Would Benefit

Through the goal of acquiring conservation easements from willing sellers, the proposed project would help maintain habitat important to a variety of fish, mammals, and migratory birds throughout the Bear River watershed. This includes the major migration corridors that connect the northern and southern Rocky Mountains. Watershed-wide conservation efforts would be coordinated, and valuable farmland and ranchland would be protected.

The small, pristine mountain streams in the forested headwaters of the Bear River are ideal breeding habitat for Bonneville cutthroat trout, leatherside chub, and blue-nosed sucker, all important native species. Elk, black bear, pika, and marmots use these high-elevation forests and snow-covered mountain slopes.

The primary routes of migratory birds following the central and Pacific flyways converge in the Bear River watershed. The national wildlife refuges and adjacent areas provide essential habitat for many species of waterfowl, wading birds, shorebirds,

and upland birds that migrate through on their way to and from the Canadian and Alaskan interior and coastal wetlands.

More than 200 bird species have been documented in the proposed project area, and half are closely associated with wetlands. Marshbirds and shorebirds include white-faced ibis, black tern, American avocet, long-billed curlew, American bittern, sandhill crane, and trumpeter swan. Upland birds include the greater sage-grouse and Columbian sharp-tailed grouse.

In addition to the importance of the proposed conservation area to bird species, many mammals are dependent on the blocks of intact habitat and the key migration linkages between these areas. Elk, mule deer, moose, pronghorn, bear, lynx, and wolverine depend on key wintering areas and migration corridors throughout the Bear River watershed.

Abbreviations

BRWCA	Bear River Watershed Conservation Area
CFR	Code of Federal Regulations
CO_2	carbon dioxide
EA	environmental assessment
GCN	(species of) greatest conservation need
HAPET	Habitat and Population Evaluation Team
LCC	land conservation cooperative
LPP	land protection plan
NRCS	Natural Resources Conservation Service
NWR	national wildlife refuge
Refuge System	National Wildlife Refuge System
Service	U.S. Fish and Wildlife Service
U.S.C.	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WPA	waterfowl production area

A glossary of these and other terms follows the Draft LPP Chapter 4.

Draft Environmental Assessment

Water is the most critical resource issue of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land.

—Luna Leopold

Draft Environmental Assessment (EA) Chapter 1—Purpose of and Need for Action

USFWS

Birds at Oxford Slough Waterfowl Production Area, Idaho

Introduction

Before Euro-American settlement, the Bear River delta on the north side of the Great Salt Lake was a vast natural marsh that provided wetland habitat for waterfowl in the arid Great Basin region. When John C. Fremont, an early explorer in the West, visited the area near the present-day Bear River Migratory Bird Refuge in 1843, he commented, "the waterfowl made a noise like thunder… as the whole scene was animated with waterfowl."

The Bear River travels a 500-mile course from its headwaters in Utah's Uinta Mountains through Wyoming and Idaho, eventually terminating its horseshoe-shaped route in Utah's Great Salt Lake, the largest inland sea in the Western Hemisphere. The forested areas at the headwaters are part of a crucial wildlife corridor for species migration in the western United States. These areas offer a major link between the northern and southern Rocky Mountain ecosystems (Theobald et al. 2011, USDA Forest Service 2003). The small, pristine mountain streams found in the area provide ideal breeding habitat for important native species, such as the Bonneville cutthroat trout and northern leatherside chub. Elk, black bear, grizzly bear, Canada lynx, wolverine, gray wolf, pika, and marmot use the high-elevation forest and snow-covered mountain slopes found in the watershed. The montane shrubland, sage grassland, and pastureland provide good habitat for greater sage-grouse, Columbian sharp-tailed grouse, bald eagle, hawks, mule deer, elk, pronghorn, rabbit, bobcat, and black bear.

Wetlands and riparian areas in the lower elevations provide some of the most important resting, staging, feeding, breeding, and nesting areas for migratory birds in the Pacific and central flyways (Downard 2010). More than 46 percent of the North American population of white-faced ibis, 24 percent of the North American population of marbled godwit, and 18 percent of the North American population of black-necked stilt use the wetland habitat found within the watershed. More than 270 different species are associated with the habitats supported by the Cokeville Meadows National Wildlife Refuge, Bear Lake National Wildlife Refuge, Bear River Migratory Bird Refuge, Oxford Slough Waterfowl Production Area, and adjacent lands located within the Bear River watershed. The Bear River watershed is essential to

the survival of the Bonneville cutthroat trout, millions of birds, and many other species of wildlife.

The Bear River is heavily influenced by land use along its course that in turn affects wildlife habitat and the amount and quality of available water. Agricultural lands provide habitat for wildlife, but in some areas these lands are rapidly being converted to residential development. The collaborative efforts of conservation partners in the Bear River watershed will be needed to preserve this working landscape that is such an important resource for people and wildlife.

Proposed Action

The U.S. Fish and Wildlife Service (Service) proposes to establish a voluntary conservation easement program in southeast Idaho, northeast Utah, and southwest Wyoming called the Bear River Watershed Conservation Area (see figure EA–1). The proposed project boundary encompasses roughly 4.8 million acres, within which the Service would strategically protect using conservation easements on up to 920,000 acres of privately owned land from willing sellers (see figure EA–2).

Conservation Easements

The Service would seek to protect habitat through perpetual conservation easements; it would not seek fee-title acquisitions. This easement program would rely on voluntary participation from landowners. Grazing, haying, and prescribed burning would continue on any land included in the easement contract. Land within an easement would remain in private ownership and, therefore, property tax and management activities such as invasive plant control and burning would remain the responsibility of the landowner. Public access to the land would also remain under the control of the landowner. This purpose is in alignment with, but does not supersede, the vision and statutory purposes of the three existing refuges in the Bear River watershed.

Easement restrictions may include, but are not limited to, residential, commercial, and industrial development that alters the natural topography; conversion of native uplands and wetlands to cropland; and draining of wetlands. The proposed easements would help maintain unfragmented blocks of habitat that would complement efforts by the existing national wildlife refuges and land trusts and entities:

- The Nature Conservancy
- Bridgerland Audubon
- Wyoming Stock Growers Agricultural Land Trust
- Sagebrush Steppe Regional Land Trust
- Idaho Department of Fish and Game
- Trout Unlimited
- Utah Division of Natural Resources
- Wyoming Game and Fish Department
- Utah Partners for Conservation and Development
- U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)

Draft Vision Statement

Landscape-scale protection of the natural resources found within the Bear River watershed is essential to humans and wildlife. The Bear River Watershed Conservation Area project preserves, protects, and restores the natural resources and working landscapes within the drainage.

Through cooperative efforts with ranchers, farmers, local communities, land management agencies, and other conservation organizations, the United States Fish and Wildlife Service builds a community of citizens dedicated to protection of wildlife habitat, maintenance of healthy communities, enhancement of water quality, promotion of sustainable agriculture, and recognition of good stewardship.

The legacy of this effort is the tapestry of snow-covered mountains, deciduous and conifer forest, vast areas of sagebrush and wetlands, and working farms and ranches that decorate the landscape of the Bear River Watershed. This expansive landscape supports a multitude of diverse wildlife species including migratory birds, sage-grouse, elk, black bear, pronghorn, mule deer, Bonneville cutthroat trout, and other native species.

Implementation of a landscape-scale collaborative effort within the Bear River Watershed Conservation Area conserves the significant wildlife, aesthetic, and cultural values of this region in perpetuity.

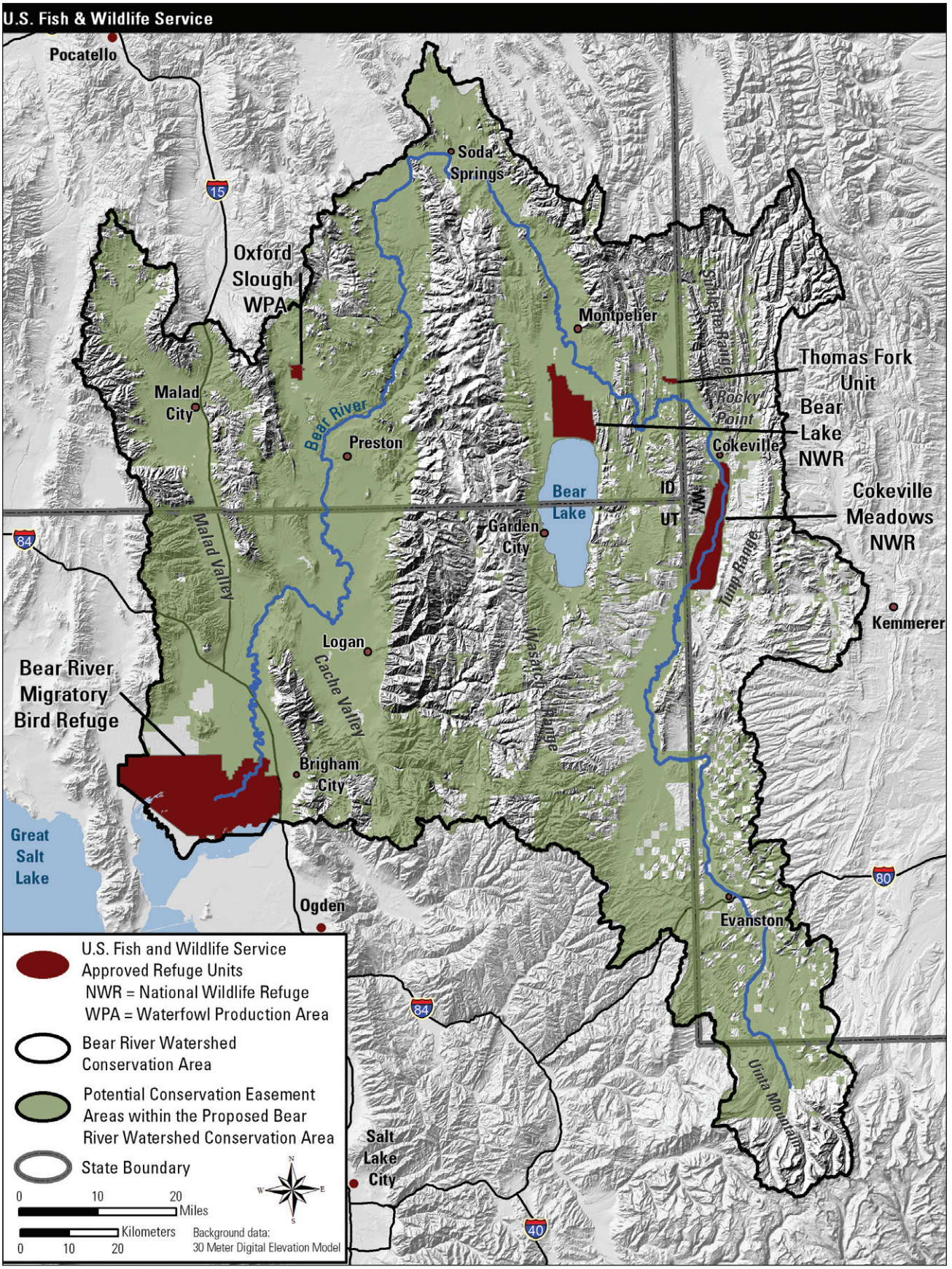


Figure EA–1. Map of the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

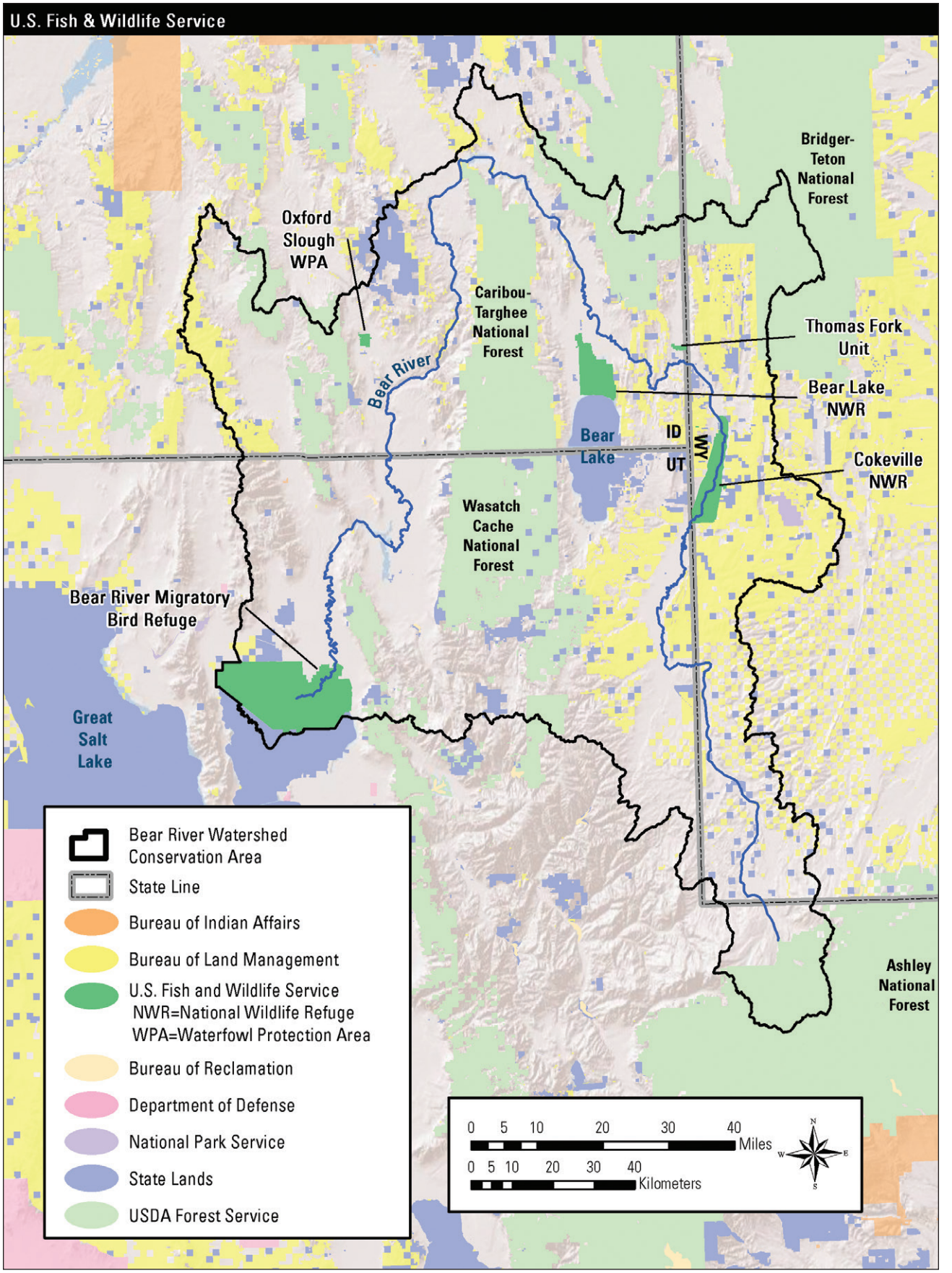


Figure EA–2. Map of land stewardship in the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

Project Area

The Bear River's current course developed about 50,000 years ago (Toth et al. 2005) when a volcanic debris slide cut off its original northerly route and deflected the river southwards through present-day Soda Springs and into the Great Basin instead of westwards toward the Snake River watershed and present-day Pocatello, Idaho.

The Bear River originates in the mountains of Utah's High Uintas Wilderness, meanders through Wyoming and Idaho, and reenters Utah, where it empties into the Great Salt Lake. The Bear River is in the Basin and Range and the Middle Rocky Mountains physiographic provinces. It has the largest discharge of any river in the Western Hemisphere that does not flow to an ocean (Dion 1969). Along with other areas in the basin, the forested areas at the headwaters form a crucial wildlife migration corridor. These forested areas offer a major link between the northern and southern Rocky Mountain ecosystems (Theobald et al. 2011). As the river flows north out of the conifer-covered slopes of the Uinta Mountains into the narrow valleys of Utah downstream, land uses begin to change and water quality begins to decline.

The Bear River eventually passes through the Bear River Migratory Bird Refuge and terminates its almost circular route in the Great Salt Lake in Utah, which has no outlet. The river contributes more than half of the total surface flow entering the Great Salt Lake each year. This large volume of fresh water from the river influences temperatures, salinity, and water levels in the lake. The basin contains many large reservoirs and hundreds of small reservoirs, stock ponds, and an extensive network of irrigation canals.

The water of the Bear River is the lifeblood for human and wildlife populations throughout the region. The central and Pacific flyways for migratory birds overlap in the watershed, and the Bear River Migratory Bird Refuge and Bear Lake National Wildlife Refuge are considered by the National Audubon Society to be Globally Important Bird Areas. [See the glossary for descriptions and definitions of some of the terms used in this document.]

Approximately one-half of the Bear River watershed is under Federal ownership. The proposed project area is adjacent to or encompasses portions of lands managed by the U.S. Fish and Wildlife Service, Bureau of Reclamation, Bureau of Land Management, and USDA Forest Service. Important habitat in private ownership is located within and next to lands managed by these Federal entities, as wells as on lands adjoining the national wildlife refuges.

Purpose of and Need for the Proposed Action

This project proposal originates from the recognition that water availability and quality are crucial for conserving the fish and wildlife species within the Bear River watershed. It is recognized that private lands are heavily used by wildlife and that properties that are next to public lands provide crucial migration corridors and linkages to a variety of habitats. As climate conditions and land use patterns change over time, many key off-refuge habitat areas will likely become both increasingly important for wildlife and increasingly subject to development pressures.

The proposed Bear River Watershed Conservation Area is a landscape-scale, strategic habitat conservation effort designed to contribute to the protection of significant values of this highly diverse ecosystem. (See more on strategic habitat conservation in chapter 5.) These values follow:

- The area is one of the most significant resting, staging, feeding, breeding, and nesting areas for large populations of migratory waterfowl and shorebirds on both the central and Pacific flyways:
- white-faced ibis (46 percent of the North American population)
- tundra swan (32 percent of the western population)
- American avocet (over 16 percent of the North American population)
- black-necked stilt (over 18 percent of the North American population)
- marbled godwit (over 24 percent of the North American population)
- The watershed provides habitat for species such as greater sage-grouse, Columbian sharp-tailed grouse, Bonneville cutthroat trout, pronghorn, and, in the high country, grizzly bear, Canada lynx, wolverine, and gray wolf.
- The watershed is an important source of water both along the river course and as the major surface water source of the Great Salt Lake.
- It is an important migration area for wide-ranging mammals.

Much of the lands in the wide valleys of the Bear River watershed have been converted to pastures and agricultural fields. Water from the river is used for irrigation of alfalfa, pastureland, and small grains. Oil and gas exploration and development are expanding in parts of the watershed. Residential development is affecting prime agricultural lands and wildlife habitat. In some areas of the Cache Valley, the population is expected to double by 2050 (Utah Division of Water Resources 2004). The Service seeks to work with ranchers, conservation organizations, and other agencies to conserve wildlife habitat and working lands for future generations.

The purposes for establishing the Bear River Watershed Conservation Area are to:

- maintain healthy populations of native wildlife species including migratory birds and threatened and endangered species;
- protect and maintain water quality and quantity;
- conserve aquatic, riparian, wetland, and upland habitats associated with the full diversity of Bear River ecosystems;
- provide habitat connectivity and migratory corridors;
- promote partnerships to coordinate implementation of watershed-level wildlife conservation actions;
- increase resiliency of the watershed to sustain wildlife and important habitat through climate and land use changes.

Decisions to Be Made

The Service's planning team (see "Appendix A, List of Preparers and Reviewers") has completed a draft analysis of the protection and management alternatives. Based on the analysis to be documented in the final EA, the Service's Directors of Region 1 and Region 6, with the approval of the Director of the U.S. Fish and Wildlife Service, will make three decisions:

- Determine whether the Service should establish the Bear River Watershed Conservation Area.
- If yes, select an approved, conservation easement project boundary that best fulfills the habitat protection purposes for the proposed conservation area.
- If yes, determine whether the selected alternative would have a significant impact on the quality of the human environment. The National Environmental Policy Act of 1969 requires this decision. If the quality of the human environment would not be significantly affected, a finding of no significant impact will be signed and made available to the public. If the alternative would have a significant impact, completion of an environmental impact statement would be required to address those impacts.

Issues Identified and Selected for Analysis

Six public scoping meetings were held in Idaho, Utah, and Wyoming in May 2011. Public comments were taken in Cokeville and Evanston, Wyoming; Brigham City and Logan, Utah; and Preston and Montpelier, Idaho, to identify issues to be analyzed for the proposed action. Approximately 130 landowners, members of various organizations, and elected representatives attended the meetings. Additionally, 10 letters providing comments were received by mail or email. A total of 327 comments and questions were received on the project proposal.

Refuge staff contacted tribal, Federal, State, and local officials as well as conservation groups that expressed an interest in the future of the Bear River watershed. Approximately 675 fact sheets were distributed, and they were also made available on the refuges' Web sites.

The main categories of comments, issues, and questions expressed at meetings or received by mail follow.

Biological Issues

- Importance of wildlife and wildlife habitat in the watershed.
- Questions about the types of habitat and lands that would be included in the proposed project.
- Ecosystem importance of the watershed (connectivity and habitat types represented).
- Importance of protecting water resources.
- Water quality and quantity issues in the watershed.
- Impacts of dams and diversions.

- Climate change impacts on the region.
- Development (residential, oil and gas, mineral, and recreational), which was perceived as the biggest threat to the long-term health and stability of the Bear River landscape, culture, and wildlife resources.
- Perceived mismanagement of lands and inappropriate stewardship (grazing and agricultural practices) in the watershed.
- Invasive species in the watershed.
- Fragmentation of habitat.

Socioeconomic Issues

- Funding sources and matching contributions.
- Tax implication of easements.
- Economic impacts of easements.
- Financial implications of easements.
- Quantity and location of land needed for the proposed Bear River Watershed Conservation Area project.
- Agricultural values of the Bear River.
- Aesthetics (open space and scenery).
- Importance of recreational opportunities.
- Availability of recreational opportunities in the watershed.
- Economic importance of the watershed (agriculture and power generation).

Administrative and Enforcement Issues for Easements

- Potential easement restrictions and language.
- Responsibilities and limitations on management practices of an easement.
- Current and future land uses and encumbrances (oil and gas leases, mining, and rights-of-way).
- Perpetual nature of Service easements.
- Comments and questions about enforcement of easements.
- Importance of monitoring conservation easement parcels.
- Possibility of easements increasing wildlife depredation, especially by sandhill cranes.
- Comparable easement programs that are available with other agencies and organizations.
- Easement financial and funding implications.
- Service appraisal process.
- Easement valuation determination.

Other Issues

- Conservation partnerships and coordination.
- Organizations and other agencies that the Service would be working with.
- Interest expressed in selling a conservation easement to the Service.
- Questions on timelines, public input opportunities, and availability of data and GIS information.
- Comments on the need for planning various watershed uses and future development.
- General concern.
- General support.
- Interest in easements.

Issues Not Selected for Detailed Analysis

Historically, there has been concern about the amount of tax generated for the counties when land protection programs take place. Because the proposed project involves conservation easements, land would not change hands and, therefore, the property taxes paid by the landowner to the county would not be affected.

Development of rural landscapes often leads to increased demand for services and higher costs to rural counties. There would generally be an offset of

any perceived reduction in the tax base, because the county would not incur the expense of providing services to rural developments.

National Wildlife Refuge System and Authorities

The mission of the National Wildlife Refuge System (Refuge System) is "to preserve a national network of lands and waters for the conservation, management, and where proper, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." The Bear River Watershed Conservation Area would be a part of the Refuge System managed in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, Executive orders, regulations, and policies.

Conservation of more wildlife habitat in the Bear River watershed would also continue in a manner consistent with the following policies and management plans:

- Migratory Bird Treaty Act (1918)
- Migratory Bird Hunting and Conservation Stamp Act (1934)
- Bald and Golden Eagle Protection Act (1940)
- Fish and Wildlife Act (1956)
- Land and Water Conservation Fund Act (1965)
- Endangered Species Act (1973)
- "North American Waterfowl Management Plan" (1994)
- "Migratory Non-game Birds of Management Concern in the U.S." (2002)

Related Actions and Activities

Private landowners have worked with many organizations to complete conservation easements. In an effort to control invasive species such as tamarisk, phragmites, Russian olive, quagga and zebra mussels, and carp, the Service's Partners for Fish and Wildlife program, The Nature Conservancy, State agencies, county weed districts, and private landowners have begun cooperative efforts throughout the region.

Bridgerland Audubon Society has worked with The Nature Conservancy and PacifiCorp to protect 500 acres of key riparian land along the Bear River in Cache County using conservation easements.

Coordinated Resource Management committees in Box Elder and Rich Counties consist of State and Federal agency staff, representatives from local government, nonprofit organizations, academic institutions, private industry, and private individuals. Coordinated Resource Management committees work to provide rich, healthy ecosystems with a sustainable agricultural industry and wildlife populations and that contain diverse recreational opportunities and a vibrant rural community.

Sagebrush Steppe Regional Land Trust was founded in 2003. It has completed 15 projects in southeast Idaho that protect 2,260 acres of natural and working lands that benefit Bonneville cutthroat trout and other wildlife species.

The Nature Conservancy bought a 6,700-acre conservation easement to protect habitat for the Columbian sharp-tailed grouse and other wildlife species. The Nature Conservancy is developing a comprehensive plan to provide early detection and rapid response for the control of invasive weeds in Cache County. The Nature Conservancy has also been involved with mapping important wetland areas throughout the watershed.

Trout Unlimited has 12 projects underway in the watershed that aim to reconnect essential spawning tributaries in each of the five major sections of the Bear River. Trout Unlimited and project partners identified barriers to fish passage such as dams and retrofitted the structures with fish ladders and screens to allow upstream passage and prevent downstream loss of fish in irrigation canals. Trout Unlimited also improves riparian and aquatic habitats in the reconnected tributaries and the main stem Bear River.

Utah Partners for Conservation and Development is a sponsor of the Utah Watershed Restoration Initiative, a partnership-driven effort to conserve, restore, and manage ecosystems in priority areas across the State to enhance Utah's wildlife, biological diversity, water quality and quantity for all uses, and opportunities for sustainable uses. In 2010, the watershed restoration initiative was involved in 26 projects totaling 19,336 acres in its Northern Region, which includes the Bear River watershed (Utah Division of Wildlife Resources 2011).

Wyoming Stock Growers Agricultural Land Trust holds 62 conservation easements on more than 170,000 acres of ranchland throughout the State. By working with landowners to conserve working ranches, crucial wildlife winter ranges and migration corridors commonly found in the most agriculturally productive locations along valleys and waterways are also protected.

Wyoming Land Trust holds conservation easements on 30,324 acres of working ranchland, wildlife habitat, and scenic areas in Wyoming.

U.S. Department of Agriculture

The *Conservation Reserve Program* is administered by the USDA Farm Service Agency and provides technical and financial help to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. Currently, 668,643 acres in Idaho, 163,082 acres in Utah, and 226,044 acres in Wyoming are enrolled in the Conservation Reserve Program (USDA Farm Service Agency 2007).

The *Farm and Ranch Land Protection Program* provides matching funds to help buy development rights to keep productive farm and ranchland in agricultural uses. Working through existing programs, the USDA collaborates with State, tribal, or local governments and nongovernmental organizations to acquire conservation easements or other interests in land from landowners. A total of 3,450 acres in Idaho, 898 acres in Utah, and 101,326 acres in Wyoming are Farm and Ranch Land Protection Program lands (USDA NRCS 2010a).

The *Environmental Quality Incentives Program* is a voluntary program administered through the NRCS that provides financial and technical help to agricultural producers through contracts lasting up to a maximum term of 10 years. These contracts provide financial assistance to help plan and carry out conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air, and related resources on agricultural land and nonindustrial private forestland. In addition, a purpose of Environmental Quality Incentives Program is to help producers meet Federal, State, tribal, and local environmental regulations.

The *Grassland Reserve Program* is a voluntary conservation program administered through the NRCS that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of grassland under threat of conversion to other uses. Participants voluntarily limit future development and cropping uses of the land while keeping the right to conduct common grazing practices and operations related to the production of forage and seeding, subject to certain restrictions during nesting seasons of bird species that are in significant decline or are protected under Federal or State law. A grazing management plan is required for participants. There are 9,692 acres in Idaho, 29,336 in Utah, and 24,458 acres in Wyoming enrolled in the program.

The *Wildlife Habitat Incentive Program* is a voluntary program administered by the NRCS for conservation-minded landowners who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and Native American lands.

Wetland Scenery in Utah

The *Wetlands Reserve Program* was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. The program offers financial and technical assistance to help eligible participants install or implement structural improvements and management practices on eligible agricultural land. In Idaho 812, Utah 30, and in Wyoming 1,013 acres are enrolled in Wetlands Reserve Program (USDA NRCS 2010b).

U.S. Department of the Interior

Partners for Fish and Wildlife provides cost-sharing to fund habitat enhancements with a special emphasis placed on projects that simultaneously benefit agricultural production and wildlife habitat for Service trust species. Participation in the Partners for Fish and Wildlife program is voluntary, and the details for each project are outlined in individual landowner agreements. Past examples include fence and water developments that improve livestock grazing management, irrigation diversion upgrades that allow for traditional water withdrawal and fish passage in streams, and rehabilitation of irrigation infrastructure to maintain and enhance created wetlands.

The *Utah Partners for Fish and Wildlife* program has restored or enhanced 11,915 acres of wetland, 46,258 acres of upland, and 64 miles of riparian or instream habitat. In Wyoming, the program has restored or enhanced 5,373 acres of wetland, 228,592 acres of upland, and 242 miles of riparian or instream habitat. More than 6,760 acres of wetland, 8,754 acres of upland, and 62 miles of riparian or instream habitat (2001–2011) have been restored or enhanced in Idaho.

Landscape conservation cooperatives are public–private partnerships that recognize that natural resource challenges transcend political and jurisdictional boundaries and require a more networked approach to conservation—holistic, collaborative, adaptive, and grounded in science to ensure the sustainability of America's land, water, wildlife, and cultural resources. As a collaborative effort, landscape conservation cooperatives seek to identify best practices, connect efforts, find gaps, and avoid duplication through improved conservation planning and design. Partner agencies and organizations coordinate with each other while working within their existing authorities and jurisdictions. In carrying out conservation actions through the proposed Bear River Watershed Conservation Area, the Service would work with the three landscape conservation cooperatives (Great Northern, Great Basin, and Southern Rockies) (see figure EA–3) and other partners to address current and future issues and opportunities related to landscape-scale conservation in a rapidly changing world.

Habitat Protection and Easement Acquisition Process

Following approval of a project boundary, habitat protection would occur through the purchase of conservation easements. It is the long-established policy of the Service to acquire the minimum land interest needed from willing sellers to achieve habitat acquisition goals.

The acquisition authority for the proposed conservation area is the Fish and Wildlife Act of 1956 (16 United States Code [U.S.C.] 742 a–742j). The Federal monies used to acquire conservation easements are received from the Land and Water Conservation Fund, which is derived primarily from oil and gas leases on the Outer Continental Shelf, motorboat fuel tax revenues, and the sale of surplus Federal property.

There could be more money to acquire lands, waters, or interest therein for fish and wildlife conservation purposes through congressional appropriations and donations from nonprofit organizations and other possible sources including Federal Duck Stamp money.

The Service would develop an objective review process for evaluating potential conservation easement areas submitted for consideration by willing sellers. The main considerations in acquiring an easement interest in private land are the biological significance of the area, the biological needs of wildlife species of management concern, existing and anticipated threats to wildlife resources, and landowner interest in the program. The purchase of conservation easements would occur with willing sellers only and would be subject to available funding.

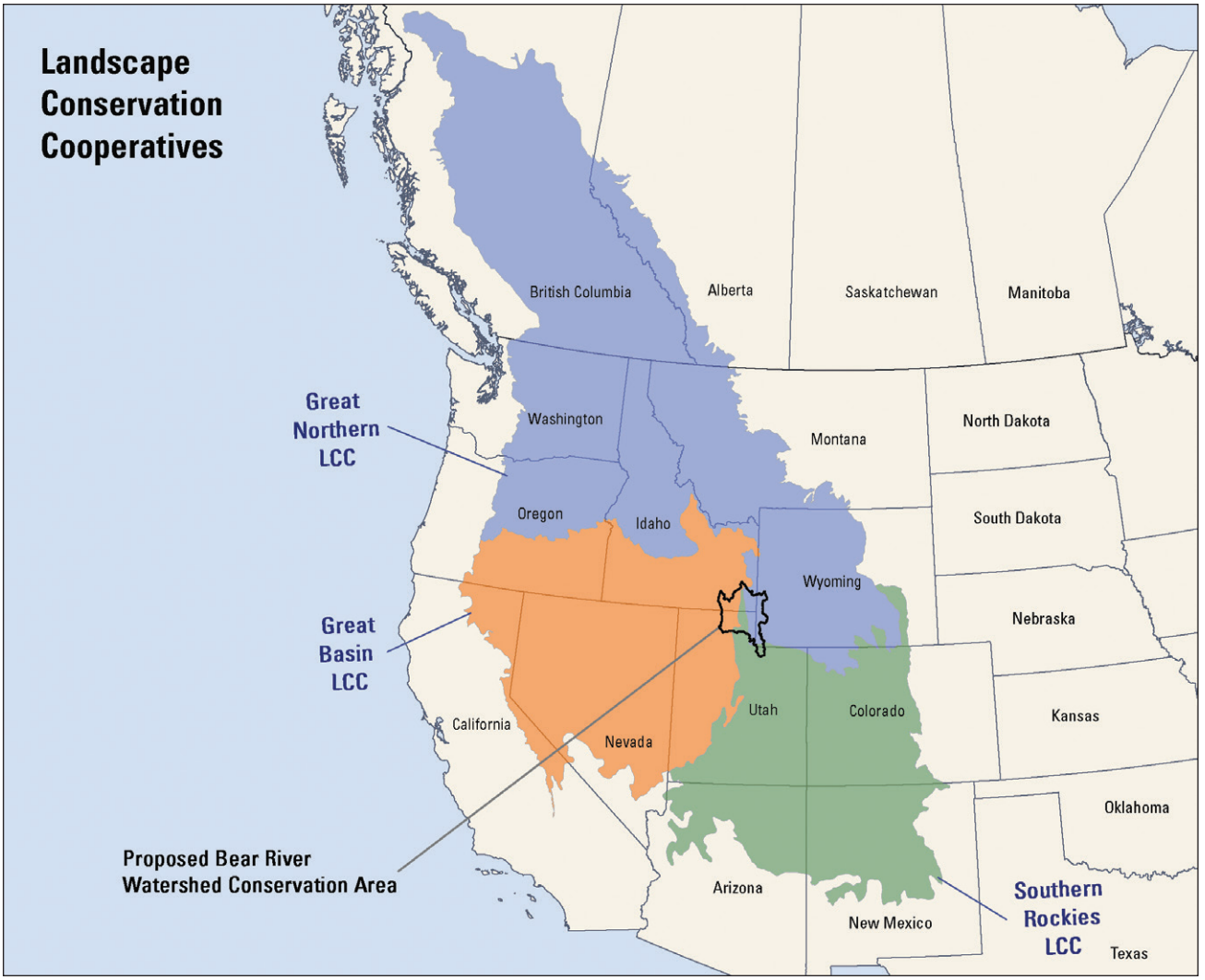


Figure EA–3. Map of the three landscape conservation cooperative areas that cover the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

Draft EA Chapter 2—Alternatives, Including the Proposed Action

Alternative A (No Action)

The Bear River Watershed Conservation Area would not be established. Habitat enhancement or restoration projects on private lands, such as water developments, grazing systems, and grassland management, would continue through cooperative efforts with private landowners. Public agencies and private land trusts would continue conservation efforts through securing easements.

Alternative B (Proposed Action)

The Service would establish the Bear River Watershed Conservation Area in parts of Idaho, Utah, and Wyoming, with the objective of conserving up to 920,000 acres of grassland, shrubland, riparian areas, and wetlands.

The Service would work to protect habitat using conservation easements from willing sellers on privately owned lands that are now providing valuable wildlife habitat. The easement contracts would specify perpetual protection of habitat used by trust species (migratory birds and threatened and endangered species) and would restrict development.

Development for residential, commercial, or industrial purposes such as energy and aggregate extraction would not be permitted on properties under a conservation easement. Alteration of the natural topography and conversion of native grassland, shrubland, wetland, and riparian lands to cropland would be prohibited. Conservation easements would prohibit the draining, filling, or leveling of protected lands.

All land would remain in private ownership; property tax and land management, including invasive plant control, would remain the responsibility of the landowner. The Service would seek to provide participating landowners with more help for invasive plant control and habitat restoration. Control of public access to the land would remain with the landowner.

The easement program would be managed by staff located at the three national wildlife refuges within the Bear River watershed. The Service staff at the Bear Lake, Bear River, and Cokeville Meadows Refuges would be responsible for monitoring and administering all easements on private land. Monitoring activities would include periodically reviewing land status through correspondence and meetings with the landowners or land managers to make sure that the stipulations of the conservation easements are being met. Photo documentation would be used at the time the easements are established to document baseline conditions.

© Keith Penner

The Bear River watershed provides important complexes of wet meadow, flooded pastures, and hayfields used by many species of migratory birds, including sandhill crane.

Alternatives Considered But Not Studied

The Service considered five other potential alternatives, but did not study them further for the reasons described below.

Voluntary Landowner Zoning

Landowners would voluntarily petition the county commissioners to create a zoning district directing the types of development that can occur within an area. This is called "citizen-initiated" zoning. For example, landowners could petition the county government to zone an area as agricultural, precluding certain types of nonagricultural development such as residential subdivisions. Because "citizen initiatives" are rarely used, this alternative was not studied further.

County Zoning

In a traditional approach used by counties and municipalities, the local government would use zoning as a means of designating what type of development could occur in an area. While laws in Idaho, Utah, and Wyoming grant cities and counties the authority to regulate land use, engaging in planning and zoning activities is optional. Many counties in these States have opted to have no planning or zoning requirements but, where used, zoning may be subject to frequent changes and would not ensure the long-term prevention of residential or commercial development in the proposed conservation area.

Fee Title

The initial cost associated with fee-title acquisition would be more than twice that of the purchase of conservation easements. In addition, there would be substantial annual costs for staff and materials needed by the Service to manage fee-title land. The higher costs associated with this method would limit acquisition to a much smaller area, making landscape-scale conservation unlikely.

It is the long-established policy of the Service to acquire the minimum interest in land necessary to achieve Service habitat conservation goals. Fee-title acquisition is not preferred over the use of conservation easements, nor is this method of acquisition necessary to conserve wildlife habitat and trust wildlife resources in the Bear River watershed.

Smaller Project Area

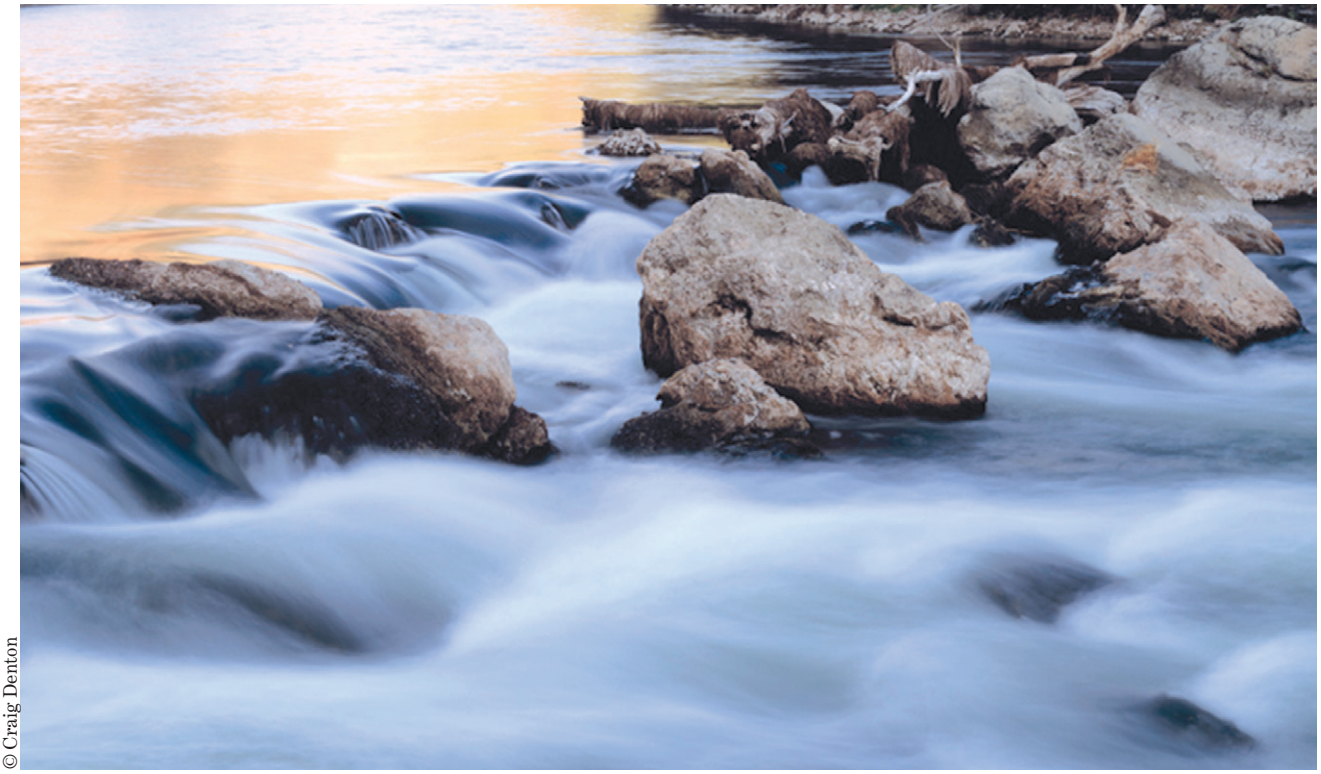
During initial project scoping, a smaller project area immediately adjacent to the established national wildlife refuges was discussed for potential land protection. The smaller project area would be unlikely to successfully conserve enough areas of intact habitat and migration corridors that are needed to sustain wildlife populations.

Short-Term Conservation Easements

Interest in the possibility of using short-term conservation easements was expressed in public scoping meetings. However, the purpose and need for action described in chapter 1 is for landscape-scale protection in perpetuity in the Bear River watershed. Repeatedly paying for the same conservation through short-term easements would not allow the Service to achieve the habitat goals and objectives needed to sustain migratory bird and other wildlife populations in this area. Because several less-than-perpetual conservation options are available through other Federal and State programs and conservation partners, it is logical that the Service continue to pursue permanent conservation avenues for the proposed conservation area project.

The Service has periodically tested short-term wetland easements in other areas of the country. A study by Higgins and Woodward (1986) concluded that 20-year contracts merely delayed habitat alteration and that short-term easements have only short-term benefits.

Draft EA Chapter 3—Affected Environment



Oneida Narrows Breakwater, Idaho

Physical Environment

The physical environment comprises the geology, soils, hydrology, and climate of the Bear River watershed. In addition, climate change is discussed.

Geology and Soils

The Bear River basin encompasses two physiographic provinces: The Basin and Range Province and the Middle Rocky Mountain Province of the Rocky Mountain Section (Dion 1969). The Basin and Range Province is noted for numerous north–south oriented, fault-tilted mountain ranges separated by intervening broad, sediment-filled basins. Approximately the western one-third of the watershed lies within the Basin and Range Province, which began forming when the previously deformed Precambrian (over 570 million years old) and Paleozoic (570 to 240 million years old) rocks were slowly uplifted and broken into huge fault blocks by extensional stresses that still continue to stretch the earth's crust (Milligan 2000).

Sediments shed from the ranges have been slowly filling the intervening wide, flat basins. Many of the basins have been further modified by shorelines and sediments of lakes that intermittently cover the valley floors. The most notable of these was Lake Bonneville, which reached its deepest level about 15,000 years ago when it flooded basins across western Utah (Milligan 2000).

The Middle Rocky Mountains Province, which encompasses approximately the eastern two-thirds of the basin, consists of mountainous terrain, stream valleys, and alluvial basins. The Utah part of this province has two major mountain ranges, the north–south trending Wasatch and east–west trending Uinta Mountains. Both ranges have cores of old Precambrian rocks, some more than 2.6 billion years old (Milligan 2000). This Precambrian bedrock became exposed during the Pleistocene by glacial activity that created smooth bowls that collect and funnel water down the Bear River (Denton 2007).

The Bear River Range, located in the central part of the Bear River watershed, is aligned north to south and divides the eastern Mesozoic and western Cenozoic zones. From the Uinta Mountains in the eastern part of the watershed, the Bear River flows northward along the edge of a Mesozoic region, characterized by rock structures that have little ability to absorb water. The western part of the watershed is comprised primarily of Paleozoic rock in the mountains and Cenozoic rock in the valleys. The valleys here contain alluvial and glacial deposits that are absorptive and lend well to agricultural use (Haws and Hughes 1973). The Bear River range is an important catch basin for precipitation.

The watershed contains multiple mountain ranges including the Wasatch Front to the west, the Bear River Divide and Tunp Ranges to the east, and the Sublette Range to the north (see figure EA–4). The convergence of mountain ranges at Rocky Point about 1 mile northeast of Cokeville creates a pinchpoint for one of the regionally important migration corridors in the watershed. The position and alignment of the various ranges across the watershed play a central role in precipitation, climatic, hydrological, and biological patterns.

Hydrology

The Bear River is the largest tributary to the Great Salt Lake, the remnant of ancient Lake Bonneville. Lake Bonneville was a closed inland sea basin the size of Lake Michigan that once dominated the landscape in Idaho, Nevada, and Utah. Approximately 16,000 years ago, Lake Bonneville began spilling over into the Snake River drainage at Red Rock Pass, reducing the lake level by 375 feet. Over the following 8,000 years, Lake Bonneville continued to shrink because of changing climatic conditions, eventually occupying only the present day Great Salt Lake (Utah Geological Survey [no date]).

The Bear River watershed is unusual in that it is entirely enclosed by mountains, forming one arm of the Great Salt Lake basin, which has no natural drainage outlets. Three States share drainage in the 7,500 square-mile watershed: 2,700 square miles in Idaho, 3,300 square miles in Utah, and 1,500 square miles in Wyoming. Progressions of small, high-mountain streams form the headwaters of the Bear River in Utah's Uinta–Wasatch–Cache National Forest. The Uinta Mountains, a subrange of the Rocky Mountains, vary in elevation from 7,500 to 13,500 feet and are unusual in that they run in an east to west orientation. From the headwaters, the Bear River flows north and west in an arc from Utah, Wyoming, Idaho, and back into Utah. Near the city of Evanston, Wyoming, the topography flattens and land use becomes a mix of urban and agricultural uses. Here the river begins a dramatic transformation from fast-flowing, cold, and clear water in the narrow valleys to a slow-moving, cool-water, meandering course on the valley floors. Humans have altered the natural stream dynamics throughout the remaining course of the Bear River to its termination at the Great Salt Lake. Although agriculture accounts for only 7 percent of the land use in the upper watershed, it accounts for more than 80 percent of the water usage. Surface and ground water sources are used to irrigate more than 96,512 acres of hay, pasture, and cropland (Bear River Watershed Information System 2009).

Instream structures like the Chapman Canal Diversion and Woodruff Narrows Reservoir disrupt natural channel-forming flows and sediment transport, leading to streambed and bank instability downstream. After passing through Woodruff Narrows Reservoir, the valley broadens and the river travels along the Wyoming–Utah border and lends itself to irrigation and production agriculture for 30 miles before reentering Wyoming near Sage Junction. Nutrient loading (especially phosphorus, which is found at naturally high levels in surrounding soil formations), sediment from accelerated bank erosion, and dewatering are leading causes of stream degradation. Sediment and nutrient levels remain as the main water quality concerns throughout the entire Bear River watershed, and those impacts contribute to water management challenges in the refuges (Utah Division of Water Resources 2002).

As the river flows north from Evanston, the ridge and swale topography of the floodplain is characterized by a complex association of irrigated meadows, wetlands, and grass uplands that support one of the highest densities of migrating and nesting waterfowl in Wyoming. Centered along a 20-mile stretch of the Bear River and its associated wetlands and uplands, Cokeville Meadows National Wildlife Refuge was established in 1992 to protect this important habitat.

After leaving Cokeville, the Bear River crosses into Idaho near the community of Border, where the flow is greatly increased by inflow from the Smith's Fork River, which originates in the Bridger–Teton National Forest and has a relatively intact watershed and native fish assemblages (Wyoming Game and Fish Department 2010).

As the Bear River passes into Idaho, PacifiCorp diverts water at Stewart Dam through Bear Lake National Wildlife Refuge and into Bear Lake proper (which straddles Idaho and Utah). Bear Lake National Wildlife Refuge, near Montpelier, Idaho, was established in 1968 to protect and manage habitat for waterfowl and other migratory birds. Once released from Bear Lake proper, water travels from the Outlet Canal and the refuge's Mud Lake unit back to the Bear River's original channel about 7 miles from

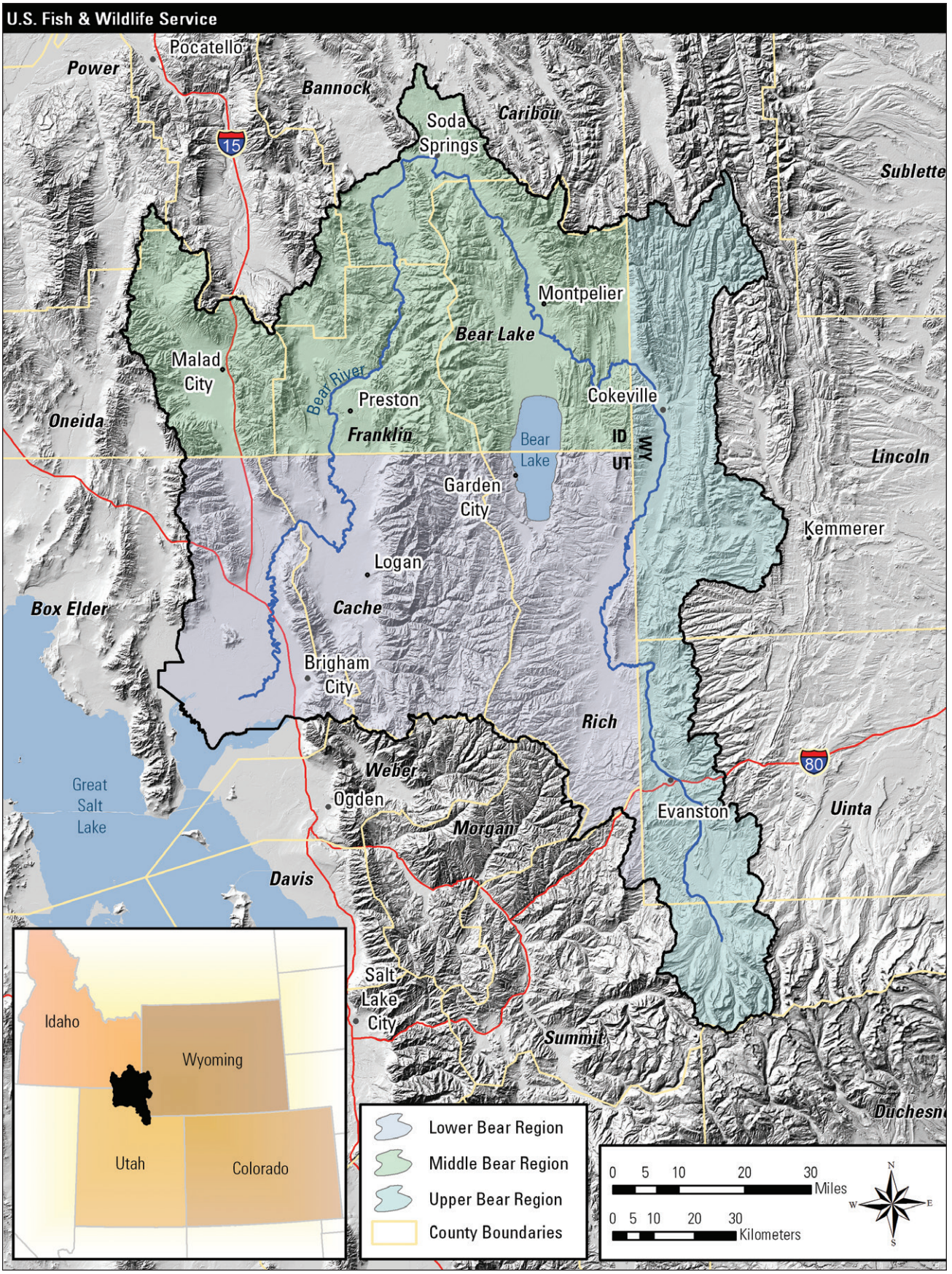


Figure EA–4. Vicinity map for the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

where the water is first diverted. Except for some water seepage from Stewart Dam, all Bear River water is diverted through the refuge; however, small creeks and irrigation return water enter into the original river channel so that the river is not completely dewatered between Stewart Dam and its reunion with the Outlet Canal.

From Bear Lake, the river travels 100 miles to the north, where it is impounded in the Alexander Reservoir for irrigation, recreation, and hydroelectric power generation. Below the Alexander Dam, about one-tenth of the river's annual flow is sent through one of the oldest diversion canals in the watershed, the Last Chance Canal. The canal was constructed by settlers to provide irrigation for agriculture in the early 1900s. From there, the river continues south toward Grace, Idaho. Just above the Black Canyon, almost all the river water is again diverted, at the Grace Dam, through an aqueduct to the Grace Power Plant for power production. The water then is returned to its original river channel just below Black Canyon at Cove Dam. As a part of its 2008 relicensing agreement for the Grace and Cove dams, PacifiCorp provides scheduled whitewater flow releases back into Black Canyon during spring and early summer months to help mimic natural flow patterns.

Below Black Canyon, the river continues south through the Gem, Gentile, and Cache Valleys, where the predominant land uses are irrigated agriculture, grazing, and dairy production. About 100,000 people live in the Cache Valley, making it the most populated area in the Bear River watershed. Just below the Idaho–Utah State line, the Bear River receives water from the Cub River, which in turn obtains part of its water from the Mount Naomi Wilderness. Below the Cub River, the amount of water in the Bear River doubles because of input from the Logan, Blacksmith Fork, and Little Bear River flows.

Eventually the Bear River passes into the Bear River delta and the Bear River Migratory Bird Refuge and then terminates its horseshoe-shaped 500-mile route in Utah's Great Salt Lake. Today, the Bear River contributes more than one-half of the total surface flow entering the Great Salt Lake each year. This large volume of freshwater from the river helps to maintain proper temperatures, salinity, and water levels in the lake. The saline waters and freshwater marshes of the Great Salt Lake comprise one of the most essential breeding and migratory staging sites for colonial waterbirds, waterfowl, and shorebirds in the Great Basin.

Climate

The climate of most of the proposed conservation area is characterized as having warm to hot summers and cold winters and is classified as humid continental, mild summer under the Koppen climate classification system. The remainder of the watershed near the Great Salt Lake is classified as semiarid desert–steppe or humid continental, hot summer for the Great Basin and Wasatch Front, respectively.

Annual precipitation is influenced greatly by the topography and elevations found within the watershed, which range from 4,200 to 13,000 feet. Annual precipitation ranges from 10 inches in the lower valleys to 65 inches at the headwaters of the Bear River in the Uinta Mountains (Utah Division of Water Resources 2004). Two major storm patterns influence precipitation in the basin: (1) frontal systems from the Pacific Northwest during winter and spring; and (2) thunderstorms from the south and southwest in late summer and early fall.

Temperatures are also variable throughout the watershed because of differences in elevation. Mean annual temperatures range from 37 °F in the Uinta Mountains at about 8,400 feet elevation to 53 °F at Tremonton at 4,300 feet. Maximum July temperatures average 91 °F at Tremonton compared to 74 °F in the Uinta Mountains.

Climate Change

The Bear River basin has warmed an average 2 °F since 1971 (Utah Climate Center; see figure EA–5). The trend of 0.5 °F per decade during the last 40 years is 1.5 times greater than the trend for the global average over the same period. Simulation models predict that by 2040 to 2060, the Bear River basin's climate could be 5–6 °F warmer, with a 5–13 percent decrease in annual runoff, 10–15 percent lower peak accumulation of snowpack, earlier spring melt by 2–4 weeks, and an increasing fraction of winter precipitation coming as rain (Degiorgio et al. 2010). Climate change models in the arid western regions of North America also suggest an increased frequency of extended drought in the future (Hughes and Diaz 2008, Barnett et al. 2008, Degiorgio et al. 2010). These changes have important implications for waterbird populations, and ecosystem stability within the Bear River basin wetlands. Maclean et al. (2008) found that waterbird abundance and phenology are sensitive to the effects of climate change.

Waterbirds dependent on inland wetlands in the west are at particular risk because these important habitats are among the most likely to be dramatically influenced by climate change in the region (Hughes and Diaz 2008, Barnett et al. 2008). For example, breeding waterbirds at the Bear River Migratory Bird Refuge rely on wetlands that lie at the interface between freshwater inflows and the saline Great Salt

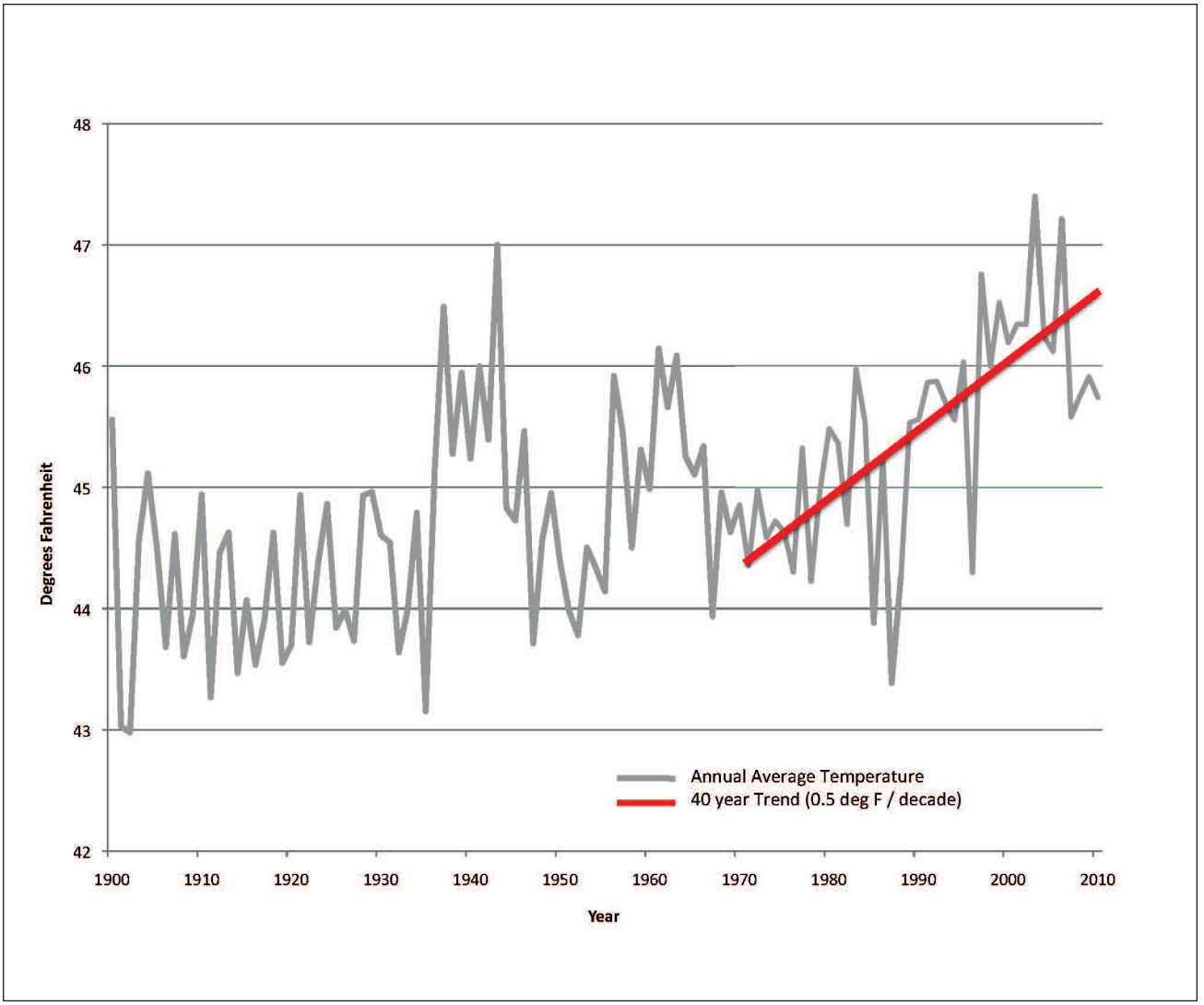


Figure EA–5. Graph of the trend in annual average temperature in the Bear River basin (Idaho, Utah, and Wyoming) over the past 100 years.

Lake. As the timing and amount of freshwater snowmelt change and humans respond by altering their use of water, the hydrology and salinity regimes of these wetlands may be dramatically influenced. Without actions that anticipate and address these likely changes, the value of this area for breeding waterbirds could be disrupted, which would likely influence the continental populations of some species.

The "U.S. Fish and Wildlife Service Strategic Plan for Responding to Accelerating Climate Change" (2010) involves three progressive strategies: adaptation, mitigation, and engagement. Adaptation involves helping fish, wildlife, and their habitats adapt to climate change by implementing management actions to help reduce the impacts. Mitigation involves reducing the carbon footprint by using less energy, consuming fewer materials, and increasing sequestration of biological carbon. Engagement encompasses developing partnerships with local, national, and international partners, key constituencies, and stakeholders to seek solutions to the challenges and threats to fish that address all three of these strategies.

Adaptation

Worldwide scientific consensus is that human activity is changing the climate system. As the climate changes, the abundance and distribution of wildlife and fish will also change in response to changing habitat conditions. Some species will adapt successfully to a warming world; many will struggle; and others will disappear.

The exact changes to temperature and precipitation in the Bear River basin are unknown. Equally unknown are the responses of wildlife and habitat to these changes, for example, which species will

become the most vulnerable. Maintaining adequate densities of wetlands, robust riparian corridors, and open spaces will become increasingly important to allow fish and wildlife to adapt to the changing environment.

Mitigation

Forests, grasslands, wetlands, and soils have a large influence on atmospheric levels of carbon dioxide (CO_2). Carbon sequestration forms one of the key elements of mitigation. The World Resources Institute estimates that grasslands store approximately 34 percent, forests store approximately 39 percent, and agro-ecosystems approximately 17 percent of the global stock of carbon in terrestrial ecosystems. It is as important to protect existing carbon stores from further degradation as it is to sequester atmospheric carbon.

Historically, the destruction of wetlands through land use changes has had the largest effects on carbon fluxes and the resulting radiative forcing of North American wetlands. [Radiative forcing is the measure of the amount that the Earth's energy budget is out of balance.] The primary effects have been a reduction in the ability of the wetlands to sequester carbon (a small to moderate increase in radiative forcing), oxidation of their soil carbon reserves upon drainage (a small increase in radiative forcing), and reduction in methane emissions (a small to large decrease in radiative forcing). It is uncertain how global changes will affect the carbon pools and fluxes of North American wetlands (Bridgham et al. 2006).

Engagement

Engagement involves cooperation, communication, and partnerships to address the conservation challenges presented by climate change (USFWS 2009). The proposed Bear River Watershed Conservation Area would serve as a model for engagement by working with landowners, nongovernmental organizations, State agencies, and Federal agencies listed earlier under "Partnership Development."

A key recommendation from a recent climate change workshop held by The Nature Conservancy was to coordinate management of shared resources. Given the regional pattern of recent temperature changes, with some areas experiencing warming more rapidly than others, natural resource managers would benefit by coordinating their activities with others who are managing common resources. Regional and coordinated management of shared habitat may be the only way to make sure that some habitat can be kept in a resilient state while other habitat transitions to another state (Robles 2010).

Taking action on these recommendations will be crucial for achieving conservation and management goals in the face of a changing climate. Reduced snowpack in the mountains combined with earlier seasonal melting caused by rising temperatures may increase the intensity and length of late summer droughts and reduce the availability of water, especially in the western United States. Finding enough water is becoming an increasingly difficult challenge for western fish and wildlife species. Spring is arriving earlier, and plants and animals are being found farther and farther north of their historical ranges in the United States. Wildlife biologists are concerned that this will mean some migratory species may not arrive in their breeding habitats when, or where, their particular food sources are available.

Education is a key part of engagement. The Bear River Migratory Bird Refuge watershed education program will work with local school districts to apply scientific understanding, at a student level, through field trips to sites within the Bear River watershed. Students groups will monitor local climate change through tracking phenological events and engage in strategies to reduce carbon footprints. It is predicted that student engagement in climate change education will result in advancing its understanding among the citizenry within the watershed.

Biological Environment

The Bear River watershed's habitat ranges from river and the adjacent riparian areas to wetland, grassland, shrubland, and forest. This section also describes the wildlife and species of concern that use these habitats.

Habitat

Below the peaks of the Uinta Mountains lies a landscape carved by glaciers containing lakes, streams, forests, and meadows. Dropping in elevation from more than 13,000 feet to 4,211 feet and crossing through numerous life zones (alpine to valley floor), the Bear River watershed contains a large diversity of plant communities. The diversity of habitats in the Bear River watershed support a variety of fish, mammal, reptile, and amphibian species as well as a large number of resident and migratory bird species. See figure EA–6 for a map of habitat types, table EA–1 for acreages, and appendix B for a list of plant and animal species representative of the Bear River watershed.)

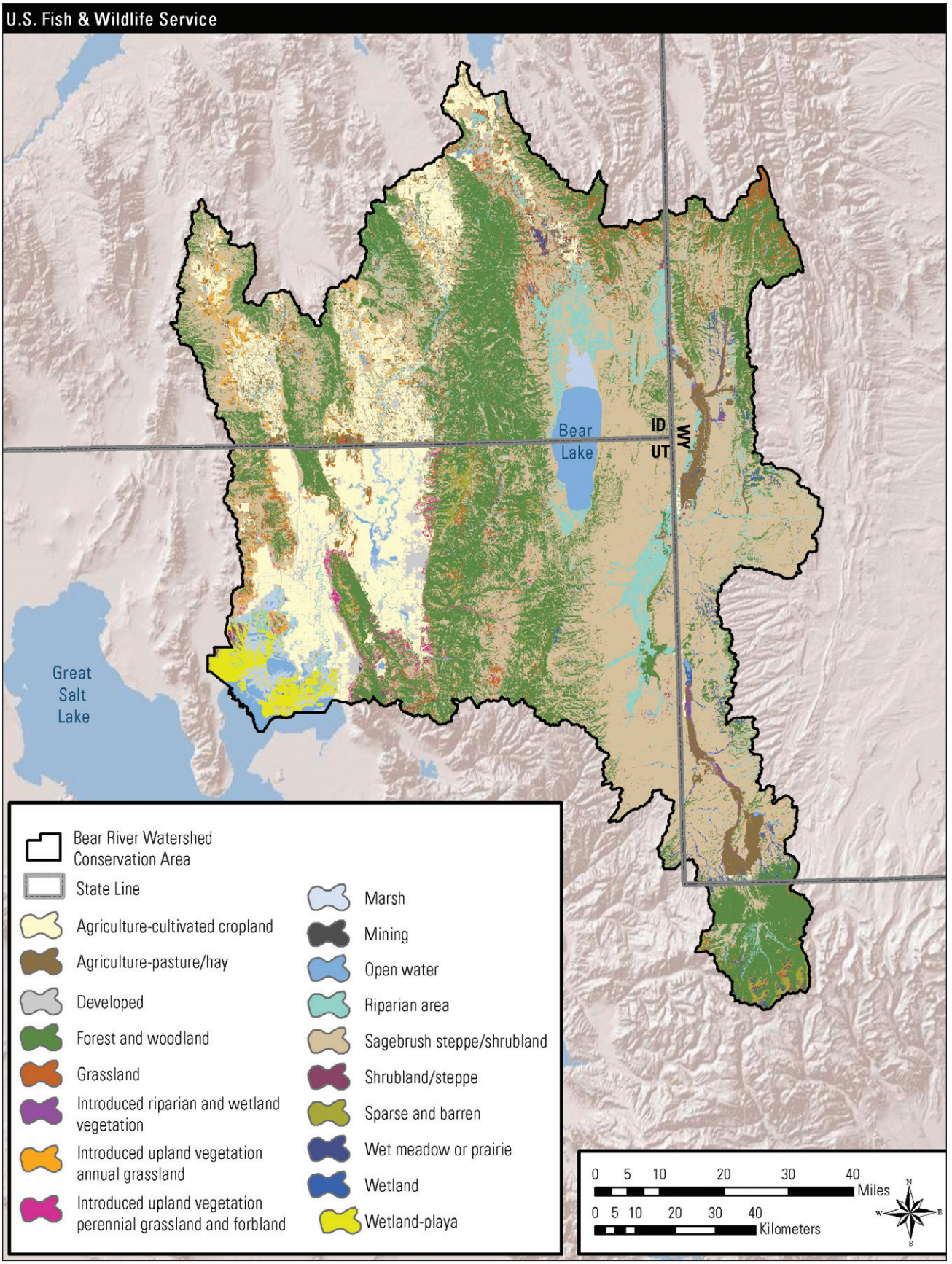


Figure EA–6. Habitat map for the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming. *Source: NorthWest GAP (Idaho Cooperative Fish and Wildlife Research Unit 2011); South West reGAP (U.S. Geological Survey 2005).*

Table EA–1. Acreages of vegetation types found in the proposed Bear River project area in Idaho, Utah, and Wyoming.

Vegetation types	*Acres*
Agriculture: cultivated cropland	594,358
Agriculture: pasture and hay	133,482
Developed	83,343
Forest and woodland	1,250,529
Grassland	128,848
Introduced riparian area and wetland vegetation	8,821
Introduced upland vegetation—annual grassland	44,840
Introduced upland vegetation—perennial grassland and forbs	19,171
Marsh	69,430
Mining	197
Open water	119,497
Riparian area	261,407
Sagebrush steppe and shrubland	1,945,752
Shrubland and steppe	18,565
Sparse and barren	44,912
Wet meadow or prairie	12,803
Wetland	27,577
Wetland–playa	59,350
Total	4,822,882

Source: http://gap.uidaho.edu/index.php/gap-home/Northwest-GAP/landcover; http://fws-nmcfwru.nmsu.edu/swregap/habitatreview/ModelQuery.asp; Northwest GAP (Idaho Cooperative Fish and Wildlife Research Unit 2011); Southwest ReGAP (U.S. Geological Survey 2005).

Connectivity and Corridors

Habitat loss and fragmentation are the chief factors in the decline of many populations of wildlife throughout the world (Harris 1984, Ehrlich 1986, Lovejoy et al. 1986). In the western United States, human development of open spaces has fragmented the connections between wildlife habitats (Gude et al. 2007). Corridors that link habitats or other landscape linkages help mitigate the effects of habitat fragmentation by linking core areas so that individuals can move between them (Mech and Hallett 2001). They also allow evolutionary and ecological processes (for example, fire, succession, and predation) to continue. By ensuring that plants and animals have connected populations, corridors can help prevent or mitigate against harmful population-level effects resulting from isolation including inbreeding, low genetic diversity, and extirpation (Noss 1983, Harris 1984, Dobson et al. 1999) and may actually increase population sizes, viability, and movement of habitat-restricted species (Noss and Cooperrider 1994, Haddad 1999, Haddad and Baum 1999). Corridors that provided connection between habitats within the landscape should also help provide for longer-term gene flow between populations in core habitats and may provide a pathway for plant populations to shift under regional climate change trends (Bates and Jones 2007).

Almost all species rely on more than one habitat type to complete their life cycles, and the availability of various intact habitats close together is essential to many wildlife species found in the watershed. For example, Saalfeld et al. (2010) found that, while the long-billed curlew's need for wetlands near its grassland nesting habitat is poorly understood, close proximity might be important since more curlews were detected near wetlands. Brood-rearing long-billed curlews typically forage in upland areas (Pampush and Anthony 1993); however, curlew chicks move toward wetlands as they grow (Foster-Willfong 2003). Shorter travel times between nest sites and wetland foraging sites may reduce chick mortality (Saalfeld et al. 2010). In addition to grassland habitat, conservation of emergent wetlands—an element that generally has been overlooked—needs to be incorporated into habitat management plans for curlews (Saalfeld et al. 2010).

White-faced ibis also have specific habitat needs that are being met in the Bear River watershed. In Wyoming, Dark-Smiley and Keinath (2003) found that ibis require large wetlands or lakes with dense emergent vegetation, such as bulrushes for breeding and foraging grounds near breeding areas. One consistent feature that all the breeding records in Wyoming have in common is proximity to irrigated crops where ibis forage. It seems likely that a combination of factors, such as proximity of foraging grounds and specialized habitat at open-water systems, plays a role in where white-faced ibis choose to breed.

The Bear River watershed provides linkages and migration corridors for seasonal movements of wildlife between various habitats within the watershed as well as between other protected lands and ecosystems in the region (see figure EA–7). Crucial

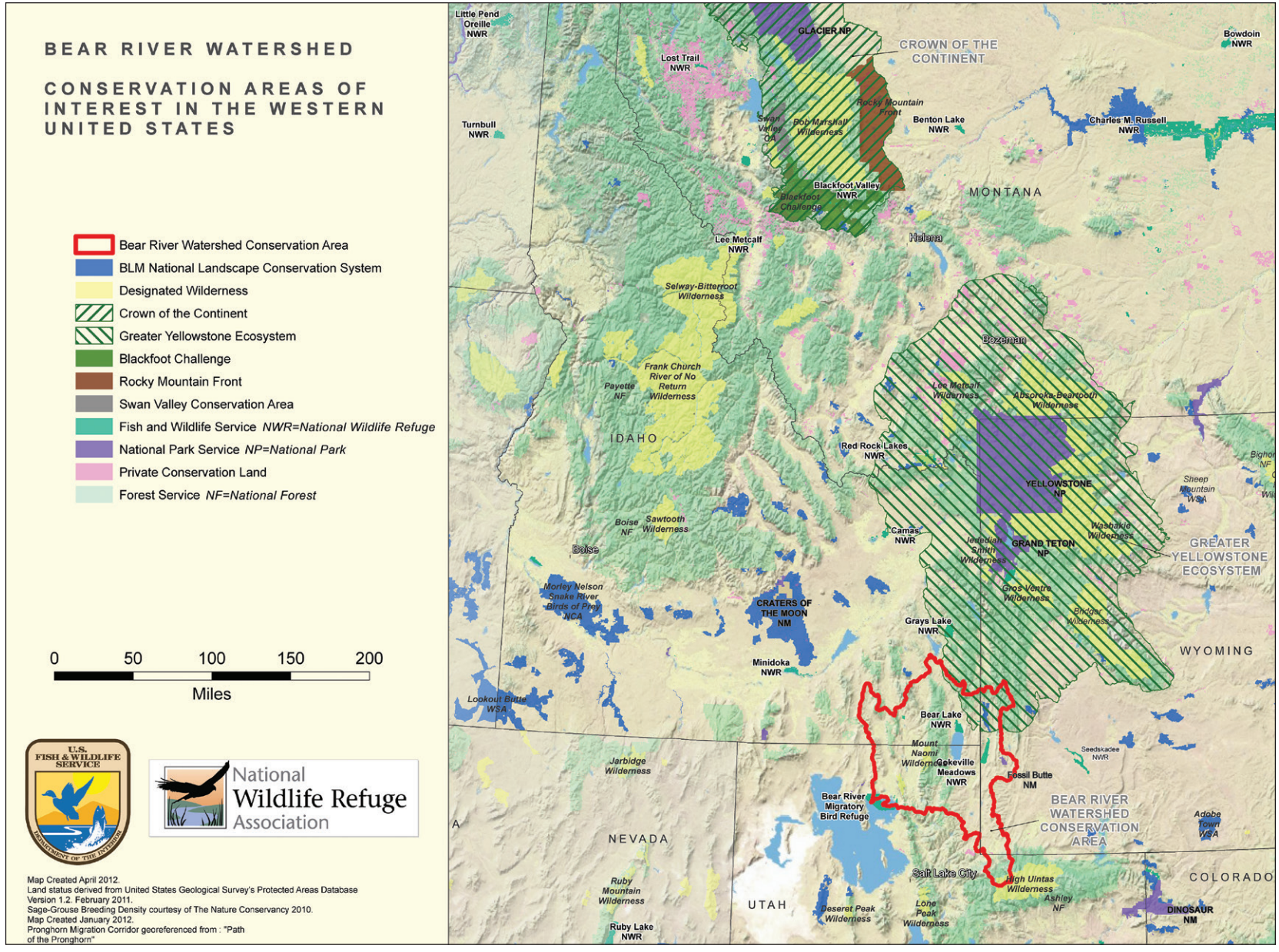


Figure EA–7. Map of regional conservation and protected areas adjacent to the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

wildlife corridors maintain system resiliency in the face of climate change, especially for wide-ranging wildlife species such as Canada lynx, wolverine, mule deer, and pronghorn. Migration corridors provide connectivity between habitats in the northern and southern Rockies and between Idaho and the Greater Yellowstone Ecosystem for mule deer, elk, and mid- to large-sized carnivores. In particular, Canada lynx linkages are mentioned for Cache, Rich, and Uinta Counties (Idaho Department of Fish and Game 2007). Core habitat areas for lynx are found in the Uinta Mountains (USDA Forest Service 2003) as well. Large numbers of mule deer, pronghorn, elk, and moose migrate through narrow corridors in the Rocky Point area north of Cokeville Meadows National Wildlife Refuge in Wyoming.

USFWS

Riparian areas are important habitat for yellow warblers.

Riverine and Riparian Areas

Although riparian areas occupy only a small proportion of the total landscape in the western United States, they tend to be more productive than other ecosystems (Svejcar 1997). Riparian habitat is estimated to cover less than 2 percent of the States of Idaho (Idaho Gap Analysis 2011) and Wyoming (Merrill et al. 1996) and less than 1 percent of the State of Utah (Utah Division of Wildlife Resources 2005b).

The importance of riparian habitat to wildlife far exceeds its abundance. Distinct ribbons of green riparian areas connect streams with uplands across much of the West. These ecosystems support high species diversity and density as well as high productivity, and they allow for an exchange of energy, nutrients, and species between aquatic, riparian, and upland terrestrial systems (Johnson and McCormack 1978, Gregory et al. 1991, Poff et al. 2011). Riparian zones along the major streams are important migration and dispersal corridors traversing harsh grassland and desert environments (Lohman 2004).

Densities of breeding birds can be up to 10 times higher in riparian tracts than in adjacent, nonriparian habitats (Lohman 2004). Bird diversity in riparian habitats has been linked to the complex vertical vegetative structure of these habitats compared to adjacent grassland or shrubland habitats (Slater 2006). In the arid Southwest, about 60 percent of all vertebrate species (Omhart and Anderson 1982) and 70 percent of all threatened and endangered species are riparian area obligates (Johnson 1989, Poff et al. 2011). The quality of riparian habitat greatly influences the quality of aquatic habitat. Riparian vegetation influences light penetration and air and water temperatures, and is the transition point for food chain interactions between aquatic and terrestrial zones. Large woody debris and litter associated with riparian vegetation are often necessary for productive fish habitats, and influence the physical, chemical, and biotic characteristics of riparian and stream ecosystems (Naiman et al. 1992). In some riparian ecosystems, herbaceous plants provide the functions supplied by woody plants in other locations (Baker et al. 2004, Poff et al. 2011).

Riparian areas also play an essential role in maintaining year-round aquatic habitat for fish and other species that occupy the stream channel. In most years, overbank flooding during snowmelt saturates riparian area soils and elevates water tables in adjacent areas. Subsurface water sustains riparian vegetation during drought periods and releases water slowly into the stream (Ewing 1978). Although often small, these waterflows help keep appropriate stream temperatures, improve water quality, and sustain isolated pools essential for fish survival (Winters et al. 1998 as cited in Wyoming Game and Fish Department 2010). Native fish populations have fluctuated, through time, in response to changes in the extent and function of riparian willow communities (Chaney et al. 1991, Binns 1981). Riffle-dwelling species such as longnose dace and riffle-spawning salmonids require relatively smaller fine sediment levels associated with healthy riparian vegetation. Riparian habitat is also required by many amphibian and reptile species.

Trout Unlimited (2010) found that the greatest limiting factor for Bonneville cutthroat trout appears to be land stewardship, because most populations are located on unprotected public and private lands. Strategies such as securing long-term protection, restoring and reconnecting degraded and fragmented habitats, and controlling nonnative species on a watershed scale are necessary to build resiliency while protecting genetic purity.

Wildlife abundance, water availability, vegetation diversity, soil productivity, and favorable topography found in riparian zones attracted both Native

Americans and early Europeans settlers to these areas. As a result, a high percentage of riparian areas are privately owned today. Most communities in the Bear River watershed are located near riparian zones used for agriculture, recreation, travel, water development, and housing (Wyoming Game and Fish Department 2010).

Riparian areas in the West are being influenced by a variety of stressors including land use change, grazing, dams, invasive species, timber harvesting, climate change, recreation, water quality, water diversion, ground-water depletion, fire, and mining. Although no comprehensive national inventory of riparian area conditions exists, Ohmart (1994) suggests that a minimum of 95 percent of all western riparian habitats have been altered in some way during the past century.

Another major influence on riparian areas in the Bear River watershed is irrigation. The timing, extent, and method of irrigation can have a strong influence on riparian vegetation. Conversion from flood irrigation to center pivot irrigation has been known to change riparian area characteristics. While technological changes like side-role systems and gated pipe deliver water more efficiently to crops and potentially conserve water for other uses like maintaining streamflows, the influence on riparian area characteristics is complex (Wyoming Game and Fish Department 2010).

Lowland Riparian Areas. Lowland riparian areas in the West are typically narrow bands of trees—predominantly cottonwoods—and shrubs surrounded by uplands of shorter vegetation (Knopf et al. 1988, Montgomery 1996). Principal woody species found in lowland riparian habitats in the watershed include Fremont cottonwood, netleaf hackberry, squaw-bush, boxelder, lanceleaf cottonwood, willow, and redosier dogwood. Nonnative invasive species include Russian olive and tamarisk. (Jones and Walford 1995, Utah Division of Wildlife Resources 2005b, Wyoming Game and Fish Department 2005).

Mountain Riparian Areas. Mountain riparian habitats differ from those found in lowlands because of the generally steeper stream gradients, cooler temperatures, and smaller amounts of soil deposition (Knight 1994). Mountain riparian vegetation is often characterized by sedges and short willow shrubland (Winward 2000). As elevation decreases, alder and tall willows become common, along with Engelmann spruce, narrowleaf cottonwood, lodgepole pine, aspen, and occasionally blue spruce and balsam poplar (Knight 1994).

Wetland

Wetlands represent a small part of the landscape in the Intermountain West, covering less than 5 percent of Utah and 2 percent or less in both Idaho and Wyoming (Idaho Gap Analysis, Wyoming Joint Venture Steering Committee 2010). Wetlands are often found in the form of marshes next to desert springs, rivers, streams, and lakes; wetlands can also be found in the spring and summer where snowmelt collects. In the Intermountain West, wetlands provide habitat for more than 140 birds and 25 mammals that are either dependent on or associated with wetlands (Gammonley 2004, Copeland et al. 2010). Nicholoff et al. (2003) estimates that about 90 percent of the wildlife species in Wyoming use wetlands and riparian habitats daily or seasonally during their life cycle, and about 70 percent of Wyoming bird species depend on wetland or riparian areas.

Wetlands within lower elevation grasslands and shrublands are especially important in terms of the biodiversity of plant species and because they have much longer growing seasons than those at higher elevations (Weiher and Keddy 1999). Lower elevation wetlands generally sustain greater biological diversity and greater overall densities of wildlife. However, these lower wetland complexes are also at greatest risk of future change because they support higher density human populations and more agriculture, have a higher potential for energy development, and are at a higher risk for climate change (Copeland et al. 2007, 2009).

Privately owned wet meadow habitats are some of the most important unprotected wetlands within the Intermountain West. Irrigated wet meadows that are hayed and grazed annually (hay meadows) represent a particularly important subset of wetland habitats. These privately owned wetlands typically occur at mid- to high elevations (4,500–8,500 feet) in

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The long-billed curlew depends on wetland and upland habitats.

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Springtime wetlands at Cokeville Meadows National Wildlife Refuge, Wyoming.

landscapes dominated by intact wetland, grassland, and sagebrush habitats not fragmented by development. These areas are important, as they often comprise almost entirely native habitats with little area converted to cropland. Grass-dominated landscapes with minimal fragmentation from cropland support high nest success for wetland- and grassland-nesting birds.

In addition to nesting habitat, these landscapes provide crucial stopover habitat for migrating waterfowl and shorebirds (Intermountain West Joint Venture 2010). Agricultural areas are a major source of foraging habitat during migration as well as nesting and brood-rearing habitat for many waterbird species. The Bear River watershed provides important complexes of wet meadow, flooded pastures, and hayfields used by many species of migrating waterfowl, shorebirds, and waterbirds including American avocet, sandhill crane, white-faced ibis, American bittern, marbled godwit, long-billed dowitcher, long-billed curlew, and northern pintail. The quality and availability of spring migration habitat have direct implications for the survival and breeding productivity of migratory birds. This shallowly flooded habitat is extremely important to spring-migrating waterfowl, especially northern pintails, whose population remains below continental management goals. Important flood-irrigated grazed and hayed wet meadow habitats sustain migrating waterfowl and waterbirds in the Intermountain West. These areas also provide crucial brood habitat for waterfowl and other waterbirds by supplying both escape cover from predators and productive foraging sites for rapidly growing ducklings and chicks.

As with riparian areas, the irrigation of agricultural lands can have both a positive and a negative influence on the ecological condition of wetlands. Agricultural irrigation has affected the hydrology of many wetlands in the Bear River watershed. Copeland et al. (2010) found that more than 50 percent of Wyoming wetland areas in four different complexes were influenced by agricultural irrigation and predicted that changes in irrigation practices driven by the need for water conservation would be likely to adversely affect the hydrology of many lower elevation wetlands. As agricultural producers convert to alternative forms of irrigation because of drought concerns, many wetlands throughout the watershed may disappear. Some studies have documented negative effects from irrigation, mainly involving the conversion of existing wetlands to cropland and impairment from contaminant and nutrient runoff (Dickerson et al. 1996; Lemly et al. 1993, 2000; Kiesecker 2002).

Livestock grazing can also have a major influence on the functional integrity of wetlands and riparian

systems throughout the Intermountain West (U.S. General Accounting Office 1988; Chaney et al. 1990, 1993; Belsky et al. 1999; Copeland et al. 2010). If effective land conservation measures are not employed, certain farming practices may adversely affect wetlands. Sediment runoff from tilled fields and heavily grazed pastures decreases the lifespan of ponds and wetlands and impairs water quality.

Upland, Grassland, and Shrubland

From 1950 to 1990, grasslands west of the Mississippi River declined by 27.2 million acres, with approximately 36 percent converted to uses other than cropland (Conner et al. 2001). Now, the greatest threats to grasslands and sagebrush ecosystems come from oil and gas development, increasing urban and agricultural development, and invasive species. Climate change is also expected to cause major changes in grassland and sagebrush distribution across the landscape (Bachelet et al. 2001). Range expansions of woody species are predicted to continue, particularly the expansion of pinyon–juniper into sagebrush–steppe and grasslands (Rowland et al. 2008), resulting in a decrease in sagebrush and an increase in woodlands across the West. Wildfires are increasing and are likely to intensify in a warmer future with drier soils, longer growing seasons, and more severe droughts (Field et al. 2007). Wildfires may also cause large changes in grassland and sagebrush ecosystems.

Changes in grassland cover can be subtle, but cover is generally predicted to decrease (Bachelet et al. 2001). Modeling suggests that climate change will likely increase net primary production in grasslands and decrease soil carbon, but high annual variability in plant production makes these projections uncertain (Parton et al. 2005). Nutrient cycling and plant production are expected to occur more rapidly in response to climate change than changes in community composition (Parton et al. 1994).

Sagebrush is typically the most common plant in shrub–steppe habitats in the watershed. There are many species of sagebrush in the Bear River watershed including basin, Wyoming, and mountain big sagebrush, and black or low sagebrush, which differ in height and habitat affinity. Other common shrubs include rabbitbrush, greasewood, fourwing saltbush, shadscale, serviceberry, and bitterbrush. Perennial grasses may also be common and include Indian ricegrass, sand dropseed, bluebunch wheatgrass, Sandberg bluegrass, alkali sacaton, wild rye, and inland saltgrass. Common forbs include Hood's phlox, arrowleaf balsamroot, yarrow, Richardson's geranium, and milkvetch (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b).

In the foothills and on mountain slopes, mountain big sagebrush occurs as a dominant shrub, typically with bluebunch wheatgrass or Idaho fescue. Mountain big sagebrush also occurs in a more diverse shrub community known as mountain shrub, in which it

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White-faced ibis feeding in an irrigated agricultural field.

codominates with bitterbrush, serviceberry, mountain snowberry, chokecherry, mountain mahogany, bigtooth maple, and a variety of forbs. In Utah, Gambel oak is a dominant species in the mountain shrub community. Idaho fescue and basin wildrye are common bunchgrasses (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b). In Idaho, this habitat is restricted to the southern part of the State but is widespread in Wyoming. This diverse community of shrubs is highly palatable and is the preferred browse for many big game species (Wyoming Game and Fish Department 2010).

Sagebrush ecosystems are among the most imperiled in North America because of a variety of human disturbances. Sagebrush habitat has been altered and fragmented by changing fire regimes, an influx of invasive species, and development (agriculture, energy, natural resource, urban, and associated infrastructure). This has resulted in a decline in both the numbers and the distribution of many of the more than 350 species that depend on sagebrush habitat for all or part of their life cycles (Wisdom et al. 2005). In particular, such habitat shifts have major implications for sagebrush-dependent vertebrates, such as certain bird species (Knick et al. 2003). In all, shrub–steppe habitats are home to 20 species in Utah, 15 species in Wyoming, and at least 25 species Idaho that need additional conservation actions (Utah Division of Wildlife Resources 2005b), Wyoming Game and Fish Department 2005, Idaho Department of Fish and Game 2005).

Climatic suitability models suggest that by 2100, sagebrush communities in Nevada, southern Idaho, Utah, Colorado, and eastern Wyoming may be at risk of loss because of climate change. Communities in southwestern Wyoming will be at less risk (Bradley 2010).

Sagebrush-dependent wildlife species have adapted to heterogeneous sagebrush communities comprised of multiple age classes of plants across the landscape. In sites where the forb and grass diversity necessary for a healthy sagebrush community is reduced, the amount of essential food and cover available for wildlife is decreased (Wyoming Game and Fish Department 2011). Greater sage-grouse in particular have been affected, with breeding populations declining 45 to 80 percent from estimated numbers in the 1950s (Connelly and Braun 1997, Connelly et al. 2004, Braun 2006).

Sagebrush ecosystems are rapidly declining both in extent and quality rangewide. The historical range contraction of the greater sage-grouse is a result of land conversion of sagebrush habitats to agriculture, climatic trends, and human population growth. Future range loss, however, may be due more to recent changes in land use and habitat condition including energy development and invasive species, such as cheatgrass and disease such as West Nile virus (Aldridge et al. 2008). Keeping large areas of intact sagebrush is considered essential to the long-term persistence of the sage-grouse (Aldridge et al. 2008). Based on this finding, it has been recommended that conservation efforts should begin by keeping large expanses of sagebrush habitat and enhancing the quality and connectivity of those areas.

Recent research shows that viable prairie grouse and sage-grouse populations are heavily dependent on suitable nesting and brood-rearing habitat (Connelly et al. 2000, Hagen et al. 2009). These habitats are usually associated with leks that are located in the approximate centers of nesting and brood-rearing habitats (Connelly et al. 2000, but see Connelly et al. 1988; Becker et al. 2009). Quality nesting and brood-rearing habitats surrounding leks are crucial to sustaining viable prairie grouse and sage-grouse populations (Giesen and Connelly 1993, Hagen et al. 2004, Connelly et al. 2000). The average distances from nests to active leks of nonmigratory sage-grouse range from 0.7 mile to 4 miles (Connelly et al. 2000), and are possibly much more for migratory populations (Connelly et al. 1988). Kaczor et al. (2011) found that sage-grouse selected brood-rearing habitats that provided increased visual obstruction and bluegrass cover. More herbaceous vegetation at these sites may provide increased invertebrate abundance. Invertebrates are a necessary part of the diet of sage-grouse chicks to support their growth, development, and survival (Johnson and Boyce 1990).

Sage-grouse avoid energy developments in otherwise suitable habitats in winter. Previous research has shown that breeding sage-grouse in oil and gas fields avoid developments, experience higher rates of mortality, or both (Holloran 2005, Kaiser 2006, Aldridge and Boyce 2007). Studies on the impacts of energy development in sagebrush–steppe ecosystems show that the effects extend beyond the sage-grouse. Sawyer et al. (2006) found that mule deer avoided otherwise suitable habitats within 1.7–2.3 miles (2.7–3.7 kilometers) of gas wells, and densities of Brewer's sparrow and sage sparrow declined by 36–57 percent within 328 feet (100 meters) of dirt roads in gas fields (Ingelfinger and Anderson 2004).

Sagebrush habitats conserved for sage-grouse may also benefit other sagebrush-dependent species, although the effectiveness of sage-grouse as an umbrella species will depend on the specific management objectives for the conservation of other target species (Rowland et al. 2006). The limits of the conservation umbrella of sage-grouse for management of many species is related in part to the nearly complete reliance of sage-grouse on sagebrush; sage-grouse are among the few species identified as true "sagebrush obligates" (Schroeder et al. 1999).

Forest

At higher elevations in the watershed, forests below treeline typically consist of spruce, lodgepole pine, and subalpine fir, with areas of high-elevation tundra on north-facing slopes. Moving down slope and the corresponding precipitation gradient, subalpine forests give way to dry forests of Douglas-fir, white fir, lodgepole pine, limber pine, and aspen groves, with bigtooth maple and boxelder in ravines.

Although the forested areas are largely on public lands, habitat loss through conversion to residential development is of local importance in some areas of the watershed. Phosphate mining also has had a significant long-term impact on forest habitats in eastern Idaho. This habitat typically occurs in landscapes that are extensively used for recreation, for livestock grazing, and increasingly for residential development.

Mark Hogan / USFWS

An aspen grove in bright fall colors.

Wildlife

This section describes the abundant variety of birds, mammals, amphibians, reptiles, and fish that live in the Bear River watershed.

Birds

The Bear River watershed provides diverse habitats used by more than 300 species of birds annually for breeding or migration. Banding data also show that migratory routes for some species that nest in the Pacific and central flyways overlap in the Bear River watershed (for example, northern pintail). The Intermountain West Joint Venture's diverse partnership for avian habitat conservation has identified eight Bird Habitat Conservation Areas (Intermountain West Joint Venture 2005), and the Bear River Migratory Bird Refuge and Great Salt Lake are designated as Western Hemisphere Shorebird Reserve Network Sites. The National Wildlife Refuge Association has designated the Bear River watershed as one of six Beyond the Boundaries focal areas nationwide because of its importance to migratory birds and other wildlife. The National Audubon Society (2012) has designated eight Important Bird Areas within the Bear River watershed, which serves to highlight the regional and continental significance of this watershed for migratory birds. Many of the transient species are neotropical migrants that breed in the United States and Canada and winter in the Central Highlands of Mexico or further south into Central and South America. Other spring migrants to the watershed winter along the Gulf of Mexico and the coasts of southern California, Baja Norte, Baja Sur, and southwestern Mexico, including the Gulf of California.

Upland areas within the Bear River watershed provide essential habitat to many bird species. Shrub–steppe and grassland habitats make up about 60 percent of the Bear River watershed land cover, supporting species such as greater sage-grouse, sage sparrow, sage thrasher, Columbian sharp-tailed grouse, burrowing owl, and long-billed curlew. All of these bird species have been listed as "Species of Greatest Conservation Need" (GCN) in the Idaho, Utah, and Wyoming comprehensive wildlife conservation strategies because of changes in habitat quantity and quality (Idaho Department of Fish and Game 2005, Wyoming Game and Fish Department 2005, Utah Division of Wildlife Resources 2005b). The greater sage-grouse is the only species listed above that has Federal status. The species became a candidate for listing under the Federal Endangered Species Act after the Service's conclusion that listing was warranted but precluded (USFWS 2010a). The Columbian sharp-tailed grouse was petitioned for listing in 2004, with a finding of "Not Warranted for Listing" issued in 2006 (USFWS 2006).

Studies referenced in the "U.S. Fish and Wildlife Land-Based Wind Guidelines" (2012) found that "based primarily on data documenting reduced fecundity (a combination of nesting, clutch size, nest success, juvenile survival, and other factors) in sage-grouse populations near roads, transmissions lines, and areas of oil and gas development and production (Holloran 2005, Connelly et al. 2000), development within 3–5 miles (or more) of active sage-grouse leks may have significant adverse effects on the affected grouse population." Lyon and Anderson (2003) found that in habitats fragmented by natural gas development, only 26 percent of hens captured on disturbed leks nested within 1.8 miles of the lek of capture, whereas 91 percent of hens from undisturbed areas nested within the same area. Holloran (2005) found that active drilling within 3.1 miles of sage-grouse

leks reduced the number of breeding males by displacing adult males and reducing recruitment of juvenile males. The magnitudes and proximal causes (for example, noise, height of structures, movement, human activity) of those impacts on grouse populations are areas of much needed research (Becker et al. 2009).

Hanser and Knick (2011) found that the diversity of sagebrush habitats used by greater sage-grouse may provide an effective umbrella for a broader community of passerine bird species associated with sagebrush that are also declining in numbers. Brewer's sparrow, sage sparrow, and sage thrasher had moderate to strong associations with sage-grouse.

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Cinnamon teal and many other waterfowl species migrate through the watershed.

The three national wildlife refuges—Bear Lake (with the Oxford Slough Waterfowl Production Area), Bear River, and Cokeville Meadows— in the watershed provide habitat for waterfowl, wading birds, shorebirds, and landbirds that migrate through these refuges on their way to and from Canadian and Alaskan interior and coastal wetlands. More than 270 different species have been identified using the habitats associated with the three refuges including the following birds:

- white-faced ibis (46 percent of the North American population)
- marbled godwit (more than 24 percent of the North American population)
- black-necked stilt (more than 18 percent of the North American population)
- American avocet (more than 16 percent of the North American population)
- tundra swan (32 percent of the western population)

Fish populations on the refuges provide food for birds like the American white pelican, egrets, herons, and the bald eagle. The Bear River Refuge is likely the most important foraging location for the Great Salt Lake breeding colony of American white pelican (Frank Howe, Utah Department of Wildlife Resources, personal communication 2000).

Other noteworthy species using wetland habitats found throughout the watershed include sandhill crane, redhead, Wilson's phalarope, trumpeter swan, black-crowned night-heron, cinnamon teal, blue-winged teal, northern pintail, American white pelican, rough-legged hawk, burrowing owl, and short-eared owl.

Mammals

The Bear River watershed provides habitat for nearly 100 species of mammals. Forty-six of these species are listed as "Species of Greatest Conservation Need" under the Idaho, Utah, and Wyoming comprehensive wildlife conservation strategies (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b, Wyoming Game and Fish Department 2005).

Many wide-ranging mammals depend on the large blocks of intact habitat found in the watershed, the wintering areas, and the key migration linkages including elk, mule deer, moose, pronghorn, grizzly bear, Canada lynx, gray wolf, and wolverine. Upland

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A bull moose rests in wetland vegetation at Bear Lake National Wildlife Refuge, Idaho.

shrub and grassland habitats support many species, such as white-tailed prairie dog, pygmy rabbit, Idaho pocket gopher, sagebrush vole, Wyoming ground squirrel, and Preble's shrew.

Wetlands in the watershed provide habitat for such species as water shrew, water vole, and northern river otter. In addition, the concentration of insects found in and around wetland complexes attract many bat species of concern including pallid bat, Townsend's big-eared bat, long-eared bat, and long-legged bat.

Amphibians

The diversity of amphibian species in the Great Basin and southern Rocky Mountains is low compared to other areas of the country, such as the Pacific Northwest. However, wetland and riparian habitats in the watershed do support 11 species of frogs and toads and one salamander. Most of these species are listed as "Species of Greatest Conservation Need" under the Idaho, Utah, and Wyoming comprehensive wildlife conservation strategies (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b, Wyoming Game and Fish Department 2005).

The Bear River watershed provides important habitat for the western population of the northern leopard frog, which was petitioned for listing under the Endangered Species Act in 2006. The Fish and Wildlife Service issued its 12-month finding in October 2011. Although the species is declining across its range and is considered rare or is locally extirpated from many States, including Idaho, Utah, and Wyoming, the Service concluded that listing was not warranted at this time (Federal Register 2011).

Reptiles

Approximately 20 species of reptiles occur in the Bear River watershed. Fifteen of these species are listed under State plans as "Species of Greatest Conservation Need." Upland areas such as sagebrush and grasslands are important habitats for species such as common sagebrush lizard and western skink. Moist habitats near wetlands or streams support species such as common gartersnake, eastern yellow-bellied racer, and smooth greensnake.

Fish

The Bear River and its tributaries provide important instream habitat for at least 15 species of native fish. All three State comprehensive wildlife conservation strategies identified the Bear River and its tributaries as playing an important role in providing habitat for an assemblage of native cool- and cold-water fish species, most notably the following:

- Bear River Bonneville cutthroat trout: Because of overharvesting, habitat modifications, dams, and diversions, Bonneville cutthroat trout was thought to be extinct by the 1960s; however, in 1974, an isolated population was discovered, which resulted in large restoration efforts by State, Federal, and local wildlife officials to bring them back. The Bonneville cutthroat trout was petitioned for listing under the Endangered Species Act in 2008; however, a finding of "Not Warranted for Listing" was decided (USFWS 2008b).

- Northern leatherside chub: The northern leatherside chub was petitioned for listing under the Endangered Species Act in 2011; however, a finding of "Not Warranted for Listing" was decided (Federal Register 2011).

Several other important Bear River native fish species recognized by these plans include mountain whitefish, mottled and Paiute sculpin, longnose and speckled dace, redside shiner, Utah sucker, and mountain sucker.

Many of these fish species evolved primarily as lake-dwelling (lacustrine) populations inhabiting Lake Bonneville during the Pleistocene. As Lake Bonneville began to recede, some fish moved up stream in search of cooler water while others adapted to the shrinking remnant lake. In the upper reaches of the Bear River, seasonal migrations from larger to smaller rivers is a common reproductive strategy for many fluvial fishes—those produced or found by a river or stream.

Species of Special Concern

Several federally listed species live in or have home ranges that overlap the proposed Bear River Watershed Conservation Area, as described in the following:

- The historical range of the endangered black-footed ferret includes the far eastern part of the watershed. Where ferrets have been reintroduced, they are considered experimental–nonessential; however, unconfirmed sightings of naturally occurring ferrets continue to be reported (Utah Division of Wildlife Resources 2005a).

- Grizzly bear and Canada lynx, both listed as threatened, can be found in the high country.

- The threatened plant Ute ladies'-tresses occurs within the proposed project area and is found in wet meadows and along perennial streams.

- Maguire primrose, a threatened plant that grows in rocky areas and on cliff faces, is highly localized near Logan, Utah.
- Candidate species such as the yellow-billed cuckoo occupy mature cottonwood–willow riparian habitats
- Greater sage-grouse, a candidate for listing, is dependent on sagebrush and grassland habitats found throughout the watershed.
- The wolverine, a candidate species, occurs in higher elevation forested areas of the watershed.
- Whitebark pine, a coniferous tree occurring in subalpine to alpine sites above 8,000 feet, is a candidate species.

Cultural Resources

Humans have inhabited the Bear River area for more than 12,000 years. Their uses of the land are as diverse as the regional topography and environments and reflect both changes through time and localized adaptations. The following brief summary of the prehistory and history of the Bear River area provides an overview of some of the major themes that have influenced the human interaction with the land.

Prehistory

Paleo-Indian Period

Current archaeological evidence shows that the earliest humans, called the paleo-Indians, migrated to the region near the close of the last ice age approximately 12,000 years ago. These people had a highly mobile lifestyle that depended on big game hunting including mammoths and a huge, now-extinct bison species. The hallmarks of most paleo-Indian sites are the beautiful but deadly spear points that are generally recovered from animal kill and butchering sites and small temporary camps, or from isolated occurrences.

Recorded paleo-Indian sites are rare in the Bear River drainage, probably indicating the need for more surveys and research rather than reflecting actual prehistoric use patterns. Several early sites have been recorded in the general region, and many of these are found in the many caves that characterize parts of the Great Basin. Sites are also found near wetlands and along the shorelines of ancient lakes, indicating the use of the abundance of floral and faunal resources that would have been available in these locations. The warming and drying climatic trend that began at the start of the Paleo-Indian Period continued and, by approximately 8,000 years ago, contributed to a change in settlement patterns and local adaptations.

Archaic Period

There was a gradual but definite shift in the pattern of human use of the region beginning about 8,000 years ago and continuing until approximately 2,500 years ago. The changes were the result of a combination of regional climatic fluctuations and an increasing population, coupled with technological innovation and regional influences. Although the Archaic Period is better represented in the archaeological record than the preceding Paleo-Indian Period, the interpretation of the remains is difficult. A greater diversity of tools and the use of a larger variety of plants and animals are found on many sites. The semipermanent occupation of small villages, the use of smaller spear points, and the creation of basketry, cloth, and cordage are hallmarks of this period. As with the earlier inhabitants, the Archaic peoples made extensive use of the many caves and the wetland environments in the region.

Late Prehistoric and Protohistoric Period

Beginning approximately 2,500 years ago, several innovations greatly influenced life in the Bear River region. Although these changes were adopted at different rates and degrees throughout the area, the advent of pottery, the bow and arrow, and agriculture, coupled with a larger and more sedentary population, define the period until approximately 800 years ago.

Approximately 1,500 years ago, people archaeologists refer to as the Fremont began to settle the Bear River drainage. Although five distinct Fremont variants have been identified in the archaeological record of the Great Basin, the use of pit houses, agriculture, granaries, and distinctive artistic motifs are common throughout the region. Fremont subsistence included cultivated corn, beans, and squash but also relied heavily on hunting and the intensive exploitation of native plants. Archaeologists suspect that a major staple of the Fremont diet along the Bear River would have been cattail and other seeds ground into meal. Animal species exploited included bison, pronghorn, and mule deer as well as shellfish, fish, and waterfowl. Evidence of the Fremont in the archaeological record disappears about 700 years ago.

About 600 years ago, the people living in the Bear River watershed began to blend culture traits with Shoshonean people living to the east of the Uinta Mountains and abandoned some Fremont cultural traits. These people continued to live in part on wild foods available in the marsh, but probably lived in smaller groups and exploited a broader range of resources. It is not known if the Fremont people were replaced or the two groups integrated. When the first trappers arrived in the early 1800s, people of the Shoshone and Bannock Tribes were living in the area.

History

The Historic Period for the Bear River drainage begins with the recurring contact of the Native Peoples with people of European descent and ends in the mid-twentieth century. This interaction generally followed many years of occasional contact—usually for the exchange of trade goods—and occurred at different times throughout the area. As with the prehistory of the area, the history of the Bear River watershed reflects both broad themes and individual stories. The narrative below briefly summarizes some of the major historic influences in the region.

The earliest documented European in the area was fur trapper Robert Stuart in 1812. The region quickly gained fame for its abundant resources and became the site of both the 1827 and 1828 trappers' rendezvous on the southern end of Bear Lake near the current town of Laketown, Utah. These annual gatherings were held from 1825 to 1840 to allow the trappers to sell their furs and restock their supplies.

Border disputes between the United States and Spain in various parts of North America, including the Bear River drainage, were addressed in the Adams–Onis Treaty of 1819. As a part of this treaty, the land north of the 42nd Parallel—the State boundary between Idaho and Utah—became United States territory and the lands below the parallel that of New Spain (Mexico after 1821).

Several major trails, sometimes referred to as the Emigrant Trails, crossed the Bear River drainage. The Oregon Trail in this area often followed the route of earlier fur trapper foot and horse trails but did not become a wagon trail until 1836. Coming from the east, the main trail takes a sharp north turn at Fort Bridger in southwest Wyoming before heading northwest along the northern banks of the Little Muddy Creek. It crosses over the Bear River Divide and joins the Bear River just south of the Cokeville Meadows National Wildlife Refuge. From there, it never strays far from the Bear River and is most often along the east or north sides of the river. Just west of Soda Springs, where the river cuts to the south, the trail diverges from the river and heads northwest toward Fort Hall. The California Trail follows a similar path through the watershed, but splits from the Oregon Trail at Fort Hall.

The grade of the Union Pacific Railroad, built as a part of the Transcontinental Railroad, crosses the watershed just north of the Bear River Migratory Bird Refuge. The Union Pacific began in Omaha, Nebraska, and headed west until joining the Central Pacific Railroad at Golden Spike, approximately 10 miles to the north of the Bear River Migratory Bird Refuge in 1869. The completion of this railroad and its links to rail systems in the eastern United States had a profound effect on the settlement of the West.

The first European resident of the area is reported to have been Thomas "Peg Leg" Smith, who ran a trading post from 1842–57 near Dingle, Idaho, on the northeastern shores of Bear Lake. The influx of settlers accelerated greatly during the early 1850s following the initial waves of Mormon immigrants arriving from the east. The towns of Brigham City and Willard in the southwest corner of the watershed were both founded in 1851 by Mormon pioneers. In 1860, Mormons settled to town of Franklin, Idaho, located along the Cub River just north of the Utah–Idaho boundary, which became the first town settled in what is now Idaho. In 1867, the Fort Hall Reservation near Pocatello, Idaho, was established for the Shoshone and Bannock Tribes.

Socioeconomic Environment

The proposed Bear River Watershed Conservation Area is located in a vast basin covering 14 counties across Idaho, Utah, and Wyoming. The watershed spans roughly 7,500 square miles: 1,500 square miles in Wyoming, 2,700 square miles in Idaho, and 3,300 square miles in Utah (Utah Division of Water Resources 2004).

The 14-county region (which excludes the three out-of-watershed counties) has a population of roughly 2.9 million people (U.S. Census Bureau 2010). (See table EA–2.) Population growth is expected throughout much of the region, with most of the growth centered in the Cache Valley. Located in the western part of the Bear River watershed in Utah, the Cache Valley is the most populated area in the watershed, and its population is estimated to double from 2000 levels to 297,597 by 2050 (Utah Division of Water Resources 2004). Population growth in the Cache Valley is partly because of the valley's proximity to the metropolitan Wasatch Front. In Wyoming, Lincoln County has seen 24.3 percent population growth over the last decade (U.S. Census Bureau 2010), with about 200 new homes built each year (Royster and Gearino 2006), and Uinta County has

Table EA–2. Population statistics for Wyoming and counties in and near the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

	Residents (2010)	*Persons per square mile*	*Population % change since 2000*
Utah	2,763,885	33.6	24
Cache County	112,656	96.7	64
Rich County	2,264	2.2	16
Summit County	36,324	19.4	22
Weber County	231,236	401.8	18
Morgan County	9,469	15.5	33
Box Elder County	49,975	8.7	17
Idaho	1,567,582	18.9	21
Power County	7,817	5.6	4
Bannock County	82,839	74.4	10
Oneida County	4,286	3.6	4
Franklin County	12,786	19.2	13
Caribou County	6,963	3.9	–5
Bonneville County*	101,234	55.8	26
Teton County*	10,170	22.6	70
Bear Lake County	5,986	6.2	–7
Wyoming	563,626	5.8	14
Uinta County	21,118	10.1	7
Teton County*	21,294	5.3	17
Lincoln County	18,106	4.4	24

Source: Utah Governor's Office of Planning and Budget (2008).
**Outside the proposed Bear River Watershed Conservation Area.*

experienced a 7 percent population growth over the decade. Idaho counties within the proposed conservation area have seen less growth, with Bear Lake and Caribou Counties seeing a decline in population over the decade. Of the proposed conservation area counties in Idaho, Franklin, and Bannock Counties have experienced the greatest growth, with 12.9 percent and 9.6 percent growth over the decade, respectively.

Total nonfarm employment was more than 265,000 individuals in 2010 (U.S. Census Bureau 2011) in the combined 14-county region. The highest percentage of total employment was found in educational services, health care, and social aid at 20 percent of nonfarm employment. This percentage is, in part, because of the high population and abundance of educational and health care centers in Cache County, Utah (home to Utah State University) and Weber County, Utah. The second and third highest percentage of total employment in 2010 was in manufacturing at 14 percent and retail trade at 12 percent. Agriculture, forestry, fishing, hunting, and mining made up an estimated 4 percent of the total employment by sector.

Mining represents a relatively small percentage of total employment for many of the counties in the region, but has increased slightly since 1998 (U.S. Census Bureau 2011, Headwaters Economics 2011). Mining accounted for less than 1 percent of total employment in 2009 for all but three counties in the 14-county region.

Landownership

The Upper Bear River area is located in parts of Summit County, Utah, and Lincoln and Uinta County, Wyoming. The headwaters of the Bear River, near the border of Summit and Uinta Counties, is forested; the remaining land cover in the high-elevation Upper Bear River area is primarily grassland and shrubland, with about three-quarters of the land used for grazing (Utah Water Research Laboratory 2011). As of 2006, about 63 percent of the land in the Upper Bear River counties was federally owned, primarily by the Bureau of Land Management and the USDA Forest Service; about 24 percent of the land was privately owned, 4 percent was State owned, and 7 percent was tribally owned (Headwaters Economics 2011). The Upper Bear River area is lightly populated. The

largest municipalities in the region are Evanston and Cokeville, Wyoming, and Randolph and Woodruff, Utah (Utah Water Research Laboratory 2011).

The Middle Bear River area is located in parts of Bear Lake, Caribou, Franklin, Bannock, Oneida, and Power Counties in Idaho. Grassland and shrubland account for about 77 percent of the land cover in the Middle Bear River counties, and croplands account for about 11 percent of the land cover (Headwaters Economics 2011). As of 2006, urban development accounts for only about 0.2 percent of the land cover in these counties; the largest municipalities in the region are Grace, Preston, Montpelier, Soda Springs, and Malad City, Idaho, and Richmond, Smithfield, North Logan, and Garden City, Utah (Headwaters Economics 2011, Utah Division of Water Resources 2004). As of 2006, landownership in the Middle Bear River counties was 48 percent private, 38 percent Federal, 5 percent State, and 6 percent tribal (Headwaters Economics 2011).

The Lower Bear River area is in parts of Box Elder, Cache, Rich, Weber, and Morgan Counties in Utah. The rich soil and abundant water in this part of the Bear River watershed support a mix of urban and agricultural uses. About 9 percent of the land cover in the Lower Bear River counties is water. Mixed croplands account for 21 percent of the land cover in the Lower Bear River counties, with croplands concentrated in Cache, Weber, and Morgan Counties (Headwaters Economics 2011). As of 2006, about 1.6 percent of the land in these counties is urban development, with much of the development concentrated in the Cache Valley (Headwaters Economics 2011). Major municipalities in the Lower Bear River area include Ogden, Brigham City, Logan, and Tremonton, Utah. As of 2006, landownership in the Lower Bear River counties was 52 percent private, 31 percent Federal, and 6 percent State (Headwaters Economics 2011).

While the population of the proposed conservation area has declined in two counties in Idaho, some parts of the proposed conservation area as well as areas next to it have experienced significant growth trends over the past decade (see table EA–2).

Property Tax

Property taxes are assessed based on the value of property. For most types of properties, county assessors use fair market value to determine property tax liabilities. In many States, however, the assessed value of agricultural land is determined based on the productive value of the land rather than on the fair market value of the property. The fair market value of land is the estimate of a property's sale price. This value includes both the productive value of the land and any speculative value associated with the possibility of developing the land.

Conservation easements reduce the fair market value of a property by removing the speculative value associated with possible development; however, conservation easements generally do not affect the productive value of agricultural land. The proposed Bear River Watershed Conservation Area encompasses three States: Idaho, Utah, and Wyoming. In all three States, property taxes for agricultural land are assessed based on the productive value of the land. Most properties that enter into conservation easement agreements with the Service are classified as agricultural land.

Public Use and Wildlife-Dependent Recreational Activities

According to the "2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation," approximately 2.9 million residents took part in wildlife-associated recreational activities in Idaho, Utah, and Wyoming in 2006 (USFWS 2008a). It was estimated that residents and visitors spent $3.3 billion on wildlife-associated recreational activities in 2006 in the three States combined. Among participants, wildlife watching was the most frequently reported activity followed by fishing and hunting. In Wyoming, 84 percent of individuals surveyed watched wildlife, 27 percent fished, and 13 percent hunted; in Utah, 77 percent watched wildlife, 33 percent fished, and 15 percent hunted; and in Idaho, 75 percent watched wildlife, 35 percent fished, and 19 percent hunted (USFWS 2008a). Following the national trend, wildlife viewing has become increasingly popular, while hunting and fishing have decreased or remained stable in popularity. From 1996 to 2006, it was found that the number of Idaho residents who fished declined by 21 percent while those who hunted declined by 33 percent. Wyoming residents who fished declined by 19 percent, while hunting and wildlife viewing numbers remained relatively constant. During the same time period, Utah residents who watched wildlife increased by 30 percent, while hunting and fishing numbers remained relatively constant (USFWS 2008a).

Draft EA Chapter 4—Environmental Consequences

Black-necked stilts are migratory shorebirds that frequent the Bear River watershed.

This chapter assesses the environmental impacts that are expected to occur from the implementation of alternatives A and B, as described in chapter 2. Environmental impacts are analyzed by issues for each alternative and appear in the same order as discussed in chapter 2. Several aspects of environmental effects are evaluated including whether the effects are negative or beneficial, direct, indirect, or cumulative with actions independent of the proposed action. The duration of the effect, whether it is a short-term or a long-term effect, is also used in the evaluation of the environmental consequences.

The intensity and timing of effects from alternative A, the no-action alternative, would vary by the location within the watershed. For example, the intensity of development would be much greater, and would occur sooner in the Cache Valley than in the more rural areas.

The level of impact from alternative B would be greatly dependent on the degree completeness the program achieves. If only a small acreage is conserved through the easement program, the long-term effects would be negligible. The rate of implementation would depend on the availability of funding and the level of landowner interest. Alternative B would likely be a long-term process with incremental change.

Effects on the Physical Environment

The physical environment comprises the geology, soils, hydrology, and climate of the Bear River watershed. In addition, climate change is discussed. Anticipated effects on these features are described for alternatives A and B. Some of the effects would be the same for either alternative.

Effects Common to Both Alternatives

Existing uses of the proposed lands would continue to have some negative effects on soils. On lands zoned for agriculture, soil problems such as compaction, trampling, and erosion caused by farming equipment, cattle grazing, and vehicle use on range lands would continue.

Water and Soil Resources—Alternative A (No Action)

The Bear River delivers an annual average of 1.2 million acre-feet of water into the Great Salt Lake, more than one-half of the total surface water flowing into the lake each year. Over the next 50 years, about one-fifth of this volume of water could be diverted to the Wasatch Front for municipal and industrial use by communities outside of the watershed (Utah State University Extension 2006).

Increased development and disturbance could reduce infiltration and ground-water recharge. Development can result in more wetland drainage, water diversion, and introduction of invasive species. Development could change drainage patterns and the rate of surface runoff, increasing soil erosion and nonpoint source pollution. Additional residential development in the proposed conservation area would have a negative effect on aquatic habitat because of sewage-derived nutrient additions to streams and lakes (Wernick et al. 1998). With projected development patterns (Toth et al. 2010), there would be more demand for ground water, potentially resulting in degradation of the hydrology of some wetland areas and negatively affecting the three refuges in the Bear River watershed.

This alternative could have a negative effect on local mitigation efforts by reducing options for conserving and storing carbon through land protection and habitat restoration.

Water and Soil Resources—Alternative B (Proposed Action)

Historical water rights would continue and the conservation easements would not allow any water rights to be sold or otherwise separated from the property. The easements would not allow change to or alteration of points of diversion, timing, or place of use for any water rights. Historical water use would be kept in accordance with current practices.

Water resources on up to 920,000 acres of conservation easements would result in some additional protection from increased nonpoint source pollution from residential subdivisions, commercial development, and draining of wetlands, all of which would be prohibited under the proposed easement program. A long-term commitment to maintenance of vegetative cover with minimal soil disturbance would help conserve local microclimate patterns and soil processes. By limiting development on some prime agricultural and wildlife habitat areas, communities would help to ensure future ground-water supplies, thus reducing the need to develop more water resources to meet growing demand (Toth 2010). The protection from conservation easements would improve water resources throughout the Bear River watershed, including for the three national wildlife refuges.

Effects on the Biological Environment

This section describes the anticipated effects on wildlife and habitat under alternatives A and B. The Bear River watershed's habitat ranges from river and the adjacent riparian areas to wetland, grassland, shrubland, and forest. This section also describes the wildlife and species of concern that use these habitats.

Habitat and Wildlife—Alternative A (No Action)

Under the no-action alternative, the Service would continue to work cooperatively with landowners to voluntarily improve habitat on private land through programs such as Partners for Fish and Wildlife. Private landowners would continue to be responsible for complying with Federal, State, county, and local invasive animal and plant control laws. Degradation of resources used by wildlife on some unprotected lands would continue as the need and demand for help and for easements exceed the capacity of existing programs. Intensification of agricultural processes combined with increasing residential and commercial development would result in the further decline of wildlife populations, such as migratory birds, native fish, resident wildlife, and species of special concern.

Under this alternative, predicted changes in the quantity and quality of water (Toth et al. 2010) combined with direct loss and fragmentation of habitat

and of migration corridors would negatively affect fish and wildlife over the long term.

Loss and Fragmentation

Subsurface, residential, and commercial development would negatively affect riverine, riparian, grassland, and shrubland habitat on which a wide variety of wildlife species depend. Besides direct habitat loss resulting from commercial and residential development, infrastructure associated with development would fragment wildlife habitat. Oil and gas development could lead to saltwater contamination and new road development. Increased levels of nonnative and invasive species resulting from disturbance would likely further fragment wildlife habitat.

Davies et al. (2011) found that exurban growth decreases native plant and animal diversity, increases the number of exotic species (including nonnative predators), and restricts the use of ecosystem management options, such as using fire to prevent conifer encroachment (Knight et al. 1995, Maestas et al. 2003, Hansen et al. 2005). Fire frequency and size are influenced by housing density and tend to be highest at intermediate levels of human actions (Syphard et al. 2007, 2009).

Riverine Area, Riparian Area, and Wetland Effects

Because the Bear River watershed is considered one of the last areas of Utah with a developable water supply, there is some concern that development pressure and demand for water would negatively affect sensitive refuge habitats and ecosystems (Toth et al. 2010). With much of the undeveloped water claimed by municipalities along the Wasatch Front, it has been estimated that one-fifth of the current Bear River flows could be diverted within the next 50 years (Utah State University Extension 2006).

Under the no-action alternative, the likely increase in development in riparian areas would remove corridors of connectivity between wetland and upland habitat types. In addition, stream quality could become degraded from development, which would negatively affect the Bonneville cutthroat trout; leatherside chub; mountain whitefish; mottled and Paiute sculpin; longnose and speckled dace; redside shiner; and Utah, bluehead, and mountain suckers. With increasing development, more barriers to fish passage are likely to be constructed.

USFWS

White-faced ibis colony a-wing.

Upland Effects

Wildlife habitat would be fragmented by increased levels of nonnative and invasive species that result from disturbance. Vertical structures such as wind towers and oil and gas infrastructure could result in large tracts of otherwise suitable habitat being avoided by some species, such as greater sage-grouse, sage thrasher, sage sparrow, pronghorn, mule deer, and other sage-dependent species. Besides the direct impacts of habitat loss and increased wildlife mortality from vehicle collisions, roads associated with development would lead to increased soil erosion, wetland degradation, spreading of invasive weeds, and habitat fragmentation.

Because it would increase the number of human-caused fires, exurban development in sagebrush communities could create and keep plant systems dominated by exotic plants and start a positive feedback loop between exotic grass invasion and increased fire frequency (D'Antonio and Vitousek 1992).

The loss of sagebrush communities is a concern in part because these plant communities provide crucial habitat for sagebrush-dependent wildlife species. Long-term monitoring of sage-grouse populations has shown a steady decline across their range since the 1960s (Connelly and Braun 1997, Connelly et al. 2004). Aldridge et al. (2008) suggested that the loss of sagebrush habitat was the main factor in the extirpation of local sage-grouse populations.

Species of Special Concern Effects

The Idaho, Utah, and Wyoming State conservation strategies include at least 70 bird, 7 amphibian, 15 reptile, and 8 fish "Species of Greatest Conservation Need" (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b, Wyoming Game and Fish Department 2005).

Although there are many species on the State lists of concern, only 10 species within the Bear River watershed are federally listed. The no-action alternative would increase the level of threat to endangered, threatened, and candidate species through habitat loss, degradation, and fragmentation, among other factors. More land conservation and protection measures are the primary actions identified in the recovery plans for most such species, as well as for species on the State lists.

Without more habitat protection measures in the watershed, there would be an increased likelihood that more species would be added to the State lists of conservation concern or to the Federal threatened and endangered species lists.

Habitat and Wildlife—Alternative B (Proposed Action)

Loss and Fragmentation

The availability of large, intact areas of diverse habitat types is important to provide for the various needs of wildlife species. Habitat connectivity provides a migration corridor for neotropical birds; between winter and summer ranges for mule deer, pronghorn, and elk; and between breeding, nesting, and brood-rearing areas for birds. It also provides access to spawning grounds for native fish. Connectivity increases the resiliency of wildlife populations by allowing movement to new areas during environmental challenges such as drought or flooding, and provides for genetic diversity by allowing an exchange of individuals from different subpopulations. Privately owned lands adjacent to the Bear Lake (and Oxford Slough Waterfowl Production Area), Bear River, and Cokeville Meadow Refuges provide connectivity between the refuges and other Federal lands, thus creating a larger block of permanently protected wildlife habitat. Through protection of important migration corridors and habitats, the proposed action would have long-term beneficial effects on fish and wildlife populations.

Riverine Area, Riparian Area, and Wetland Effects

The Bear River is the lifeblood of the three national wildlife refuges located along its course. Large populations of waterfowl, shorebirds, and native fishes depend on the refuges and adjacent habitat areas to meet their breeding, migration, and feeding needs. The proposed action would protect privately owned wetlands, irrigated meadows, and fields that now provide important wildlife habitat.

The proposed action would help maintain healthy riparian areas that recharge aquifers, reduce soil erosion, filter chemical wastes, moderate stream temperatures, and help buffer water loss from upland drainages.

Retaining the role of riparian habitats in providing travel corridors for wildlife would become an increasingly important part of effective mitigation plans for human development as well as climate change (Wyoming Game and Fish Department 2010). Conservation of riparian areas would benefit a variety of species of special conservation concern that depend on riparian habitat, such as Lewis's woodpecker and many neotropical migratory birds. Additionally, connectivity between different riverine habitat types is important for fish access to suitable spawning and rearing

grounds while providing adequate habitat for adult growth and survival.

Upland Effects

The proposed action would provide the ability to conserve large patches of sagebrush that occur on acquired easements.

Maintaining and restoring large patches of sagebrush would create a mosaic of sagebrush habitats that would be an important step toward reversing the population declines of sage-grouse and other sagebrush-dependent species, such as sage sparrow, sage thrasher, and Brewer's sparrow (Hanser and Knick 2011).

Species of Special Concern Effects

With the additional habitat protection measures in the watershed under the proposed action, there would be a greater likelihood that common species can remain common. There are relatively few species with Federal status in the Bear River watershed. There would be a reduced need for more species to be added to the State lists of conservation concern or to be federally listed as threatened or endangered.

The effects of the proposed Bear River Watershed Conservation Area on endangered, threatened, and candidate species would vary by the area under consideration. The differences in the effects would be due to differences in species' ranges, habitat affinities and restrictions, and elevations.

Climate—Alternative A (No Action)

Carbon sequestration capabilities would be reduced with the increased development and disturbance of native vegetation likely to occur under the no-action alternative. There would be negative effects on the resiliency of the watershed and the ability of ecosystems to adapt to a changing climate and changing land uses. This alternative could also negatively affect local mitigation efforts by reducing options for conserving and storing carbon through land protection and habitat restoration.

Climate—Alternative B (Proposed Action)

By protecting habitat, reducing habitat fragmentation, and increasing connectivity between habitats, the proposed action would help keep the ability of native species and ecosystems to adapt to a changing climate. Climate change mitigation efforts would be positively affected by this alternative because carbon sequestration now provided by native vegetation would be conserved.

Effects on the Socioeconomic Environment

This section describes the anticipated effects of alternatives A and B on landownership, land use, public use, development (including oil and gas, wind energy, and residential), and intact ecosystem values.

Landownership and Land Use—Alternative A (No Action)

Landownership would not be affected by the no-action alternative. Acquisition of wetland and upland easements would continue under current Federal and private programs and funding sources. More than 2.53 million acres of the Bear River watershed would remain in private ownership, with no additional protections by the Service through conservation easements.

With future predicted development trends (Toth et al. 2010), landowners would lose some open space as well as the agricultural and ranching heritage and natural aesthetics of the Bear River watershed.

Ranching and agricultural opportunities would be reduced if landowners begin to split tracts into smaller lots for residential and commercial development. Landowners who subdivide could increase their revenue by developing recreational homesites. Subdivided tracts could maintain wildlife values if there were a desire to cluster housing or to keep open space.

Landownership and Land Use—Alternative B (Proposed Action)

The proposed action would only affect lands where the Service has acquired a conservation easement. The location, distribution, and sale of development rights by landowners on adjacent lands without Service easements would not be affected. Traditional agricultural uses such as ranching, grazing, and haying would be allowed to continue on easement lands.

Because this alternative would maintain open space on a large scale, it would preserve a rural

lifestyle and associated tourism and economic activities. The purchase of an easement would not result in a transfer of land title, so private landowners would continue to pay property taxes. In all three States, property taxes for agricultural land are assessed based on the productive value of the land. Most properties that enter into conservation easement agreements with the Service are classified as agricultural land; therefore, there would be little or no effect on the current property tax base for the 14-county area.

Because the sale of conservation easements provides landowners with more revenue, easement purchases could inject new money into local economies. Landowners could spend some percentage of this money on such items as purchasing new real estate, consumer goods, or local services. This spending activity would directly affect local industries such as construction and various service sectors.

Conservation easements could help keep the regional character by protecting working landscapes and a traditional agricultural way of life. Land with historical commercial use, such as ranching, forestry, and farming, is often compatible with or beneficial to wildlife refuge objectives (Jordan et al. 2007, Rissman et al. 2007). Conservation easements provide financial benefits for landowners that enable them to preserve the natural and historic value of their farms, ranches, and open space lands, and to pass this legacy on to their children and grandchildren.

The easement program would have no effect on tribal jurisdiction or tribal rights, because it is outside of reservation lands and would affect only private landowners who are willing to sell easements.

Public Use—Alternative A (No Action)

Under the no-action alternative, the Service would not buy conservation easements. Private landowners would continue to manage public use and access of their lands.

With increased development levels, opportunities for wildlife-dependent recreational activities such as hunting, fishing, and wildlife observation would likely decline, resulting in diminished associated economic benefits to local communities. Negative economic effects to landowners could occur from diminished public wildlife viewing, tourism, fishing, and hunting opportunities.

Public Use—Alternative B (Proposed Action)

Conservation easements bought on private tracts would not change landowners' rights to manage public access to and use of their property. Under the proposed easement program, landowners would retain full private property rights, including control of hunting and fishing on their lands. Under the proposed action, wildlife-dependent recreational opportunities such as hunting, fishing, and wildlife observation would not be diminished because of declining wildlife populations. According to the "2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation," approximately 2.9 million residents took part in wildlife-associated recreation activities in Idaho, Utah, and Wyoming in 2006. It was estimated that residents and visitors spent $3.3 billion on wildlife-associated recreation activities in the three States combined (USFWS 2008a).

Development—Alternative A (No Action)

More than 2.53 million acres would remain in private ownership, with no additional restrictions from conservation easements. Farming and ranching opportunities could be reduced if landowners begin to split tracts into smaller lots for residential and commercial development.

Over time, the land development that is forecast (Toth et al. 2010) would result in population declines of many wildlife species. The Utah Governor's Office of Planning and Budget (2008) projects that the population in Utah will increase by more than 250 percent between 2008 and 2060, from 2.7 million to 6.84 million people, with Cache and Box Elder Counties accommodating an increasing share of the State's population. To accommodate this growth, 32,000 new households are expected to be built statewide every year, resulting in a 75 percent increase in developed land and a 7.3 percent loss of agricultural land by 2030 (Utah Governor's Office of Planning and Budget 2008). As a result, the communities within the Bear River watershed would lose open space, agricultural lands, and scenic values.

Subsurface Development

Mining and oil and gas development would continue to occur on private lands in the Bear River watershed. Stipulations to protect the surface estate would be governed by existing State regulations.

Commercial and Residential Development

Development rights would remain in private ownership, with none of the restrictions that would accompany conservation easements.

Residential development and subdivisions generally increase costs to the county governments that provide services to rural areas. Rural residences tend to have higher costs for county governments and school districts than urban residences. On average, the cost to provide community services to new residential developments is $1.15 for every $1.00 of revenue created by those developments (American Farmland Trust 2001, Coupal et al. 2002). In Wyoming, community service costs averaged $2.01 for every $1.00 of revenue for rural residential lands; in contrast, the average cost to provide services for lands under agricultural production averaged $0.54 for every $1.00 of revenue (Taylor and Coupal 2000).

Development—Alternative B (Proposed Action)

The proposed action would protect up to 920,000 acres of wetland, riparian, grassland, and shrubland wildlife habitat from more fragmentation and loss by precluding surface occupancy and infrastructure development.

Subsurface Development

Conservation easements typically do not affect subsurface estates (mineral, oil, and gas deposits) because the Service only acquires rights associated with surface ownership. The proposed easement program would preclude mining and oil and gas exploration or development requiring surface occupancy on easement land only when the landowner owns the subsurface rights. In many places, including the Bear River watershed, the subsurface estate has been severed from surface ownership, and the landowner does not own the subsurface rights. In these cases, the easement that the Service acquires from the landowner is junior to the subsurface rights.

For easements that have been put in place on land where the owner has not sold or leased the mineral or subsurface estates, the Service easement would be senior to any subsurface interests later acquired by a developer. Because development of the mineral estate could significantly damage the resources that the Service is attempting to protect, the Service would require that a developer access minerals from offsite as a term of the easement.

Commercial and Residential Development

The Service's easement program would enhance the protection of wildlife species that depend on unfragmented upland habitat through prohibiting surface disturbance or development of infrastructure. This program would also provide financial compensation to landowners through the sale of easements to offset potential revenue loss from the sale of development rights or leases.

The proposed project would only affect lands on which the Service has acquired a conservation easement. Development on adjacent lands that do not have Service conservation easements would not be limited.

Land acreage with potential for wind energy development is relatively low in Idaho (1.67 percent) and Utah (1.19 percent). Wyoming, however, has a higher development potential at 43.58 percent (National Renewable Energy Laboratory 2011). Most land with potential for wind energy development in each State would still be available under the proposed action.

Designated open space and protected natural areas can increase surrounding property values (see McConnell and Walls 2005 for a comprehensive review). The value of open space on nearby property values would vary depending on landscape characteristics and location (for example, distance to the conserved area) (Kroger 2008). Permanence of the open space also influences property values. Typically, open space that is permanently protected—such as refuge lands and lands protected with perpetual conservation easements—would generate a higher enhancement value to local properties than land that has the potential for future development (Geoghegan et al. 2003). Location and demographic factors in the region can also influence the relative level of property enhancement value. For instance, open space could generate larger amenity premiums for property in more urbanized areas and where median incomes are higher (Netusil et al. 2000, Vrooman 1978, Phillips 2000, Crompton 2001, Thorsnes 2002). Private lands protected by conservation easements benefit residents through increased biodiversity, recreational quality, and hunting opportunities on adjacent publicly accessible wildlife refuges and on some private lands (Rissman et al. 2007).

Other Conservation Impacts—Alternative A (No Action)

Under the no-action alternative, the threat of habitat fragmentation would continue to increase. Landowners would continue to face economic

pressures to subdivide their land and sell their water rights. Ecosystem services such as nutrient cycling (see figure EA–8) that are now provided by a rural landscape would be diminished.

Conservation of wetland and upland habitats would continue under existing acquisition authorities. These conservation programs are not able to keep pace with current rates of wetland and upland loss.

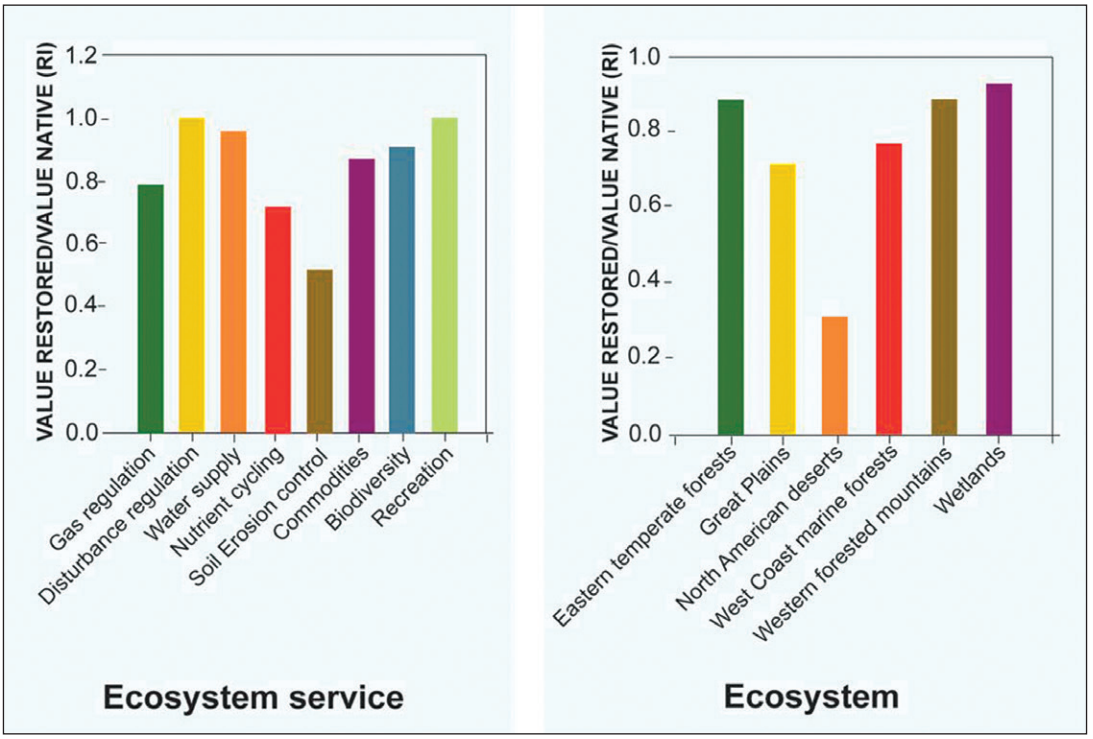


Figure EA–8. Chart of the relative native and restored benefits of ecosystem goods and services.
Source: Dodds et al. 2008.

Note: The relative value is determined as the ratio of estimated benefits derived from native and restored acreages per year.

Other Conservation Impacts—Alternative B (Proposed Action)

Wetland, riparian, grassland, and shrubland habitat would remain intact. Because the proposed action would keep intact wildlife habitat on working lands through conservation easements, ecosystem services would be available for local residents (Millennium Ecosystem Service Assessment 2005). Ecosystem services such as pollination, water purification, nutrient cycling, carbon sequestration, soil conservation, and control of pest insects by birds are often unrecognized or are considered "free." These services would not be provided in areas that have undergone residential or commercial development.

The proposed action would help protect valuable ecosystem services, as shown in figure EA–8 above. Furthermore, it would eliminate the need for expensive restoration of disturbed land and habitat.

Dodds et al. (2008) found that wetlands had the greatest value for each of the ecosystem services examined in both native and restored habitat. The most valuable ecosystem goods and services that wetlands provided were disturbance regulation and nutrient cycling. The greater value per area of wetlands did not translate to an equally large disparity in total value because the total area of wetlands is substantially less than that of terrestrial ecoregions within the United States.

Conservation easements on private lands would strengthen habitat resiliency and provide opportunities for wildlife movement and adaptation for years to come.

Public safety is an added benefit of conservation easements that limit development in wetlands and riparian areas. Some areas within the Bear River watershed have a moderate to high likelihood of a natural disaster that could cause harm to both the residents and structures in these areas. The major hazards that are located within the watershed include flooding, landslides, earthquakes, and soils that are susceptible to liquefaction (Toth 2010).

Effects on Cultural Resources

This section describes the anticipated effects of alternatives A and B on cultural resources.

Cultural Resources—Alternative A (No Action)

Cultural resources on the lands under consideration would remain subject to State and local regulation and permitting. Cultural resources could be negatively affected by differing land uses or development. Activities not requiring permits could contribute to the loss or damage of cultural resources, especially if resources have not been identified.

Cultural Resources—Alternative B (Proposed Action)

As a Federal agency, the Service is required to comply with many laws pertaining to cultural resources, including the National Historic Preservation Act (16 U.S.C. 470 et seq., Public Law 89–665, the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa–470mm; Public Law 96–95), as amended, and the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq., Public Law 101–601). Although conservation easements would preclude or limit most forms of surface disturbance, these requirements would not apply to or be fully effective in protecting cultural resources on private lands with easements. However, the proposed action provides benefits to cultural resources when compared to the no-action alternative because easements would limit surface disturbance.

Unavoidable Adverse Impacts

Any adverse effects that could be unavoidable while carrying out alternatives A and B are described below.

Alternative A (No Action)

The adverse impacts of habitat degradation and fragmentation would be expected to be more widespread and prevalent in the proposed project area. Some habitat protection would continue through existing authorities and funding.

Alternative B (Proposed Action)

No direct or indirect, unavoidable, adverse impacts to the environment would result from the selection of alternative B. The easement program would not result in unavoidable adverse impacts on the physical or biological environment. The selection of an approved boundary would not, by itself, affect any aspect of landownership or values. Management of lands to protect wildlife habitat would benefit ranching operations, but would limit future development options for landowners.

More conservation easements acquired by the Service could have unavoidable minimal to moderate adverse effects on the local economy by precluding new mining oil, gas, wind, and residential development on easement lands. However, these impacts would be offset in part by protecting these areas from adverse impacts to watersheds, which are important to aquifer recharge and water quality, from further degradation or loss of native ecosystems, and from conversion of prime agricultural lands.

Irreversible and Irretrievable Commitments of Resources

Any commitments of resources that could be irreversible or irretrievable because of carrying out alternatives A and B are described below.

Alternative A (No Action)

There would be no added commitment of resources by the Service if no action were taken.

The likely introduction of new residential and commercial infrastructure in the Bear River watershed would be considered an irretrievable loss of habitat. The irretrievable loss of habitat caused by the development of new residential and commercial infrastructure in the Bear River watershed could eventually lead to an irreversible loss of both wildlife species and habitat.

The new infrastructure could effectively cause an irretrievable loss of habitat for certain wildlife species because of their avoidance of infrastructure. With the loss of habitat, some of these wildlife species could be pushed toward threatened or endangered status. Without other suitable habitat being available, there could be an irreversible loss to some of these species.

The connectivity between various habitat types and migration corridors between the three national wildlife refuges and other large areas of protected

lands would be reduced or possibly eliminated without more conservation of important wildlife areas.

In 2009, The Nature Conservancy conducted a Conservation Action Planning study in the Bear River watershed and found that residential development and water allocation policies are the greatest threats to wildlife conservation in the watershed (The Nature Conservancy 2010). Because the Bear River watershed is considered one of the last areas of Utah with a developable water supply, there is a concern that development pressure and demand for water will adversely affect sensitive refuge habitats and ecosystems (Toth et al. 2010). Without more measures such as wetland easements to keep some of the current water uses and applications, there could be irreversible impacts to wetlands and riparian ecosystems.

The connectivity between various habitat types and migration corridors between the three national wildlife refuges and large areas of protected lands would be reduced or possibly be maintained with added protection of important wildlife habitat with conservation easements.

Alternative B (Proposed Action)

There would not be any irreversible or irretrievable commitments of resources associated with establishing the conservation easement program; however, any easements that are acquired with Land and Water Conservation Funds would require an irretrievable and irreversible commitment of resources (such as expenditures for fuel and staff for monitoring) for the long-term administration of the easement provisions.

The introduction of new residential and commercial infrastructure to the Bear River watershed would be greatly restricted on conservation easement lands, so this alternative would reduce the likelihood of an irretrievable loss of habitat associated with development. The irretrievable loss of habitat caused by the development of new residential and commercial infrastructure in the Bear River watershed that would eventually lead to an irreversible loss of both species and habitat could be minimized under the proposed action.

With the protection measures provided by the wetland conservation easements, some of the current water uses and applications could be retained and irreversible impacts to wetlands and riparian ecosystems related to water loss could be reduced or avoided.

Short-Term Use versus Long-Term Productivity

This section describes the short-term effects versus long-term productivity under alternatives A and B.

Alternative A (No Action)

Wetlands and uplands are expected to continue to be lost at current, or in some areas, increasing rates of development, which would create long-term negative implications for the maintenance of the biological and ecological communities now found in the watershed. Although efforts to conserve these habitats would continue through ongoing efforts by existing agencies and organizations as well as funding, the ability to conserve large tracts of wetlands and uplands would be diminished and fragmentation of these habitats would continue.

Ranches and agricultural lands could be sold to developers for short-term gains, but the expected rates of development would have an adverse effect on the long-term biological and agricultural productivity of the area.

Over the long term, the costs to counties to sustain development in rural areas could be significant (see the "Landownership and Land Use" section above). Wind energy and oil and gas development would provide short-term income gains, but would have a long-term adverse impact on the wildlife habitats in the Bear River watershed and region.

Alternative B (Proposed Action)

The increased ability to acquire perpetual conservation easements under the proposed action would conserve important wetland and upland areas and reduce long-term loss and fragmentation of important habitats that a variety of wildlife species, including threatened and endangered species, depend on.

The proposed conservation easement program would maintain the Bear River watershed's long-term biological productivity, biological diversity, and habitat connectivity as well as migration corridors to other ecosystems and adjacent large blocks of protected lands.

The ability to sell conservation easements would provide an immediate economic benefit to participating landowners while maintaining the long-term agricultural heritage and productivity of the area.

The nation would gain the protection of these habitat types for the wildlife species that depend on them for future generations of Americans. The public

would retain long-term opportunities for wildlife-dependent recreational activities.

Cumulative Impacts

Cumulative impacts are defined by the National Environmental Policy Act as the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 Code of Federal Regulations [CFR] § 1508.7).

This section describes the cumulative impacts on the environment that could result from the combination of reasonably foreseeable actions under alternatives A and B, with other biological and socioeconomic conditions, actions, events, and developments.

Past Actions

Previous land protection efforts within the Bear River watershed included the establishment of the three national wildlife refuges—Bear Lake National Wildlife Refuge (18,089 acres), Bear River Migratory Bird Refuge (74,421 acres), and Cokeville Meadows National Wildlife Refuge (9,259 acres)—the Thomas Fork Unit of Bear Lake National Wildlife Refuge (1,015 acres), and Oxford Slough Waterfowl Production Area (1,878 acres). Sagebrush Steppe Regional Land Trust, Wyoming Land Trust, and the Wyoming Stock Growers Agricultural Land Trust have worked with a variety of partners to acquire conservation easements in the watershed.

Present Actions

The Service's proposed Bear River Watershed Conservation Area easement program, which would establish up to 920,000 acres of conservation easements in the Bear River watershed, is the only known action of this scope and scale for land protection in the region. Once approved, it would take several years for the program to begin to have a noticeable effect. Acquisition of easements would depend on available funding and willing sellers.

Reasonably Foreseeable Future Actions

Reasonably foreseeable actions are actions and activities that are independent of the proposed action but could result in cumulative or additive effects when combined with the proposed action. These actions are anticipated to occur regardless of which alternative is selected. Commercial oil and gas, mining, wind, and residential development; increased water demands; and future conservation efforts by a variety of organizations are the primary reasonably foreseeable actions occurring in the Bear River watershed.

Development

Overall, mining represents a relatively small percentage of total employment for many of the counties in the region, but has increased slightly since 1998 (U.S. Census Bureau 2011, Headwaters Economics 2011). In particular, employment in nonmetallic mineral mining increased by 124 percent, oil and gas extraction decreased by 64 percent, and metal ore mining decreased to zero by 2009 (U.S. Census Bureau 2011, Headwaters Economics 2011). One of the most economically significant nonmetallic mining activities during the past 50 years has been phosphate extraction, with roughly 40 percent of the United States' reserves located in southeastern Idaho (van Every 2004).

The acreage that has potential for wind energy development is relatively low in Idaho and Utah, with 1.67 percent and 1.19 percent of the State available for such development, respectively. Wyoming has a higher development potential at 43.58 percent (National Renewable Energy Laboratory 2011). Most of the land with potential for wind energy development would still be available under the proposed action.

Population growth is expected throughout much of the region, with most of the growth centered on the Cache Valley. Located in the western part of the Bear River watershed in Utah, the Cache Valley is the most populated area in the watershed. It has experienced a population increase of 64 percent since 2000, and it is anticipated to double in population by 2050 (Utah Division of Water Resources 2004).

Lincoln County, home to the Cokeville Meadows National Wildlife Refuge, has grown by 24 percent since 2000, making it the fastest growing county among the Wyoming counties in the proposed conservation area.

Bannock County has the largest population of the Idaho counties located within the watershed; it has grown by 10 percent since 2000. The populations of two other Idaho counties, Caribou County and Bear Lake County, have decreased by 5 percent and 7 percent, respectively.

Development—Alternative A (No Action). The incremental increases in infrastructure construction resulting from commercial and residential

development activities in the Bear River watershed would likely result in the fragmentation of wetland, riparian, grassland, and shrubland habitats now used by wildlife. Over the long term, the combined effect of these activities would likely result in the continuation, and possibly the acceleration, of the decline of many wildlife populations.

Development—Alternative B (Proposed Action). The proposed action would provide more long-term protection on up to 920,000 acres of wildlife habitat from the combined effects of various future development activities by precluding surface occupancy and the resultant habitat fragmentation and infrastructure.

Other Conservation Efforts

The USDA's Conservation, Grassland, and Wetland Reserve Programs provide ongoing programs in the watershed. Additionally, many nongovernmental organizations are active in the area, including Bridgerland Audubon, The Nature Conservancy, Ducks Unlimited, Trout Unlimited, and Wyoming Stock Growers Agricultural Land Trust. These organizations are expected to continue offering multiple programs to landowners. The proposed action would augment these current conservation efforts by collaborating with landowners to protect wildlife, fisheries, and working agricultural lands. The Service would continue to work with other agencies, organizations, and individuals to ensure conservation of migratory birds, threatened and endangered species, and species of special concern.

The Service's Partners for Fish and Wildlife program would likely continue to help landowners in the watershed under either alternative. With the proposed action, this program could increase its efforts in the watershed because of the increased Service interaction with local landowners and the added benefit of habitat restoration and enhancement on lands protected by perpetual conservation easements.

The conservation efforts of these groups would result in generally beneficial cumulative effect for the wildlife resources of the watershed.

Conservation Efforts—Alternative A (No Action). Current Service programs such as Partners for Fish and Wildlife would continue within the proposed conservation project area. The Service would continue to work cooperatively with landowners to voluntarily improve habitat on private land. Those landowners wishing to sell easements on their lands would have fewer options for selling them.

Conservation Efforts—Alternative B (Proposed Action). Through the proposed easement program, up to 920,000 acres of privately owned wetland, riparian, grassland, and shrubland habitats could be added to the 2.53 million acres within the proposed project area that already have some level of protection. This would have long-term positive impacts on wildlife habitat and would result in the long-term conservation of migratory birds, threatened and endangered species, resident wildlife species, native plants, and the overall biological diversity of the proposed Bear River Watershed Conservation Area.

Draft EA Chapter 5—Coordination and Environmental Review

USFWS

Canada geese in flight near Bear Lake National Wildlife Refuge, Idaho.

The Service has discussed the proposal to establish the Bear River Watershed Conservation Area with landowners; conservation organizations; other Federal agencies; tribal, State, and local governments; and other interested groups and individuals.

Agency Coordination

The Service has coordinated within the agency as well as with each of the three State wildlife agencies in developing this EA. Field and regional Service staffs conducted the analysis and prepared the documentation (refer to "Appendix A, List of Preparers and Reviewers"). The Service held six public open-house meetings throughout the proposed project area to provide information and to discuss the proposal with landowners and other interested citizens.

At the Federal level, Service staff briefed Senators Labrador, Simpson, Hatch, Lee, Enzi, and Barrasso and the congressional delegations for Representatives Simpson, Labrador, Bishop, and Lummis. Representatives from the USDA Forest Service, NRCS, and the Bureau of Land Management were also contacted and provided with project information. At the State level, Governors Otter, Herbert, and Mead; Idaho Department of Fish and Game; Utah Division of Wildlife Resources; Utah State Forestry; Utah Sovereign Lands; and the Wyoming Game and Fish Department were also briefed on the proposed project. Information on the proposed project was provided for 15 tribes with interest in the proposed project area.

Representatives from local soil and water conservation districts, farm bureaus, universities, counties, and towns were also provided with project information.

The Service has coordinated with many nongovernmental groups that are essential to the success of the proposed conservation project, including The Nature Conservancy, Trout Unlimited, Bridgerland

Audubon, Sagebrush Steppe Regional Land Trust, and Wyoming Stock Growers Agricultural Land Trust.

Contaminants and Hazardous Materials

A level I pre-acquisition site assessment would be conducted on individual tracts before purchase of any land interests. Qualified Service staff in Idaho, Utah, and Wyoming would make sure that policies and guidelines are followed before acquisition of any conservation easements.

National Environmental Policy Act

The Service conducted this environmental analysis under the authority of and in compliance with the National Environmental Policy Act, which requires an evaluation of reasonable alternatives that meet stated objectives and an assessment of the possible effects on the human environment.

Environmental Assessment

This EA will be the basis for determining whether implementation of the proposed action would constitute a major Federal action significantly affecting the quality of the human environment. National Environmental Policy Act planning for this EA involved other government agencies and the public in the identification of issues and alternatives for the proposed project.

Distribution and Availability

The Service is distributing this EA (with the associated draft LPP in the same volume) to the project mailing list, which includes Federal and State legislative delegations, tribes, agencies, landowners, private groups, and other interested individuals. After they have been released for public review, the Service will hold public meetings to talk about the EA and draft LPP.

Copies of the EA and information about public meetings are available by visiting the project Web site or by contacting the Service by email, postal mail, telephone, or in person.

Project Web site: www.fws.gov/mountain-prairie/planning/lpp/ut/brr/brr.html

Project email: brwca_comments@fws.gov

Service Unit Contacts

Amy Thornburg, Planning Team Leader
Attn: Proposed Bear River Watershed Conservation Area
U.S. Fish and Wildlife Service, Region 6
Division of Refuge Planning
134 Union Boulevard
Lakewood, Colorado 80228
303 / 236 4345

U.S. Fish and Wildlife Service, Region 1
Division of Refuge Planning
911 NE 11th Avenue
Portland, Oregon 97232–4181
503 / 872 2897

U.S. Fish and Wildlife Service, Region 1
Bear Lake National Wildlife Refuge
P.O. Box 9
Montpelier, Idaho 83254
208 / 847 1757

U.S. Fish and Wildlife Service, Region 6
Bear River Migratory Bird Refuge
2155 West Forest Street
Brigham City, Utah 84302
435 / 734 6451

U.S. Fish and Wildlife Service, Region 6
Cokeville Meadows National Wildlife Refuge
P.O. Box 700
Green River, Wyoming 82935
307 / 875 2187

Strategic Habitat Conservation

The proposed Bear River Watershed Conservation Area project is a landscape-scale effort to conserve populations of priority species in a highly diverse and endangered ecosystem over the approximately 4.8 million-acre project area. Therefore, it is important to incorporate the elements of strategic habitat conservation to ensure effective conservation. Strategic habitat conservation uses an ongoing cycle of strategic biological planning and conservation

design, integrated conservation delivery, monitoring, and research at ecoregional scales (see figure EA–9).

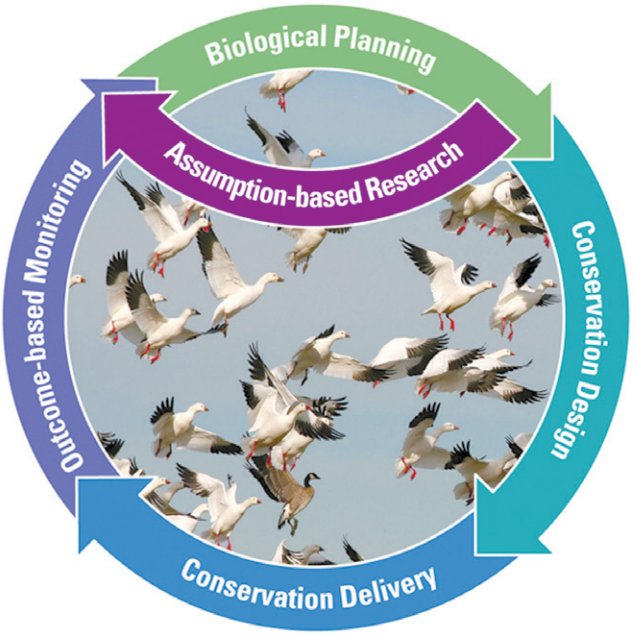


Figure EA–9. Elements of strategic habitat conservation.

Biological Planning

Biological planning requires the identification of priority species, development of population objectives, and identification of landscape-level limiting factors that are keeping the populations of priority trust species below desired levels.

The need and opportunity for strategic conservation to benefit fish and wildlife in the Bear River watershed is articulated in the following regional plans reviewed by the planning team:

- "Conservation Action Plan (CAP) for the Bear River Watershed"
- State Wildlife Action Plans for Idaho, Utah, and Wyoming
- "Intermountain West Regional Shorebird Plan"
- "Intermountain West Waterbird Conservation Plan"
- "Partners In Flight"
- "Audubon Society Globally Important Bird Areas"
- "National Fish Habitat Action Plan 2006"
- "North American Waterfowl Management Plan"
- "U.S. Shorebird Conservation Plan"

Based on these plans and input from local stakeholders and partners, initial biological planning uses four focal species, acting as surrogates for others, to model the distribution and habitat needs of a larger group of wildlife species with similar needs. This information will also be used to set priorities for Service conservation efforts within the proposed project area.

Focal Species

Bonneville cutthroat trout was used to represent the habitat needs of other native fish species found in the Bear River watershed including northern leatherside chub, mountain whitefish, mottled and Paiute sculpin, longnose and speckled dace, redside shiner, and Utah and mountain suckers. Once thought to be extinct because of habitat loss and overharvesting, Bonneville cutthroat trout were rediscovered in recent decades, with relatively pure populations continuing to persist along the periphery of the Bonneville basin in Utah, Idaho, Wyoming, and Nevada. The Bear River basin supports the largest remaining migratory populations, including both fluvial (living in rivers or streams) and adfluvial (living in lakes and migrating to rivers or streams) forms, while other metapopulations and strongholds also occur in the Northern Bonneville basin (Haak et al. 2011). Declines in populations of native salmonids, including Bonneville cutthroat trout, can result from the combined effects of habitat degradation and fragmentation, blocked migration corridors, degraded water quality or quantity, angler harvesting and poaching, entrainment into diversion canals and dams, nonnative species interactions, and other factors (USFWS 2002).

The *greater sage-grouse* and the *sage thrasher* act as surrogates for sagebrush-dependent trust species. Sagebrush ecosystems are among the most imperiled in North America because of a variety of human-caused disturbances. Sagebrush habitat has been altered and fragmented, resulting in the decline in both the numbers and the distribution of many of the more than 350 species that depend on sagebrush habitat for all or part of their life cycles (Wisdom et al. 2005.) In particular, such habitat shifts have major implications for sagebrush-dependent vertebrates including bird species such as sage thrasher, greater sage-grouse, and sage sparrow (Knick et al. 2003). Keeping large areas of intact sagebrush is considered crucial for the long-term persistence of sage-grouse (Aldridge et al. 2008) as well as other sagebrush-dependent species. Based on this finding, it has been recommended that conservation efforts begin by keeping large expanses of sagebrush habitat and enhancing the quality and connectivity of those areas.

American avocet was used to represent a larger group of wetland-dependent species including the white-faced ibis. Breeding Bird Surveys have shown the population trend for American avocets in the Basin and Range physiographic region to be declining at a rate of approximately 18 percent per year from 1966 (Sauer et al. 2005). Habitat destruction and fragmentation of wetlands and marshes also limits the population of many waterbirds and waterfowl as they eliminate nesting, brood, and foraging habitats. The proximity and quality of these various habitat types particularly affect the survival rates of young birds.

Besides the importance of breeding habitat, the quality and availability of spring migration habitat has direct implications for the survival and breeding productivity of the millions of migratory birds passing through the Bear River watershed each year.

Conservation Design

Conceptual and quantitative models have been developed to help in predicting key habitats now used by the highest density of four focal species populations, and to aid in initial conservation design and delivery efforts.

Priority species, along with associated population goals, would continually be defined and updated throughout the implementation of this proposed project, and additional landscape models would be developed for priority trust species.

Most wildlife species require more than one type of habitat during their life history. The wetland, riparian, grassland, and shrubland habitats found in the Bear River watershed allow multiple groups of species to meet their needs.

The connectivity between the three national wildlife refuges, waterfowl production area, and other large areas of protected lands keeps migration corridors for migratory and resident wildlife species. The connectivity within the Bear River watershed as well as to other ecosystems such as the Greater Yellowstone increases the resiliency of the region.

Habitat and Population Evaluation Team (HAPET) biologists assessed land cover data in a Geographic Information System (GIS) to set priorities for different areas of the watershed for acquisition of conservation easements, resulting in spatially explicit decision support tools. An existing landscape prioritization tool for the greater sage-grouse, which identified rangewide breeding densities (Doherty et al. 2010), was coupled with the decision support tool for sage thrasher and American avocet to provide land managers in the Bear River watershed the best available information on landscape values for the four focal species.

To assess Bonneville cutthroat trout populations, the Service used models prepared by Trout Unlimited that evaluated species densities and genetic purity in Bear River watershed streams.

The Service used a Marxan model to incorporate the HAPET models for sage thrasher, greater sage-grouse, and American avocet along with the Bonneville cutthroat trout model based on data provided by Trout Unlimited. In addition, Marxan modeling was used to incorporate crucial wetland and riparian habitat depended on by a wide variety of migratory bird species including white-faced ibis, yellow warbler, flycatchers, yellow-billed cuckoo, for which there is insufficient data available to develop other types of models based on bird densities and abundance. The modeling allowed a "bottom-up" approach to be used to generate an alternate method of predicting likely areas of habitat use by migratory birds. One of the key results from Marxan is the "selection frequency" of a given spatial planning unit. A spatial planning unit that has a high selection frequency shows that it must be protected to meet conservation goals, based on input criteria. In other words, it is irreplaceable; conservation goals cannot be met in an efficient manner without protecting these areas. The four conservation ranks are described below:

- *High Conservation Rank*: High irreplaceability across all goal levels, higher ecological integrity, and multiple conservation targets present.
- *Medium Conservation Rank*: Moderate irreplaceability across all goal levels, lower ecological integrity, and fewer conservation targets than high priority.
- *Low Conservation Rank*: Not irreplaceable across all goal levels, lower ecological integrity, and one conservation target present.
- *No Conservation Rank*: Not selected with the data that is now available.

Chapter 4 of the LPP describes the detailed process for determining conservation priority areas.

Integrated Conservation Delivery

Over the years, the staffs from the three national wildlife refuges have worked with a wide variety of agencies, nongovernmental organizations, and private landowners on wildlife conservation issues and

opportunities. Partners for Fish and Wildlife biologists have worked with landowners on habitat restoration projects and partnerships that provide the foundation for a successful easement program. The ongoing involvement of the Partners for Fish and Wildlife program, landscape conservation cooperatives, and many partner organizations and agencies would be essential for the effective delivery of sustainable conservation program. Application of the strategic habitat conservation framework would build on existing partnerships and support the development of new partnerships for conservation throughout the region. The spatially explicit decision-support tools being developed would allow for greater flexibility, increased responsiveness, and improved efficiency in meeting Service and partner needs for conservation delivery.

Wetland and upland conservation easements are essential tools for protecting important wildlife habitat on a landscape scale. The detailed LPP developed in conjunction with this EA provides the information necessary to carry out the conservation action of acquiring conservation easements on the "best of the best" habitat for priority species. As understanding of the functional relationships between priority species and habitats increases, the Service would adapt the strategies used to target acquisition of the highest priority habitat for meeting the population objectives of priority species.

Monitoring and Research

Although the importance of the Bear River watershed for migratory birds is widely recognized, there are gaps in our knowledge about the area's resources. More Breeding Bird Survey routes, completion of the National Wetlands Inventory database, and incorporating research and information from the large number of conservation agencies and organizations in the region would help to assess conservation needs and priorities in the region. The Service would work with the Great Basin, Great Northern, and Southern Rockies Landscape Conservation Cooperatives and many partners to develop and refine predictive population models. The results of Breeding Bird Surveys; the annual monitoring the Service conducts on waterfowl, breeding shorebirds, other waterbirds, grassland birds, and raptors on the three national wildlife refuges; and other appropriate regional, State, and local surveys would be used to assess the effectiveness of the conservation easement program.

Research and monitoring emphasis would be placed on the highest priority species that have the greatest degree of uncertainty about limiting factors and the effectiveness of management actions at minimizing and reducing limiting factors. Data from existing surveys such as the Breeding Bird Survey would be evaluated and incorporated into spatial models. When necessary, more data would be collected to evaluate the assumptions used in the modeling process and assessments would be adjusted accordingly. These methods would provide an estimate of the population response of trust species on easement lands and on noneasement properties.

Evaluation of the assumptions and uncertainties identified through the biological planning, conservation design, and conservation delivery elements would be addressed in cooperation with partners such as nongovernmental organizations and universities.

The contributions of conservation easements and other management actions toward meeting population goals for priority trust species would be evaluated using spatially explicit models that allow for estimation of population size on conservation easements and other land parcels of interest. Such models would allow the Service and its conservation partners to evaluate the contribution of the program to meeting population goals and to refine conservation delivery to ensure greatest efficiency. Spatially explicit models would also enable the Service to show the contribution of the proposed Bear River Watershed Conservation Area to national and continental population goals for priority species.

Landscape Conservation Cooperatives

The proposed Bear River Watershed Conservation Area covers three landscape conservation cooperatives (Great Basin, Great Northern, and Southern Rockies) that cover parts of 11 western States and Canada (see figure EA–3). The landscape conservation cooperatives involve many partners and function at a scale necessary to address wildlife adaptation in response to climate change. In carrying out conservation actions through the proposed conservation area, the Service would use the efforts of the landscape conservation cooperatives to refine priority acquisitions and to address current and future issues and opportunities related to landscape-scale conservation in a rapidly changing world.

The Service would work with the three landscape conservation cooperatives as a means of conducting strategic habitat conservation to deal with a range of resource threats, such as development, invasive species, and water scarcity.

Draft Land Protection Plan

Draft Vision Statement

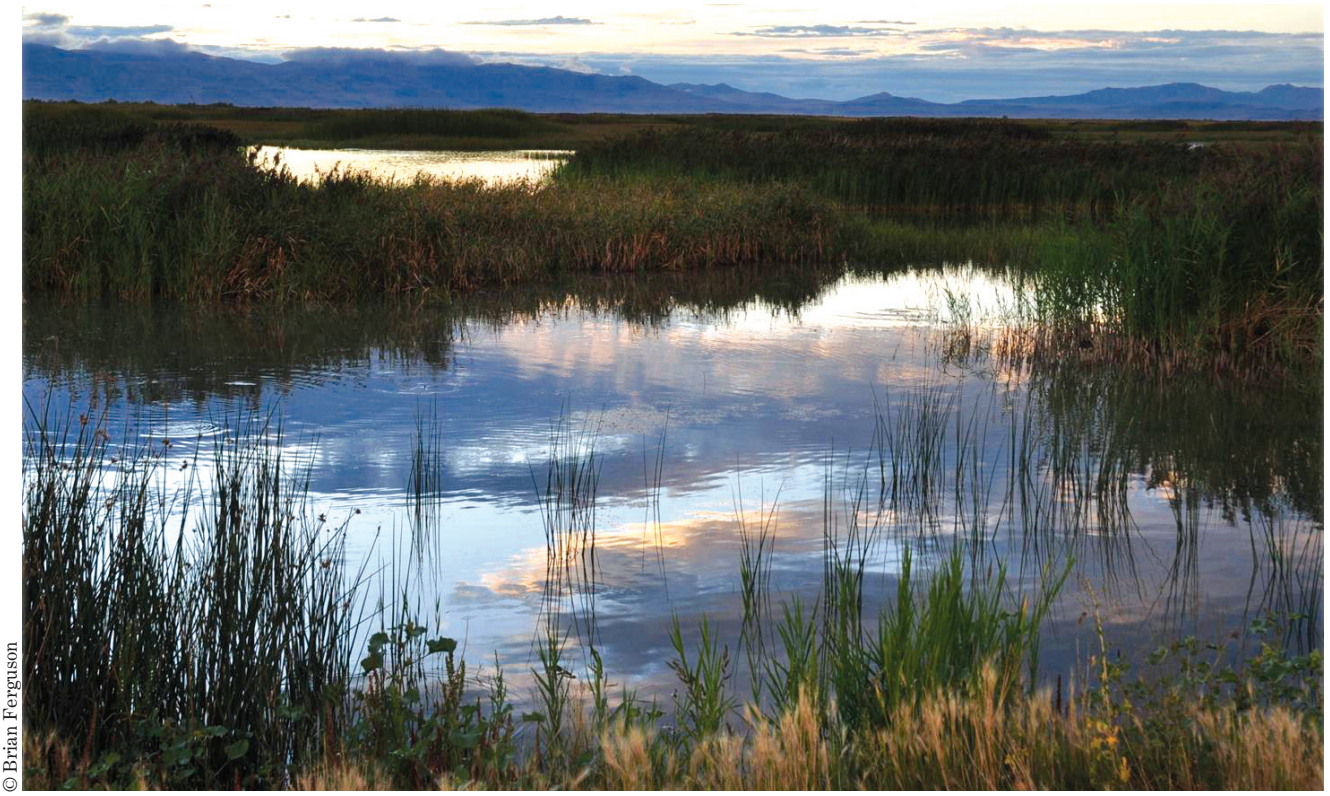
Landscape-scale protection of the natural resources found within the Bear River watershed is essential to humans and wildlife. The Bear River Watershed Conservation Area project preserves, protects, and restores the natural resources and working landscapes within the drainage.

Through cooperative efforts with ranchers, farmers, local communities, land management agencies, and other conservation organizations, the United States Fish and Wildlife Service builds a community of citizens dedicated to protection of wildlife habitat, maintenance of healthy communities, enhancement of water quality, promotion of sustainable agriculture, and recognition of good stewardship.

The legacy of this effort is the tapestry of snow-covered mountains, deciduous and conifer forest, vast areas of sagebrush and wetlands, and working farms and ranches that decorate the landscape of the Bear River Watershed. This expansive landscape supports a multitude of diverse wildlife species including migratory birds, sage-grouse, elk, black bear, pronghorn, mule deer, Bonneville cutthroat trout, and other native species.

Implementation of a landscape-scale collaborative effort within the Bear River Watershed Conservation Area conserves the significant wildlife, aesthetic, and cultural values of this region in perpetuity.

Draft Land Protection Plan (LPP) Chapter 1—Introduction and Project Description



Bear River Marsh, Utah

Introduction

The draft EA completed by the Service during the planning process considered several alternatives, with two alternatives being selected for further analysis. Alternative A, called the no-action alternative, considered the consequences of not doing anything beyond current actions in the Bear River watershed. Alternative B considers the positive and negative consequences of purchasing conservation easements and establishing the Bear River Watershed Conservation Area (see figure LPP–1 for a map of the proposed project area).

Project Description

Before Euro-American settlement, the Bear River delta was a vast natural marsh that provided wetland habitat for waterfowl in the arid Great Basin region. When John C. Fremont, an early explorer in the West, visited the area near the present day Bear River Refuge in 1843, he commented, "the waterfowl made a noise like thunder… as the whole scene was animated with waterfowl."

The Bear River travels a 500-mile course from its headwaters in Utah's Uinta Mountains through Wyoming and Idaho, eventually terminating its horseshoe-shaped route in Utah's Great Salt Lake, the largest inland sea in the Western Hemisphere (see figure LPP–1). The forested areas at the headwaters are part of a crucial wildlife migration corridor. These forested areas offer a major link between the Northern and Southern Rocky Mountain ecosystems (Theobald et al. 2011, USDA Forest Service 2003). The small, pristine mountain streams found in the area provide ideal breeding habitat for important native species, such as the Bonneville cutthroat trout and northern leatherside chub. Elk, black bear, grizzly bear, Canada lynx, wolverine, gray wolf, pika, and marmots inhabit

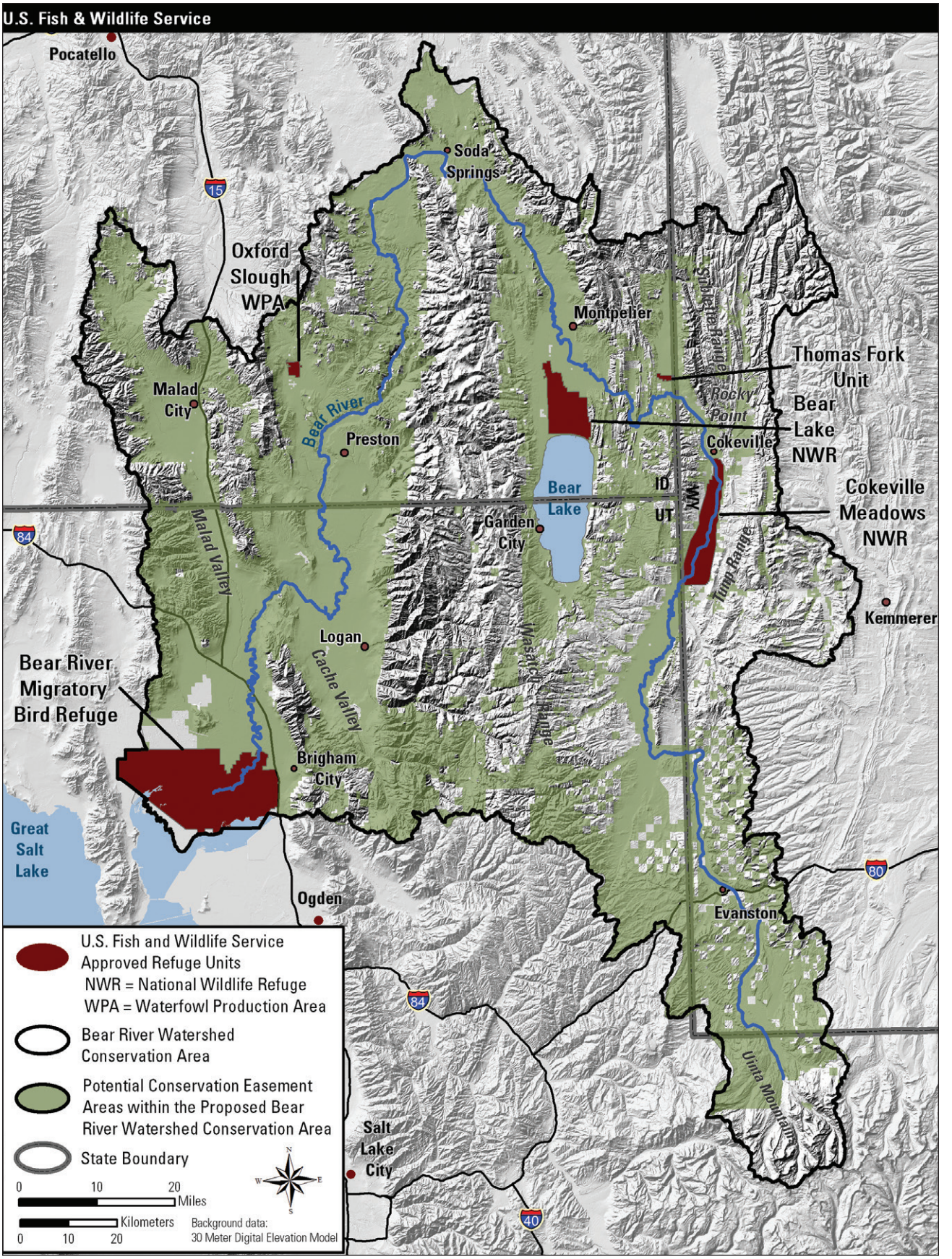


Figure LPP–1. Map of the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

the high-elevation forest and snow-covered mountain slopes found in the watershed. The montane shrubland, sage grassland, and pastureland provide good habitat for greater sage-grouse, Columbian sharp-tailed grouse, bald eagle, mule deer, elk, pronghorn, rabbit, bobcat, black bear, and various hawks.

Wetlands and riparian areas in the lower elevations provide some of the most important resting, staging, feeding, breeding, and nesting areas for migratory birds in the Pacific and central flyways (Downard 2010). More than 46 percent of the white-faced ibis, 24 percent of the marbled godwits, and 18 percent of the black-necked stilts in North America use the wetland habitat found within the watershed. More than 270 different species are associated with the habitats supported by the Cokeville Meadows National Wildlife Refuge, Bear Lake National Wildlife Refuge, Bear River Migratory Bird Refuge, Oxford Slough Waterfowl Production Area, and adjacent lands located within the Bear River watershed.

The Bear River watershed is essential to the survival of the Bonneville cutthroat trout as well as millions of birds and other wildlife.

Although it provides many functions both for wildlife and for people along its route, the river is heavily affected by land use along its course. Land use in the watershed affects wildlife habitat and the amount and quality of available water. Agricultural lands provide habitat for wildlife, but in some areas are rapidly being converted to residential developments. Some counties in the watershed are expected to double in population over the next 30 years (Utah Division of Water Resources 2004). Based on its job growth rate and low unemployment rate, Logan, Utah, in the Cache Valley, was deemed the best-performing small city in the United States in 2011 (DeVol et al. 2011). The collaborative efforts of conservation partners in the Bear River watershed would be crucial to preserving this working landscape that is such an important resource for people and wildlife.

The proposed Bear River Watershed Conservation Area is located in southeast Idaho, southwest Wyoming, and northeastern Utah. The proposed conservation area would contain parts of 12 counties: Bannock, Bear Lake, Caribou, Franklin, Oneida, and Power in Idaho; Box Elder, Cache, Rich, and Summit in Utah; and Lincoln and Uinta in Wyoming.

Issues Identified and Selected for Analysis

Six public scoping meetings were held in Idaho, Utah, and Wyoming in May 2011. Public comments were taken in Cokeville and Evanston, Wyoming; Brigham City and Logan, Utah; and Preston and Montpelier, Idaho, to identify issues to be analyzed for the proposed action. Approximately 130 landowners, members of various organizations, and elected representatives attended the meetings. Additionally, 10 letters providing comments were received by mail or email. A total of 327 comments and questions were received on the project proposal.

Refuge staff contacted tribal, Federal, State, and local officials, as well as conservation groups that expressed an interest in the future of the Bear River watershed. Not only were fact sheets describing the proposed project made available on the refuges' Web sites, but approximately 675 fact sheets on the proposed project were distributed to interested members of the public.

The main categories of comments, issues, and questions expressed at meetings or received by mail follow.

Biological Issues

- Importance of wildlife and wildlife habitat in the watershed.
- Questions about the types of habitat and lands that would be included in the proposed project.
- Ecosystem importance of the watershed (connectivity and habitat types represented).
- Importance of protecting water resources.
- Water quality and quantity issues in the watershed.
- Impacts of dams and diversions.
- Climate change impacts on the region.
- Development (residential, oil and gas, mineral, and recreational), which was perceived as the biggest threat to the long-term health and stability of the Bear River landscape, culture, and wildlife resources.
- Perceived mismanagement of lands and inappropriate stewardship (grazing and agricultural practices) in the watershed.
- Invasive species in the watershed.
- Fragmentation of habitat.

Socioeconomic Issues

- Funding sources and matching contributions.

- Tax implication of easements.
- Economic impacts of easements.
- Financial implications of easements.
- Quantity and location of land needed for the proposed Bear River Watershed Conservation Area project.
- Agricultural values of the Bear River.
- Aesthetics (open space and scenery).
- Importance of recreational opportunities.
- Availability of recreational opportunities in the watershed.
- Economic importance of the watershed (agriculture and power generation).

Administrative and Enforcement Issues for Easements

- Potential easement restrictions and language.
- Responsibilities and limitations on management practices of an easement.
- Current and future land uses and encumbrances (oil and gas leases, mining, and rights-of-way).
- Perpetual nature of Service easements.
- Comments and questions about enforcement of easements.
- Importance of monitoring conservation easement parcels.
- Possibility of easements increasing wildlife depredation, especially by sandhill cranes.
- Comparable easement programs that are available with other agencies and organizations.
- Easement financial and funding implications.
- Service appraisal process.
- Easement valuation determination.

Other Issues

- Conservation partnerships and coordination.
- Organizations and other agencies that the Service would be working with.
- Interest expressed in selling a conservation easement to the Service.
- Questions on timelines, public input opportunities, and availability of data and GIS information.
- Comments on the need for planning various watershed uses and future development.
- General concern.
- General support.
- Interest in easements.

National Wildlife Refuge System and Authorities

The mission of the Refuge System is "to preserve a national network of lands and waters for the conservation, management, and, where proper, restoration of fish, wildlife, and plant resources and their habitats within the United States for the benefit of present and future generations of Americans." The proposed conservation area project would be monitored as part of the refuge system in accordance with the National Wildlife Refuge System Administration Act of 1966 and other relevant legislation, Executive orders, regulations, and policies.

Conservation of more wildlife habitat in the Bear River region would also continue, consistent with the following policies and management plans:

- Migratory Bird Treaty Act (1918)
- Migratory Bird Hunting and Conservation Stamp Act (1934)
- Bald and Golden Eagle Protection Act (1940)
- Fish and Wildlife Act (1956)
- Land and Water Conservation Fund Act (1965)
- Endangered Species Act (1973)
- "North American Waterfowl Management Plan" (1994)
- "Migratory Non-game Birds of Management Concern in the U.S." (2002)

Related Actions and Activities

Private landowners have worked with many organizations including the Service's Partners in Fish and Wildlife program, The Nature Conservancy, State agencies, and county weed districts, to complete conservation easements and control invasive plants such as tamarisk, phragmites, Russian olive, carp, and quagga and zebra mussels.

Bridgerland Audubon Society has worked with The Nature Conservancy and PacifiCorp to establish conservation easements on 500 acres of key riparian land along the Bear River in Cache County.

Coordinated Resource Management committees in Box Elder and Rich Counties consist of State and Federal agency staff, representatives from local government, nonprofit organizations, academic institutions, private industry, and private individuals. Coordinated Resource Management works to provide rich, healthy ecosystems; sustainable agriculture industry and wildlife populations; and diverse recreational opportunities and vibrant rural communities.

Sagebrush Steppe Regional Land Trust was founded in 2003. It has completed 15 projects in southeast Idaho that provide protection on 2,260 acres of natural and working lands to benefit Bonneville cutthroat trout and other wildlife species.

The Nature Conservancy bought a 6,700-acre conservation easement to protect habitat for the Columbian sharp-tailed grouse and other wildlife species. The organization is developing a comprehensive plan to provide early detection and rapid response for the control of invasive weeds in Cache County. The Nature Conservancy has also been involved with mapping important wetland areas throughout the watershed.

Trout Unlimited has 12 projects underway in the watershed to reconnect essential spawning tributaries in each of the five major sections of the Bear River. Trout Unlimited and project partners find movement barriers and retrofit the structures with fish ladders and screens to allow upstream passage around dams and prevent downstream loss of fish in irrigation canals. Trout Unlimited also works to improve aquatic and riparian habitats in the reconnected tributaries and in the main stem Bear River.

Utah Partners for Conservation and Development is a sponsor of the Utah Watershed Restoration Initiative, a partnership-driven effort to conserve, restore, and manage ecosystems in priority areas across the State to enhance Utah's wildlife and biological diversity, water quality and yield for all uses, and opportunities for sustainable uses. In 2010, the watershed restoration initiative was involved in 26 projects comprising 19,336 acres in the Northern Region, which includes the Bear River watershed (Utah Division of Wildlife Resources 2010).

Wyoming Stock Growers Agricultural Land Trust holds 62 conservation easements on more than 170,000 acres of ranchland throughout the State. By working with landowners to conserve working ranches, the crucial wildlife winter ranges and travel corridors that are commonly found in the most agriculturally productive locations along valleys and waterways are also protected.

Wyoming Land Trust holds conservation easements on 30,234 acres of working ranchland, wildlife habitats, and scenic areas in Wyoming.

U.S. Department of Agriculture

The *Conservation Reserve Program* is administered by the Farm Service Agency and provides technical and financial help to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The statewide acreage of Conservation Reserve Program–enrolled land is 668,643 acres in Idaho, 163,082 acres in Utah, and 226,044 acres in Wyoming (USDA Farm Service Agency 2007).

The *Farm and Ranch Land Protection Program* provides matching funds to help buy development rights to keep productive farm and ranchland in agricultural uses. The Farm and Ranch Land Protection Program works through existing programs. The USDA collaborates with State, tribal, or local governments and nongovernmental organizations to acquire conservation easements or other interests in land from landowners. Currently, 3,450 acres in Idaho, 898 acres in Utah, and 101,336 acres in Wyoming are protected under this program (USDA NRCS 2010a).

The *Environmental Quality Incentives Program* is a voluntary program administered through the NRCS that provides financial and technical help to agricultural producers through contracts up to a maximum term of 10 years. These contracts provide financial assistance to help plan and carry out conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air, and related resources on agricultural land and nonindustrial private forestland. This program also helps producers to meet Federal, State, tribal, and local environmental regulations.

The *Grassland Reserve Program* is a voluntary conservation program administered through the NRCS that emphasizes support for working grazing operations, enhancement of plant and animal biodiversity, and protection of grassland under threat of conversion to other uses. Participants voluntarily

limit future development and cropping uses of their land while keeping the right to conduct common grazing practices and operations related to the production of forage and seeding, subject to certain restrictions during nesting seasons of bird species that are in significant decline or are protected under Federal or State law. A grazing management plan is required for participants. There are 9,692 acres in Idaho, 29,336 in Utah, and 24,458 acres in Wyoming enrolled in the program.

The *Wildlife Habitat Incentive Program* is a voluntary program administered by the NRCS for conservation-minded landowners who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and tribal lands.

The *Wetlands Reserve Program* was reauthorized in the Farm Security and Rural Investment Act of 2002 (Farm Bill) to provide a voluntary conservation program for farmers and ranchers that promotes agricultural production and environmental quality as compatible national goals. This program offers financial and technical assistance to help eligible participants install or implement structural and management practices on eligible agricultural land. In Idaho 892 acres, in Utah 22 acres, and in Wyoming 1,013 acres are enrolled in the Wetlands Reserve Program (USDA NRCS 2010b).

Department of the Interior

The *Partners for Fish and Wildlife* program provides cost-sharing to fund habitat enhancements, with a special emphasis placed on projects that simultaneously benefit agricultural production and wildlife habitat for Service trust species. Participation in the program is voluntary, and the details of each project are outlined in individual landowner agreements. Past examples include fence and water developments that improve livestock grazing management, irrigation diversion upgrades that allow for traditional water withdrawal and fish passage in streams, and rehabilitation of irrigation infrastructure to maintain and enhance created wetlands.

The *Utah Partners for Fish and Wildlife* program has restored or enhanced 11,915 acres of wetlands, 46,258 acres of uplands, and 64 miles of riparian or instream habitat. In Wyoming, the program has restored or enhanced 5,373 acres of wetland, 228,592 acres of upland, and 242 miles of riparian or instream habitat. More than 6,760 acres of wetland, 8,754 acres of upland, and 62 miles of riparian or instream habitat (from 2001 to 2011) have been restored or enhanced in Idaho.

Landscape conservation cooperatives are public–private partnerships that recognize that conservation challenges transcend political and jurisdictional boundaries and require an approach that is holistic, collaborative, adaptive, and grounded in science to ensure the sustainability of America's land, water, wildlife, and cultural resources.

As a collaborative, landscape conservation cooperatives seek to identify best practices, connect efforts, find gaps, and avoid duplication through improved conservation planning and design. Partner agencies and organizations coordinate with each other while working within their existing authorities and jurisdictions.

In carrying out conservation actions through the proposed Bear River Watershed Conservation Area, the Service would work with the Great Northern, Great Basin, and Southern Rockies Landscape Conservation Cooperatives (see figure LPP–2) and other partners to address current and future issues and opportunities related to landscape-scale conservation in a rapidly changing world.

Habitat Protection and Easement Acquisition Process

On approval of a project boundary, habitat protection would occur through the purchase of conservation easements. It is the long-established policy of the Service to acquire minimum interest in land needed from willing sellers to achieve habitat acquisition goals.

The acquisition authority for the proposed conservation area is the Fish and Wildlife Act of 1956 (16 U.S.C. 742 a–742j). The Federal monies used to acquire conservation easements are received from the Land and Water Conservation Fund, which is derived primarily from oil and gas leases on the Outer Continental Shelf, motorboat fuel tax revenues, and sale of surplus Federal property.

There could be more money to acquire lands, waters, or interest therein for fish and wildlife conservation purposes through congressional appropriations and donations from nonprofit organizations and other possible sources.

Conservation Easements

The Service would develop an objective review process for evaluating potential conservation easement areas submitted for consideration by willing sellers. The main considerations in acquiring an easement interest in private land are the biological significance of the area, the biological needs of wildlife

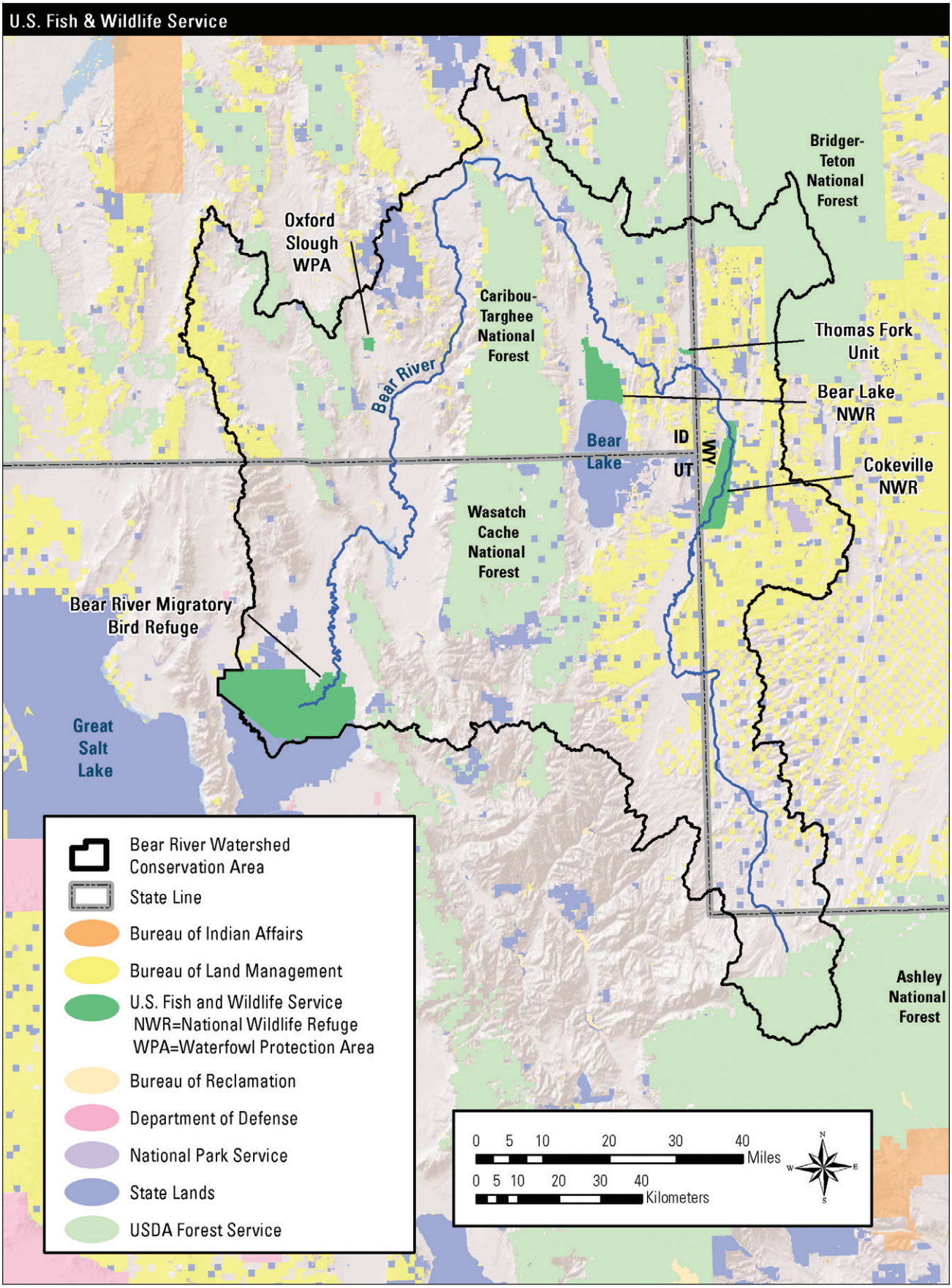


Figure LPP–2. Map of land stewardship in the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

species of management concern, existing and anticipated threats to wildlife resources, and landowner interest in the program. The purchase of conservation easements would occur with willing sellers only and would be subject to available funding.

Service conservation easements would complement current conservation efforts by other agencies and organizations in the watershed. Fee-title acquisition is not required for, nor is it preferable to, conservation easements to achieve wildlife habitat protection. Fee-title acquisition would triple or quadruple the cost of land acquisition, would add significant increases in management costs, and would not be accepted by most landowners.

Keeping the working landscapes and agricultural heritage that have sustained the variety of wildlife species in the proposed conservation area is key to ensuring long-term habitat integrity and protection of wildlife resources. Conservation easements are the only viable means of protecting wildlife values on a large scale.

Draft LPP Chapter 2—Area Description and Resources

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Yellow-headed Blackbird

Physical Environment

The physical environment comprises the geology, soils, hydrology, and climate of the Bear River watershed. In addition, climate change is discussed.

Geology and Soils

The Bear River basin encompasses two physiographic provinces: The Basin and Range Province and the Middle Rocky Mountain Province of the Rocky Mountain Section (Dion 1969). The Basin and Range Province is noted for many north–south oriented, fault-tilted mountain ranges separated by intervening broad, sediment-filled basins. Approximately the western one-third of the watershed lies within the Basin and Range Province, which began forming when the previously deformed Precambrian (over 570 million years old) and Paleozoic (570–240 million years old) rocks were slowly uplifted and broken into huge fault blocks by extensional stresses that still continue to stretch the earth's crust (Milligan 2000).

Sediments shed from the ranges are slowly filling the intervening wide, flat basins. Many of the basins have been further modified by shorelines and sediments of lakes that intermittently cover the valley floors. The most notable of these was Lake Bonneville, which reached its deepest level about 15,000 years ago when it flooded basins across western Utah (Milligan 2000).

The Middle Rocky Mountains Province, which encompasses approximately the eastern two-thirds of the basin, consists of mountainous terrain, stream valleys, and alluvial basins. The Utah part of this province has two major mountain ranges, the north–south trending Wasatch and east–west trending

Uinta Mountains. Both ranges have cores of old Precambrian rocks, some more than 2.6 billion years old (Milligan 2000). This Precambrian bedrock became exposed during the Pleistocene by glacial activity that created smooth bowls that collect and funnel water down the Bear River (Denton 2007).

The Bear River Range, located in the central part of the Bear River watershed, is aligned north to south and divides the eastern Mesozoic and western Cenozoic zones. From the Uinta Mountains in the eastern part of the watershed, the Bear River flows northward along the edge of a Mesozoic region, characterized by rock structures that have little ability to absorb water. The western part of the watershed is comprised primarily of Paleozoic rock in the mountains and Cenozoic rock in the valleys. The valleys here contain alluvial and glacial deposits that are absorptive and lend well to agricultural use (Haws and Hughes 1973). The Bear River range is an important catch basin for precipitation.

The watershed contains multiple mountain ranges including the Wasatch Front to the west, the Bear River Divide (Crawford) and Tunp Ranges to the east, and the Sublette Range to the north (see figure LPP–3). The convergence of mountain ranges at Rocky Point about 1 mile northeast of Cokeville creates a pinch-point for one of the regionally important migration corridors in the watershed. The position and alignment of the various ranges across the watershed play a central role in precipitation, climatic, hydrological, and biological patterns.

Hydrology

The Bear River is the largest tributary to the Great Salt Lake, the remnant of ancient Lake Bonneville. Lake Bonneville was a closed inland sea basin the size of Lake Michigan that once dominated the landscape in Idaho, Nevada, and Utah. Approximately 16,000 years ago, Lake Bonneville began spilling over into the Snake River drainage at Red Rock Pass, reducing the lake level by 375 feet. Over the following 8,000 years, Lake Bonneville continued to shrink because of changing climatic conditions, eventually occupying only the present day Great Salt Lake (Utah Geological Survey [no date]).

The Bear River watershed is unusual in that it is entirely enclosed by mountains, forming one arm of the Great Salt Lake basin, which has no natural drainage outlets. Three States share drainage in the 7,500 square-mile watershed: 2,700 square miles in Idaho, 3,300 square miles in Utah, and 1,500 square miles in Wyoming. Progressions of small, high-mountain streams form the headwaters of the Bear River in Utah's Uinta–Wasatch–Cache National Forest. The Uinta Mountains, a subrange of the Rocky Mountains, vary in elevation from 7,500 to 13,500 feet and are unusual in that they run in an east to west orientation. From the headwaters, the Bear River flows north and west in an arc from Utah, Wyoming, Idaho, and back into Utah. Near the city of Evanston, Wyoming, the topography flattens and land use becomes a mix of urban and agricultural uses. Here the river begins a dramatic transformation from fast-flowing, cold, and clear water in the narrow valleys to a slow-moving, cool-water, meandering course on the valley floor. Humans have altered the natural stream dynamics throughout the remaining course of the Bear River to its termination at the Great Salt Lake. Although agriculture accounts for only 7 percent of the land use in the upper watershed, it accounts for more than 80 percent of the water usage. Surface and ground water sources are used to irrigate more than 96,512 acres of hay, pasture, and cropland (Bear River Watershed Information System 2009).

Instream structures like the Chapman Canal Diversion and Woodruff Narrows Reservoir disrupt natural channel-forming flows and sediment transport, leading to streambed and bank instability downstream. After passing through Woodruff Narrows Reservoir, the valley broadens and the river travels along the Wyoming–Utah border and lends itself to irrigation and production agriculture for 30 miles before reentering Wyoming near Sage Junction. Nutrient loading (especially phosphorus, which is found at naturally high levels in surrounding soil formations), sediment from accelerated bank erosion, and dewatering are leading causes of stream degradation. Sediment and nutrient levels remain as the main water quality concerns throughout the entire Bear River watershed, and those impacts contribute to water management challenges in the refuges (Utah Division of Water Resources 2002).

As the river flows north from Evanston, the ridge and swale topography of the floodplain is characterized by a complex association of irrigated meadows, wetlands, and grass uplands that support one of the highest densities of migrating and nesting waterfowl in Wyoming. Centered along a 20-mile stretch of the Bear River and its associated wetlands and uplands, Cokeville Meadows National Wildlife Refuge was established in 1992 to protect this important habitat.

After leaving Cokeville, the Bear River crosses into Idaho near the community of Border, where the flow is greatly increased by inflow from the Smith's Fork River, which originates in the Bridger–Teton National Forest and has a relatively intact watershed and native fish assemblages (Wyoming Game and Fish Department 2010).

As the Bear River passes into Idaho, PacifiCorp diverts water at Stewart Dam through Bear Lake National Wildlife Refuge and into Bear Lake proper (which straddles Idaho and Utah). Bear Lake

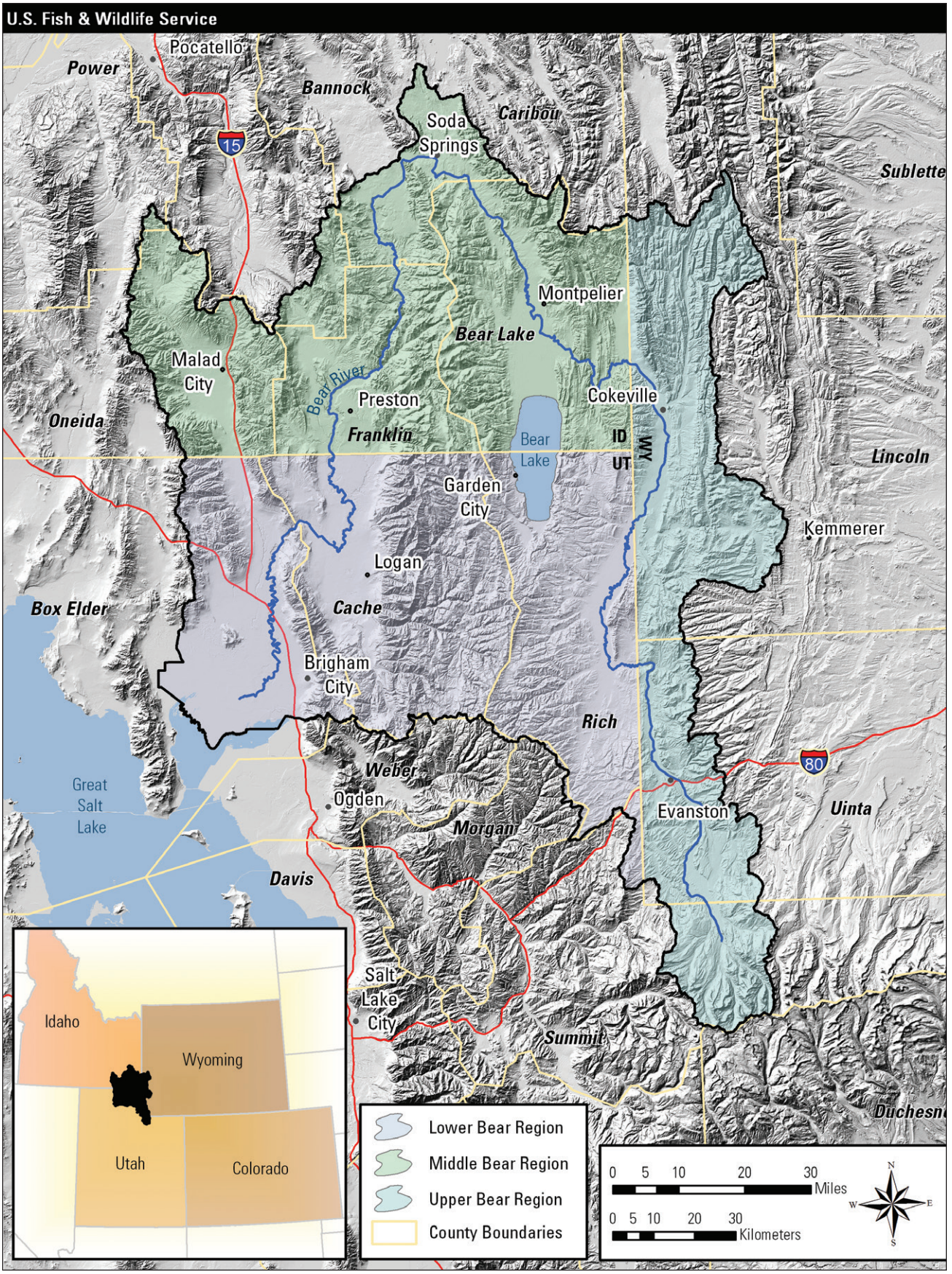

Figure LPP–3. Base map for the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

National Wildlife Refuge, near Montpelier, Idaho, was established in 1968 to protect and manage habitat for waterfowl and other migratory birds. Once released from Bear Lake proper, water travels from the Outlet Canal and the refuge's Mud Lake unit back to the Bear River's original channel about 7 miles from where the water is first diverted. Except for some water seepage from Stewart Dam, all Bear River water is diverted through the refuge; however, small creeks and irrigation return water enter into the original river channel so that the river is not completely dewatered between Stewart Dam and its reunion with the Outlet Canal.

From Bear Lake, the river travels 100 miles to the north, where it is impounded in the Alexander Reservoir for irrigation, recreation, and hydroelectric power generation. Below the Alexander Dam, about one-tenth of the river's annual flow is sent through one of the oldest diversion canals in the watershed, the Last Chance Canal. The canal was constructed by settlers to provide irrigation for agriculture in the early 1900s. From there, the river continues south toward Grace, Idaho. Just above the Black Canyon, almost all the river water is again diverted, at the Grace Dam, through an aqueduct to the Grace Power Plant for power production. The water then is returned to its original river channel just below Black Canyon at Cove Dam. As a part of its 2008 relicensing agreement for the Grace and Cove dams, PacifiCorp provides scheduled whitewater flow releases back into Black Canyon during spring and early summer months to help mimic natural flow patterns.

Below Black Canyon, the river continues south through the Gem, Gentile, and Cache Valleys, where the predominant land uses are irrigated agriculture, grazing, and dairy production. About 100,000 people live in the Cache Valley, making it the most populated area in the Bear River watershed. Just below the Idaho–Utah State line, the Bear River receives water from the Cub River, which in turn obtains part of its water from the Mount Naomi Wilderness. Below the Cub River, the amount of water in the Bear River doubles because of input from the Logan, Blacksmith Fork, and Little Bear River flows.

Eventually the Bear River passes into the Bear River delta and the Bear River Migratory Bird Refuge and then terminates its horseshoe-shaped 500-mile route in Utah's Great Salt Lake. Today, the Bear River contributes more than one-half of the total surface flow entering the Great Salt Lake each year. This large volume of freshwater from the river helps to maintain proper temperatures, salinity, and water levels in the lake. The saline waters and freshwater marshes of the Great Salt Lake comprise one of the most important breeding and migratory staging sites for colonial waterbirds, waterfowl, and shorebirds in the Great Basin.

Climate

The climate of most of the proposed Bear River Watershed Conservation Area is characterized as having warm to hot summers and cold winters and is classified as humid continental, mild summer under the Koppen climate classification system. The remainder of the watershed near the Great Salt Lake is classified as semiarid desert–steppe or humid continental, hot summer for the Great Basin and Wasatch Front, respectively.

Annual precipitation is influenced greatly by the topography and elevations found within the watershed, which range from 4,200 to 13,000 feet. Annual precipitation ranges from 10 inches in the lower valleys to 65 inches at the headwaters of the Bear River in the Uinta Mountains (Utah Division of Water Resources 2005b). Two major storm patterns influence precipitation in the basin: (1) frontal systems from the Pacific Northwest during winter and spring; and (2) thunderstorms from the south and southwest in late summer and early fall.

Temperatures are also variable throughout the watershed because of differences in elevation. Mean annual temperatures range from 37 °F in the Uinta Mountains at about 8,400 feet elevation to 53 °F at Tremonton at 4,300 feet. Maximum July temperatures average 91 °F at Tremonton compared to 74 °F in the Uinta Mountains.

Climate Change

The Bear River basin has warmed an average 2 °F since 1971 (Utah Climate Center). The trend of 0.5 °F per decade during the last 40 years is 1.5 times greater than the trend for the global average over the same period. Simulation models predict that, by 2040 to 2060, the Bear River basin's climate could be 5–6 °F warmer with a 5–13 percent decrease in annual runoff, 10–15 percent lower peak accumulation of snowpack, earlier spring melt by 2–4 weeks, and an increasing fraction of winter precipitation coming as rain (Degiorgio et al. 2010) (see figure LPP–4). Climate change models in the arid western regions of North America also suggest an increased frequency of extended drought in the future (Hughes and Diaz 2008, Barnett et al. 2008, Degiorgio et al. 2010). These changes have important implications for waterbird populations, and ecosystem stability within the Bear River basin wetlands.

Maclean et al. (2008) found that waterbird abundance and phenology are sensitive to the effects of climate change.

Waterbirds dependent on inland wetlands in the west are at particular risk because these crucial habitats are among the most likely to be dramatically influenced by climate change in the region (Hughes

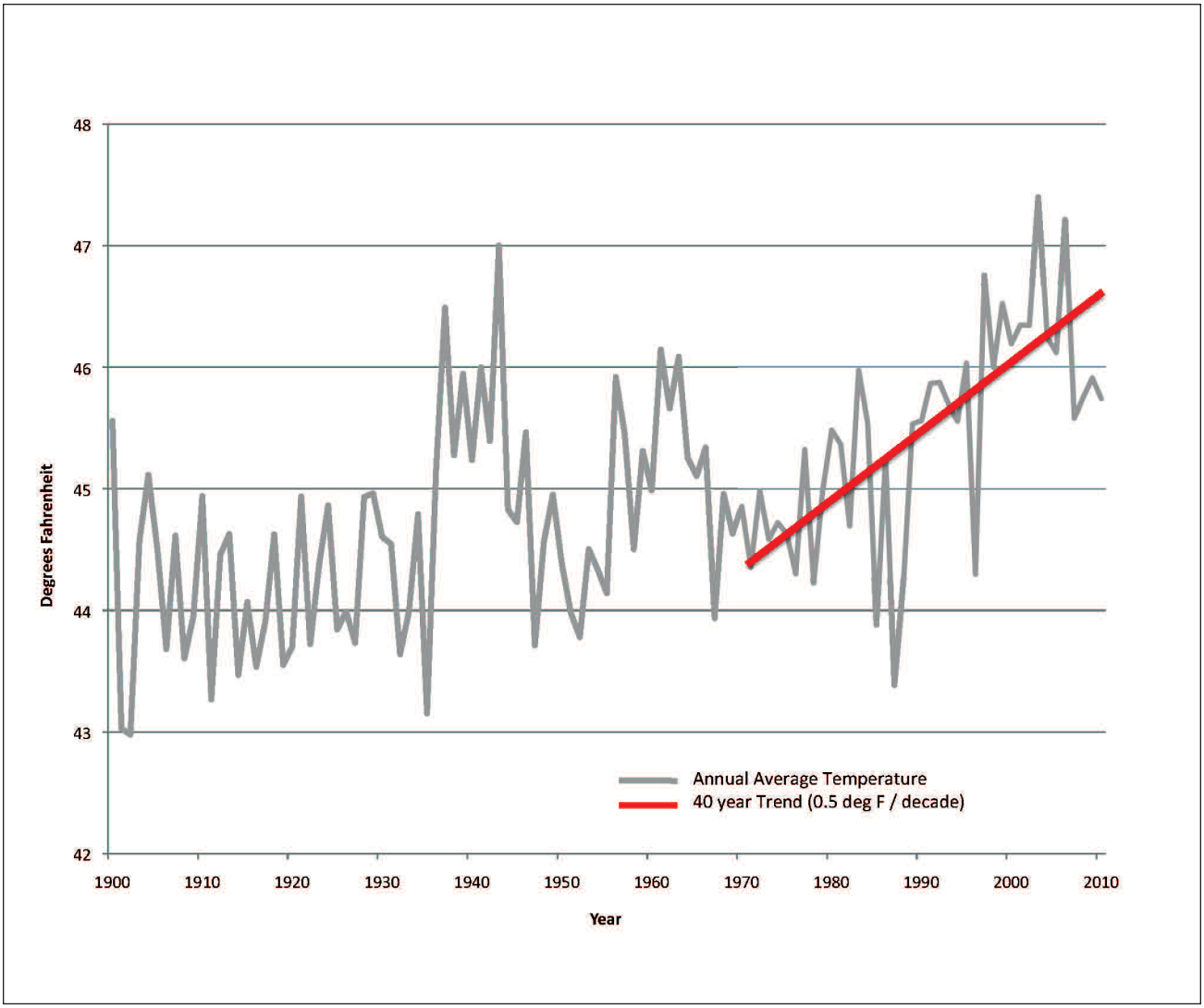

Figure LPP–4. Graph of the trend in annual average temperature in the Bear River basin (Idaho, Utah, and Wyoming) over the past 100 years.

and Diaz 2008, Barnett et al. 2008). For example, breeding waterbirds at the Bear River Migratory Bird Refuge rely on wetlands that lie at the interface between freshwater inflows and the saline Great Salt Lake. As the timing and amount of freshwater snowmelt change and humans respond by altering their use of water, the hydrology and salinity regimes of these wetlands may be dramatically influenced. Without actions that anticipate and address these likely changes, the value of this area for breeding waterbirds could be disrupted, which would likely influence the continental populations of some species.

The "U.S. Fish and Wildlife Service Strategic Plan for Responding to Accelerating Climate Change" (2010) involves three progressive strategies: Adaptation, Mitigation, and Engagement. Adaptation involves helping fish, wildlife, and their habitats adapt to climate change by implementing management actions to help reduce the impacts. Mitigation involves reducing the carbon footprint by using less energy, consuming fewer materials, and increasing sequestration of biological carbon. Engagement encompasses developing partnerships with local, national, and international partners, key constituencies, and stakeholders to seek solutions to the challenges and threats to fish and wildlife conservation. The proposed Bear River Watershed Conservation Area would have aspects that address all three of these strategies.

Adaptation

Worldwide scientific consensus is that human activity is changing the climate system. As the climate changes, the abundance and distribution of wildlife and fish will also change in response to changing habitat conditions. Some species will adapt

successfully to a warming world; many will struggle; and others will disappear.

The exact changes to temperature and precipitation in the Bear River basin are unknown. Equally unknown are the responses of wildlife and habitat to these changes, for example, which species will become the most vulnerable. Keeping adequate densities of wetlands, robust riparian corridors, and open spaces will become increasingly important to allow fish and wildlife to adapt to the changing environment.

Mitigation

Forests, grasslands, wetlands, and soils have a large influence on atmospheric levels of CO_2. Carbon sequestration forms one of the key elements of mitigation. The World Resources Institute estimates that grasslands store approximately 34 percent, forests store approximately 39 percent, and agro-ecosystems approximately 17 percent of the global stock of carbon in terrestrial ecosystems. It is as important to protect existing carbon stores from further degradation as it is to sequester atmospheric carbon.

Historically, the destruction of wetlands through land use changes has had the largest effects on carbon fluxes and the resulting radiative forcing of North American wetlands. [Radiative forcing is the measure of the amount that the Earth's energy budget is out of balance.] The primary effects have been a reduction in the ability of the wetlands to sequester carbon (a small to moderate increase in radiative forcing), oxidation of their soil carbon reserves upon drainage (a small increase in radiative forcing), and reduction in methane emissions (a small to large decrease in radiative forcing). It is uncertain how global changes will affect the carbon pools and fluxes of North American wetlands (Bridgham et al. 2006).

Engagement

Engagement involves cooperation, communication, and partnerships to address the conservation challenges presented by climate change (USFWS 2009). The conservation area would serve as a model for engagement by working with landowners, nongovernmental organizations, State agencies, and Federal agencies listed earlier under "Partnership Development."

A key recommendation from a recent climate change workshop held by The Nature Conservancy was to coordinate management of shared resources. Given the regional pattern of recent temperature changes, with some areas experiencing warming more rapidly than others, natural resource managers would benefit by coordinating their activities with others who are managing common resources. Regional and coordinated management of shared habitat may be the only way to make sure that some habitat can be kept in a resilient state while other habitat transitions to another state (Roble 2011).

Taking action on these recommendations will be crucial for achieving conservation and management goals in the face of a changing climate. Reduced snowpack in the mountains combined with earlier seasonal melting caused by rising temperatures may increase the intensity and length of late summer droughts and reduce the availability of water, especially in the western United States. Finding enough water is becoming an increasingly difficult challenge for western fish and wildlife species. Spring is arriving earlier, and plants and animals are being found farther and farther north of their historical ranges in the U.S. Wildlife biologists are concerned that this will mean some migratory species may not arrive in their breeding habitats when, or where, their particular food sources are available.

Education is a key part of engagement. The Bear River Migratory Bird Refuge watershed education program will work with local school districts to apply scientific understanding, at a student level, through field trips to sites within the Bear River watershed. Students groups will monitor local climate change through tracking phenological events and engage in strategies to reduce carbon footprints. It is predicted that student engagement in climate change education will result in advancing its understanding among the citizenry within the watershed.

Biological Environment

The Bear River watershed's habitat ranges from river and the adjacent riparian areas to wetland, grassland, shrubland, and forest. This section also describes the wildlife and species of concern that use these habitats.

Habitat

Below the peaks of the Uinta Mountains lies a landscape carved by glaciers containing lakes, streams, forests, and meadows. Dropping in elevation from more than 13,000 feet to 4,211 feet and crossing through many life zones (alpine to valley floor), the Bear River area contains a large diversity of plant communities. The diversity of habitats in the Bear River watershed support a variety of fish, mammal, reptile, and amphibian species as well as a large number of resident and migratory bird species. See figure LPP–5 for a map of habitat types, table LPP–1 for

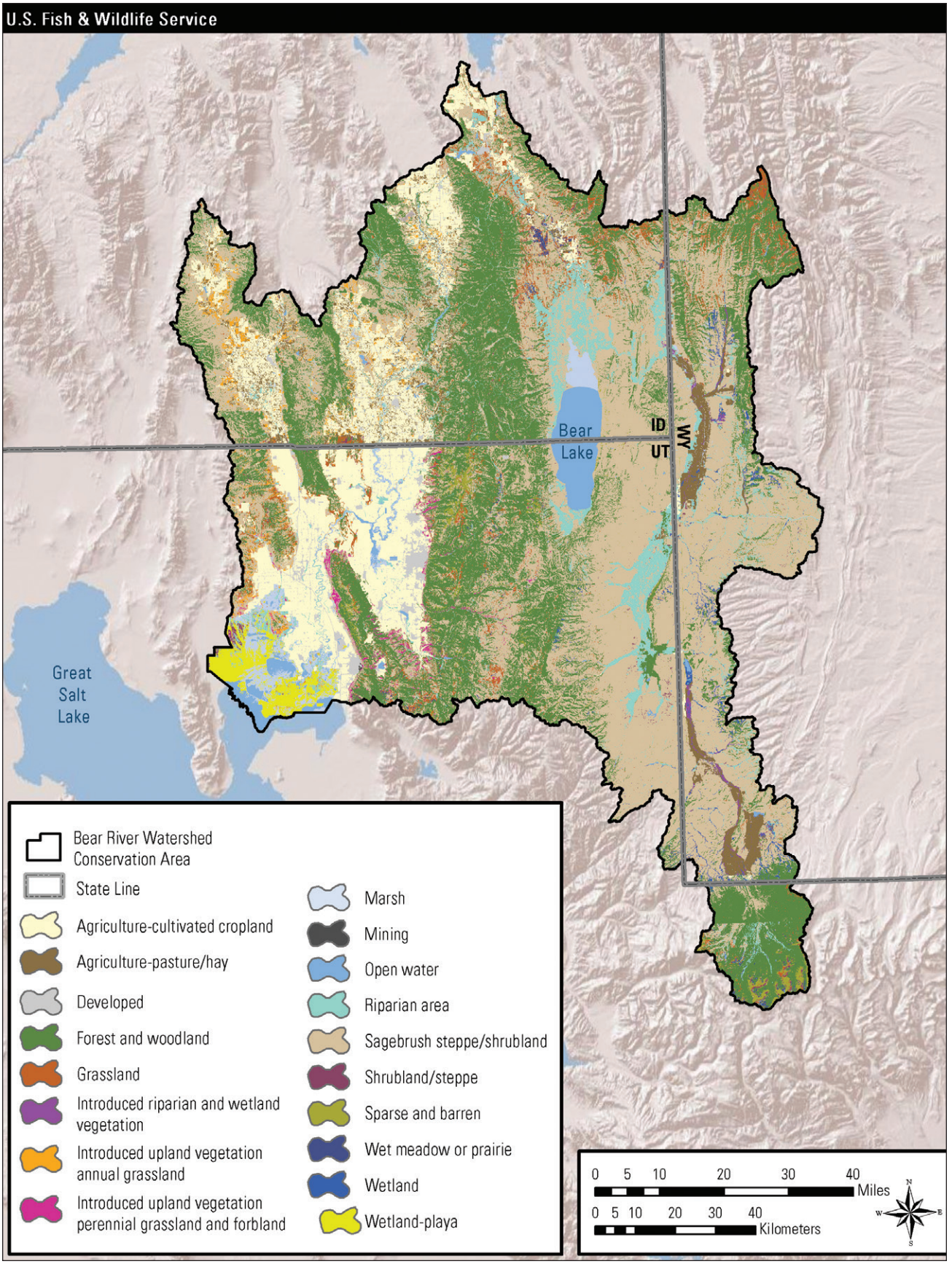

Figure LPP–5. Habitat map for the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming. *Source: NorthWest GAP (Idaho Cooperative Fish and Wildlife Research Unit 2011); South West reGAP (U.S. Geological Survey 2005).*

acreages of vegetation types, and appendix B for a list of plant and animal species representative of the Bear River watershed.

Table LPP–1. Acreages of vegetation types found in the proposed Bear River project area in Idaho, Utah, and Wyoming.

Vegetation types	*Acres*
Agriculture: cultivated cropland	594,358
Agriculture: pasture and hay	133,482
Developed	83,343
Forest and woodland	1,250,529
Grassland	128,848
Introduced riparian area and wetland vegetation	8,821
Introduced upland vegetation—annual grassland	44,840
Introduced upland vegetation—perennial grassland and forbs	19,171
Marsh	69,430
Mining	197
Open water	119,497
Riparian area	261,407
Sagebrush steppe and shrubland	1,945,752
Shrubland and steppe	18,565
Sparse and barren	44,912
Wet meadow or prairie	12,803
Wetland	27,577
Wetland–playa	59,350
Total	4,822,882

Source: http://gap.uidaho.edu/index.php/gap-home/Northwest-GAP/landcover; http://fws-nmcfwru.nmsu.edu/swregap/habitatreview/ModelQuery.asp; Northwest GAP (Idaho Cooperative Fish and Wildlife Research Unit 2011); Southwest ReGAP (U.S. Geological Survey 2005).

Connectivity and Corridors

Habitat loss and fragmentation are the chief factors in the decline of many populations of wildlife throughout the world (Harris 1984, Ehrlich 1986, Lovejoy et al. 1986). In the western United States, human development of open spaces has fragmented the connections between wildlife habitats (Gude et al. 2007). Corridors that link habitats or other landscape linkages help mitigate the effects of habitat fragmentation by linking core areas so that individuals can move between them (Mech and Hallett 2001). They also allow evolutionary and ecological processes (for example, fire, succession, predation) to continue. By ensuring that plants and animals have connected populations, corridors can help prevent or mitigate against harmful population-level effects resulting from isolation including inbreeding, low genetic diversity, and extirpation (Noss 1983, Harris 1984, Dobson et al. 1999) and may actually increase population sizes, viability, and movement of habitat-restricted species (Noss and Cooperrider 1994, Haddad 1999, Haddad and Baum 1999). Landscape linkages should also help to provide for longer term gene flow between populations in core habitats and linkage areas and may provide a pathway for plants populations to shift under regional climate change trends (Bates and Jones 2007).

Almost all species rely on more than one habitat type to complete their life cycles, and the availability of various intact habitats close together is essential to many wildlife species found in the watershed. For example, Saalfeld et al. (2010) found that, while the long-billed curlew's need for wetlands near its grassland nesting habitat is poorly understood, it is clearly important since more curlews were detected near wetlands. Brood-rearing long-billed curlews typically forage in upland areas (Pampush and Anthony 1993); however, curlew chicks move toward wetlands as they grow (Foster-Willfong 2003). Shorter travel times between nest sites and wetland foraging sites reduce chick mortality (Saalfeld et al. 2010). In addition to grassland habitat, conservation of emergent wetlands—an element that generally has been overlooked—needs to be incorporated into habitat management plans for curlews (Saalfeld et al. 2010).

White-faced ibis also have specific habitat needs that are now being met in the Bear River watershed. In Wyoming, Dark-Smiley and Keinath (2003) found that ibis require large wetlands or lakes with dense emergent vegetation, such as bulrushes for breeding and foraging grounds near breeding areas. One consistent feature that all the breeding records in Wyoming have in common is proximity to irrigated crops. It seems likely that a combination of factors, such as proximity of foraging grounds and specialized habitat at open-water systems, plays a role in where white-faced ibis choose to breed.

The Bear River watershed provides linkages and migration corridors for seasonal movements of wildlife between various habitats within the watershed

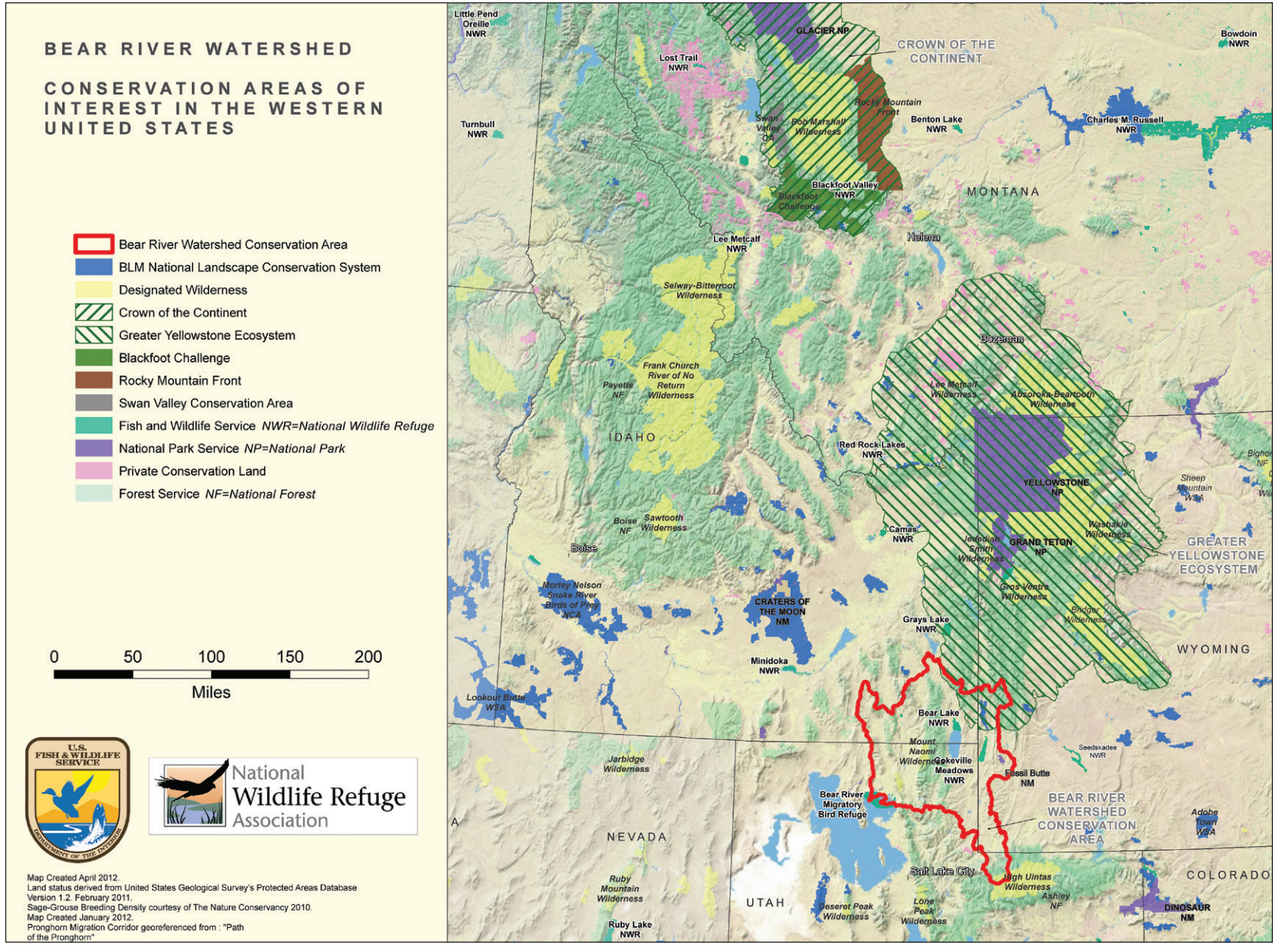

Figure LPP–6. Map of regional conservation and protected areas adjacent to the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

as well as between other protected lands and ecosystems in the region (see figure LPP–6). Crucial wildlife corridors maintain system resiliency in the face of climate change, especially for wide-ranging wildlife species such as Canada lynx, wolverine, mule deer, and pronghorn. Migration corridors provide connectivity between habitats in the northern and southern Rockies and between Idaho and the Greater Yellowstone Ecosystem for mule deer, elk, and mid- to large-sized carnivores. In particular, Canada lynx linkages are mentioned for Cache, Rich, and Uinta Counties (Idaho Department of Fish and Game 2007). Core habitat areas for lynx are found in the Uinta Mountains (USDA Forest Service 2003) as well. Large numbers of mule deer, pronghorn, elk, and moose migrate through narrow corridors in the Rocky Point area north of Cokeville Meadows National Wildlife Refuge in Wyoming.

Riverine and Riparian Areas

Although riparian areas occupy only a small proportion of the total landscape in the western United States, they tend to be more productive than other ecosystems (Svejcar 1997). Riparian habitat is estimated to cover less than 2 percent of the States of Idaho (Idaho Cooperative Fish and Wildlife Research Unit 2011) and Wyoming (Merrill et al. 1996) and less than 1 percent of the State of Utah (Utah Division of Wildlife Resources 2005b).

The importance of riparian habitat to wildlife far exceeds its abundance. Distinct ribbons of green riparian areas connect streams with uplands across much of the West. These ecosystems support high species diversity and density as well as high productivity, and they allow for an exchange of energy, nutrients, and species between aquatic, riparian, and upland terrestrial systems (Johnson and McCormack 1978, Gregory et al. 1991, Poff et al. 2011). Riparian zones along the major streams are important migration and dispersal corridors traversing harsh grassland and desert environments (Lohman 2004).

Densities of breeding birds can be up to 10 times higher in riparian tracts than in adjacent, nonriparian habitats (Lohman 2004). Bird diversity in riparian habitats has been linked to the complex

Oneida Narrows Breakwater, Idaho

vertical vegetative structure of these habitats compared to adjacent grassland or shrubland habitats (Slater 2006). In the arid Southwest, about 60 percent of all vertebrate species (Omhart and Anderson 1982) and 70 percent of all threatened and endangered species are riparian area obligates (Johnson 1989, Poff et al. 2011). The quality of riparian habitat greatly influences the quality of aquatic habitat. Riparian vegetation influences light penetration and air and water temperatures, and is the transition point for food chain interactions between aquatic and terrestrial zones. Large woody debris and litter associated with riparian vegetation are often necessary for productive fish habitats, and influence the physical, chemical, and biotic characteristics of riparian and stream ecosystems (Naiman et al. 1992). In some riparian ecosystems, herbaceous plants provide the functions supplied by woody plants in other locations (Baker et al. 2004, Poff et al. 2011).

Riparian areas also play an essential role in maintaining year-round aquatic habitat for fish and other species that occupy the stream channel. In most years, overbank flooding during snowmelt saturates riparian area soils and elevates water tables in adjacent areas. Subsurface water sustains riparian vegetation during drought periods and releases water slowly into the stream (Ewing 1978). Although often small, these waterflows help keep appropriate stream temperatures, improve water quality, and sustain isolated pools essential for fish survival (Winters et al. 1998 as cited in "Wyoming State Wildlife Action Plan" 2010). Native fish populations have fluctuated, through time, in response to changes in the extent and function of riparian willow communities (Chaney et al. 1991, Binns 1981). Riffle-dwelling species such as longnose dace and riffle-spawning salmonids require relatively smaller fine sediment levels associated with healthy riparian vegetation. Riparian habitat is also required by many amphibian and reptile species.

Trout Unlimited (2010) found that the greatest limiting factor for Bonneville cutthroat trout appears to be land stewardship, because most populations are located on unprotected public and private lands. Strategies such as securing long-term protection, restoring and reconnecting degraded and fragmented habitats, and controlling nonnative species on a watershed scale are necessary to build resiliency while protecting genetic purity.

Wildlife abundance, water availability, vegetation diversity, soil productivity, and favorable topography found in riparian zones attracted both Native Americans and early Europeans settlers to these areas. As a result, a high percentage of riparian areas are today privately owned. Most communities in the Bear River watershed are located near riparian zones used for agriculture, recreation, travel, water development, and housing (Wyoming Game and Fish Department 2010).

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Riparian areas are important habitat for yellow warblers.

Riparian areas in the West are being influenced by a variety of stressors including land use change, grazing, dams, invasive species, timber harvesting, climate change, recreation, water quality, water diversion, ground-water depletion, fire, and mining. Although no comprehensive national inventory of riparian area conditions exists, Ohmart (1994) suggests that a minimum of 95 percent of all western riparian habitats have been altered in some way during the past century.

Another major influence on riparian areas in the Bear River watershed is irrigation. The timing, extent, and method of irrigation can have a strong influence on riparian vegetation. Conversion from flood irrigation to center pivot irrigation has been known to change riparian area characteristics. While technological changes like side-role systems and gated pipe deliver water more efficiently to crops and potentially conserve water for other uses like maintaining streamflows, the influence on riparian area characteristics is complex (Wyoming Game and Fish Department 2010).

Lowland Riparian Areas. Lowland riparian areas in the West are typically narrow bands of trees—predominantly cottonwoods—and shrubs surrounded by uplands of shorter vegetation (Knopf et al. 1988, Montgomery 1996). Principal woody species found in lowland riparian habitats in the watershed include Fremont cottonwood, netleaf hackberry, squaw-bush, boxelder, lanceleaf cottonwood, willow, and redosier dogwood. Nonnative invasive species include Russian olive and tamarisk. (Utah Division of Wildlife Resources, 2005, Wyoming Game and Fish Department, 2005).

Mountain Riparian Areas. Mountain riparian habitats differ from those found in lowlands because of the generally steeper stream gradients, cooler temperatures, and smaller amounts of soil deposition

(Knight 1994). Mountain riparian vegetation is often characterized by sedges and short willow shrubland (Winward 2000). As elevation decreases, alder and tall willows become common, with Engelmann spruce, narrowleaf cottonwood, lodgepole pine, aspen, and occasionally blue spruce and balsam poplar (Knight 1994).

Wetland

Wetlands represent a small part of the landscape in the Intermountain West, covering less than 5 percent of Utah and 2 percent or less in both Idaho and Wyoming (Idaho Gap Analysis, Wyoming Joint Venture Steering Committee 2010). Wetlands are often found in the form of marshes next to desert springs, rivers, streams, and lakes, but can also be found in the spring and summer where snowmelt collects. In the Intermountain West, wetlands provide habitat for more than 140 birds and 25 mammals that are either dependent on or associated with wetlands (Gammonley 2004, Copeland et al. 2010). Nicholoff et al. (2003) estimates that about 90 percent of the wildlife species in Wyoming use wetlands and riparian habitats daily or seasonally during their life cycle, and about 70 percent of Wyoming bird species depend on wetland or riparian areas.

Wetlands within lower elevation grasslands and shrublands are especially important in terms of the biodiversity of plant species and because they have much longer growing seasons than those at higher elevations (Weiher and Keddy 1999). Lower elevation wetlands generally sustain greater biological diversity and greater overall densities of wildlife. However, these lower wetland complexes are also at greatest risk of future change because they support higher density human populations and more agriculture, have a higher potential for energy development, and are at a higher risk for climate change (Copeland et al. 2007, 2009).

Privately owned wet meadow habitats are some of the most important unprotected wetlands within the Intermountain West. Irrigated wet meadows that are hayed and grazed annually (hay meadows) represent a particularly important subset of wetland habitats. These privately owned wetlands typically occur at mid- to high elevations (4,500–8,500 feet) in landscapes dominated by intact wetland, grassland, and sagebrush habitats not fragmented by development. These areas are important, as they often comprise almost entirely native habitats with little area converted to cropland. Grass-dominated landscapes with minimal fragmentation from cropland support high nest success for wetland- and grassland-nesting birds.

In addition to nesting habitat, these landscapes provide crucial stopover habitat for migrating waterfowl and shorebirds (Intermountain West Joint Venture 2010). Agricultural areas are a major source of foraging habitat during migration as well as nesting and brood-rearing habitat for many waterbird species. The Bear River watershed provides important complexes of wet meadow, flooded pastures, and hayfields used by many species of migrating waterfowl, shorebirds, and waterbirds including American avocet, sandhill crane, white-faced ibis, American bittern, marbled godwit, long-billed dowitcher, and northern pintail. The quality and availability of spring migration habitat have direct implications for the survival and breeding productivity of migratory birds. This shallowly flooded habitat is extremely important to spring-migrating waterfowl, especially northern pintails, whose population remains below continental management goals. Important flood-irrigated grazed and hayed wet meadow habitats sustain migrating waterfowl and waterbirds in the Intermountain West. These areas also provide crucial brood habitat for waterfowl and other waterbirds by supplying both escape cover from predators and productive foraging sites for rapidly growing ducklings and chicks.

As with riparian areas, the irrigation of agricultural lands can have both a positive and a negative influence on the ecological condition of wetlands. Agricultural irrigation has affected the hydrology of many wetlands in the Bear River watershed. Copeland et al. (2010) found that more than 50 percent of Wyoming wetland areas in four different complexes were influenced by agricultural irrigation and predicted that changes in irrigation practices driven by the need for water conservation would be likely to adversely affect the hydrology of many lower elevation wetlands. As agricultural producers convert to

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The long-billed curlew depends on wetland and upland habitats.

alternative forms of irrigation because of drought concerns, many wetlands throughout the watershed may disappear. Some studies have documented negative effects from irrigation, mainly involving the conversion of existing wetlands to cropland and impairment from contaminant and nutrient runoff (Dickerson et al. 1996; Lemly et al. 1993, 2000; Kiesecker 2002).

Livestock grazing can also have a major influence on the functional integrity of wetlands and riparian systems throughout the Intermountain West (U.S. General Accounting Office 1988; Chaney et al. 1990, 1993; Belsky et al. 1999; Copeland et al. 2010). If effective land conservation measures are not employed, certain farming practices may adversely affect wetlands. Sediment runoff from tilled fields and heavily grazed pastures decreases the lifespan of ponds and wetlands and impairs water quality.

Upland, Grassland, and Shrubland

From 1950 to 1990, grasslands west of the Mississippi River declined by 27.2 million acres, with approximately 36 percent converted to uses other than cropland (Conner et al. 2001). Now, the greatest threats to grasslands and sagebrush ecosystems come from oil and gas development, increasing urban and agricultural development, and invasive species. Climate change is also expected to cause major changes in grassland and sagebrush distribution across the landscape (Bachelet et al. 2001). Range expansions of woody species are predicted to continue, particularly the expansion of pinyon–juniper into sagebrush–steppe and grasslands (Rowland et al. 2006), resulting in a decrease in sagebrush and an increase in woodlands across the West. Wildfires are increasing and are likely to intensify in a warmer future with drier soils, longer growing seasons, and more severe droughts (Field et al. 2007); wildfires may also cause large changes in grassland and sagebrush ecosystems.

Changes in grassland cover can be subtle, but cover is generally predicted to decrease (Bachelet et al. 2001). Modeling suggests that climate change will likely increase net primary production in grasslands and decrease soil carbon, but high annual variability in plant production makes these projections uncertain (Parton et al. 2005). Nutrient cycling and plant production are expected to occur more rapidly in response to climate change than changes in community composition (Parton et al. 1994).

Sagebrush is typically the most common plant in shrub–steppe habitats in the watershed. There are many species of sagebrush in the Bear River watershed including basin, Wyoming, and mountain big sagebrush, and black or low sagebrush, which differ in height and habitat affinity. Other common shrubs include rabbitbrush, greasewood, fourwing saltbush, shadscale, serviceberry, and bitterbrush. Perennial grasses may also be common and include Indian ricegrass, sand dropseed, bluebunch wheatgrass, Sandberg bluegrass, alkali sacaton, wild rye, and inland saltgrass. Common forbs include Hood's phlox, arrowleaf balsamroot, yarrow, Richardson's geranium, and milkvetch (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b).

In the foothills and on mountain slopes, mountain big sagebrush occurs as a dominant shrub, typically with bluebunch wheatgrass or Idaho fescue. Mountain big sagebrush also occurs in a more diverse shrub community known as mountain shrub, in which it codominates with bitterbrush, serviceberry, mountain snowberry, chokecherry, mountain mahogany, bigtooth maple, and a variety of forbs. In Utah, Gambel oak is a dominant species in the mountain shrub community. Idaho fescue and basin wildrye are common bunchgrasses (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b). In Idaho, this habitat is restricted to the southern part of the State but is widespread in Wyoming. This diverse community of shrubs is highly palatable and is the preferred browse for many big game species (Wyoming Game and Fish Department 2010).

Sagebrush ecosystems are among the most imperiled in North America because of a variety of human disturbances. Sagebrush habitat has been altered and fragmented by changing fire regimes, an influx of invasive species, and development (agriculture, energy, natural resource, urban, and associated infrastructure). This has resulted in a decline in both the numbers and the distribution of many of the more than 350 species that depend on sagebrush habitat for all or part of their life cycles (Wisdom et al. 2005). In particular, such habitat shifts have major implications for sagebrush-dependent vertebrates, such as certain bird species (Knick et al. 2003). In all, shrub–steppe habitats are home to 20 species in Utah, 15 species in Wyoming, and at least 25 species Idaho that need added conservation actions (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b, Wyoming Game and Fish Department 2005).

Sagebrush-dependent wildlife species have adapted to heterogeneous sagebrush communities comprised of multiple age classes of plants across the landscape. In sites where the forb and grass diversity necessary for a healthy sagebrush community is reduced, the amount of essential food and cover available for wildlife is decreased (Wyoming Game and Fish Department 2011). Greater sage-grouse in particular have been affected, with breeding populations declining 45 to 80 percent from estimated numbers in the 1950s (Connelly and Braun 1997, Connelly et al. 2004, Braun 2006).

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White-faced ibis feeding in an irrigated agricultural field.

Sagebrush ecosystems are rapidly declining both in extent and quality rangewide. The historical range contraction of the greater sage-grouse is a result of land conversion of sagebrush habitats to agriculture, climatic trends, and human population growth. Future range loss, however, may be due more to recent changes in land use and habitat condition including energy development and invasive species, such as cheatgrass and West Nile virus (Aldridge et al. 2008). Keeping large areas of intact sagebrush is considered essential to the long-term persistence of the sage-grouse (Aldridge et al. 2008). Based on this finding, it has been recommended that conservation efforts should begin by maintaining large expanses of sagebrush habitat and enhancing the quality and connectivity of those areas.

Recent research shows that viable prairie grouse and sage-grouse populations are heavily dependent on suitable nesting and brood-rearing habitat (Connelly et al. 2000, Hagen et al. 2009). These habitats are usually associated with leks that are located in the approximate centers of nesting and brood-rearing habitats (Connelly et al. 2000, but see Connelly et al. 1988; Becker et al. 2009). Quality nesting and brood-rearing habitats surrounding leks are crucial to sustaining viable prairie grouse and sage-grouse populations (Giesen and Connelly 1993, Hagen et al. 2004, Connelly et al. 2000). The average distances from nests to active leks of nonmigratory sage-grouse range from 0.7 mile to 4 miles (Connelly et al. 2000), and are possibly much more for migratory populations (Connelly et al. 1988). Kaczor et al. (2011) found that sage-grouse selected brood-rearing habitats that provided increased visual obstruction and bluegrass cover. More herbaceous vegetation at these sites may provide increased invertebrate abundance. Invertebrates are a necessary part of the diet of sage-grouse chicks to support their growth, development, and survival (Johnson and Boyce 1990).

Sage-grouse avoid energy developments in otherwise suitable habitats in winter. Previous research has shown that breeding sage-grouse in oil and gas fields avoid developments, experience higher rates of mortality, or both (Holloran 2005, Kaiser 2006, Aldridge and Boyce 2007).

Studies on the impacts of energy development in sagebrush–steppe ecosystems show that the effects extend beyond the sage-grouse. Sawyer et al. (2006) found that mule deer avoided otherwise suitable habitats within 1.7–2.3 miles (2.7–3.7 kilometers) of gas wells, and densities of Brewer's sparrow and sage sparrow declined by 36–57 percent within 328 feet (100 meters) of dirt roads in gas fields (Ingelfinger and Anderson 2004).

Sagebrush habitats conserved for sage-grouse may also benefit other sagebrush-dependent species, although the effectiveness of sage-grouse as an umbrella species will depend on the specific management objectives for the conservation of other target species (Rowland et al. 2006).

Forest

At higher elevations in the watershed, forests typically consist of spruce, lodgepole pine, and subalpine fir, with areas of high-elevation tundra on north-facing slopes. Moving down slope and the corresponding precipitation gradient, subalpine forests give way to dry forests of Douglas-fir, white fir, lodgepole pine, limber pine, and aspen groves, with bigtooth maple and boxelder in ravines.

Although the forested areas are largely on public lands, habitat loss through conversion to residential development is of local importance in some areas of the watershed. Phosphate mining also has had a significant long-term impact on forest habitats in eastern Idaho. This habitat typically occurs in landscapes that are extensively used for recreation, for livestock grazing, and increasingly for residential development.

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An aspen grove in bright fall colors.

Wildlife

This section describes the abundant variety of birds, mammals, amphibians, reptiles, and fish that live in the Bear River watershed.

Birds

The Bear River watershed provides diverse habitats used by more than 300 species of birds annually for breeding or migration. Banding data also show that migratory routes for some species that nest in the Pacific and central flyways overlap in the Bear River watershed (for example, northern pintail). The Intermountain West Joint Venture's diverse partnership for avian habitat conservation has identified eight Bird Habitat Conservation Areas (Intermountain West Joint Venture 2005), and the Bear River Migratory Bird Refuge is designated as a Western Hemisphere Shorebird Reserve Network Site. The National Wildlife Refuge Association has designated the Bear River watershed as one of six Beyond the Boundaries focal areas nationwide because of its importance to migratory birds and other wildlife. The National Audubon Society (2012) has designated eight Important Bird Areas within the Bear River watershed, which serves to highlight the regional and continental significance of this watershed for migratory birds. Many of the transient species are neotropical migrants that breed in the United States and Canada and winter in the Central Highlands of Mexico or further south into Central and South America. Other spring migrants to the watershed winter along the Gulf of Mexico and the coasts of southern California, Baja Norte, Baja Sur, and southwestern Mexico, including the Gulf of California.

Upland areas within the Bear River watershed provide essential habitat for many bird species. Shrub–steppe and grassland habitats make up about 60 percent of the Bear River watershed land cover, supporting species such as greater sage-grouse, sage sparrow, sage thrasher, Columbian sharp-tailed grouse, burrowing owl, and long-billed curlew. All of these bird species have been listed as "Species of Greatest Conservation Need" in the Idaho, Utah, and Wyoming comprehensive wildlife conservation strategies because of changes in habitat quantity and quality (Idaho Department of Fish and Game 2005, Wyoming Game and Fish Department 2005, Utah Division of Wildlife Resources 2005b). The greater sage-grouse is the only species listed above that has Federal status. The species became a candidate for listing under the Federal Endangered Species Act after the Service's conclusion that listing was warranted but precluded (USFWS 2010a). The Columbian sharp-tailed grouse was petitioned for listing in 2004, with a finding of "Not Warranted for Listing" issued in 2006 (USFWS 2006).

Studies referenced in the "U.S. Fish and Wildlife Land-Based Wind Guidelines" (2011) found that "based primarily on data documenting reduced fecundity (a combination of nesting, clutch size, nest success, juvenile survival, and other factors) in sage-grouse populations near roads, transmissions lines, and areas of oil and gas development and production (Holloran 2005, Connelly et al. 2000), development within 3–5 miles (or more) of active sage-grouse leks may have significant adverse effects on the affected grouse population." Lyon and Anderson (2003) found that in habitats fragmented by natural gas development, only 26 percent of hens captured on disturbed leks nested within 1.8 miles of the lek of capture, whereas 91 percent of hens from undisturbed areas nested within the same area. Holloran (2005) found

that active drilling within 3.1 miles of sage-grouse leks reduced the number of breeding males by displacing adult males and reducing recruitment of juvenile males. The magnitudes and proximal causes (for example, noise, height of structures, movement, human activity) of those impacts on grouse populations are areas of much needed research (Becker et al. 2009).

Hanser and Knick (2011) found that the diversity of sagebrush habitats used by greater sage-grouse may provide an effective umbrella for a broader community of passerine bird species associated with sagebrush that are also declining in numbers. Brewer's sparrow, sage sparrow, and sage thrasher had moderate to strong associations with sage-grouse.

The three national wildlife refuges—Bear Lake (with the Oxford Slough Waterfowl Production Area), Bear River, and Cokeville— in the watershed provide habitat for waterfowl, wading birds, shorebirds, and landbirds that migrate through these refuges on their way to and from Canadian and Alaskan interior and coastal wetlands. More than 270 different species have been identified using the habitats associated with the three refuges including the following birds:

- white-faced ibis (46 percent of the North American population)
- marbled godwit (more than 24 percent of the North American population)
- black-necked stilt (more than 18 percent of the North American population)
- American avocet (more than 16 percent of the North American population)
- tundra swan (32 percent of the western population)

Fish populations on the refuges provide food for birds like the American white pelican, egrets, herons, and the bald eagle. The Bear River Refuge is likely the most important foraging location for the Great Salt Lake breeding colony of American white pelican (Frank Howe, Utah Department of Wildlife Resources, personal communication 2000).

Other noteworthy species using wetland habitats found throughout the watershed include sandhill crane, redhead, Wilson's phalarope, trumpeter swan, black-crowned night-heron, cinnamon teal, blue-winged teal, northern pintail, American white pelican, rough-legged hawk, burrowing owl, and short-eared owl.

Mammals

The Bear River watershed provides habitat for nearly 100 species of mammals. Forty-six of these species are listed as "Species of Greatest Conservation Need" under the Idaho, Utah, and Wyoming comprehensive wildlife conservation strategies (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b, Wyoming Game and Fish Department 2005).

Many wide-ranging mammals depend on the large blocks of intact habitat found in the watershed, the wintering areas, and the key migration linkages including elk, mule deer, moose, pronghorn, grizzly bear, Canada lynx, gray wolf, and wolverine. Upland shrub and grassland habitats support many species, such as white-tailed prairie dog, pygmy rabbit, Idaho pocket gopher, sagebrush vole, Wyoming ground squirrel, and Preble's shrew.

Wetlands in the watershed provide habitat for such species as water shrew, water vole, and northern river otter. In addition, the concentration of insects found in and around wetland complexes attracts

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Cinnamon teal and many other waterfowl species migrate through the watershed.

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A bull moose rests in wetland vegetation at Bear Lake National Wildlife Refuge, Idaho.

many bat species of concern including pallid bat, Townsend's big-eared bat, long-eared bat, and long-legged bat.

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The northern leopard frog is declining across its range.

Amphibians

The diversity of amphibian species in the Great Basin and southern Rocky Mountains is low compared to other areas of the country, such as the Pacific Northwest. However, wetland and riparian habitats in the watershed do support 11 species of frogs and toads and one salamander. Most of these species are listed as "Species of Greatest Conservation Need" under the Idaho, Utah, and Wyoming comprehensive wildlife conservation strategies (Idaho Department of Fish and Game 2005, Utah Division of Wildlife Resources 2005b, Wyoming Game and Fish Department 2005).

The Bear River watershed provides important habitat for the western population of the northern leopard frog, which was petitioned for listing under the Endangered Species Act in 2006. The Fish and Wildlife Service issued its 12-month finding in October 2011. Although the species is declining across its range and is considered rare or is locally extirpated from many States, including Idaho, Utah, and Wyoming, the Service concluded that listing was not warranted at this time (USFWS 2011d).

Reptiles

Approximately 20 species of reptiles occur in the Bear River watershed. Fifteen of these species are listed under State plans as "Species of Greatest Conservation Need." Upland areas such as sagebrush and grasslands are important habitats for species such as common sagebrush lizard and western skink. More moist habitats near wetlands or streams support species such as common gartersnake, eastern yellow-bellied racer, and smooth greensnake.

Fish

The Bear River and its tributaries provide important instream habitat for at least 15 species of native fish. All three State comprehensive wildlife conservation strategies identified the Bear River and its tributaries as playing an important role in providing habitat for an assemblage of native cool- and cold-water fish species, most notably the following:

- Bear River Bonneville cutthroat trout: Because of overharvesting, habitat modifications, dams, and diversions, Bonneville cutthroat trout was thought to be extinct by the 1960s; however, in 1974, an isolated population was discovered, which resulted in large restoration efforts by State, Federal, and local wildlife officials to bring them back. The Bonneville cutthroat trout was petitioned for listing under the Endangered Species Act in 2008; however, a finding of "Not Warranted for Listing" was decided (USFWS 2008b).

- Northern leatherside chub: The northern leatherside chub was petitioned for listing under the Endangered Species Act in 2011; however, a finding of "Not Warranted for Listing" was decided (USFWS 2011c).

Several other important Bear River native fish species recognized by these plans include mountain whitefish, mottled and Paiute sculpin, longnose and speckled dace, redside shiner, Utah sucker, and mountain sucker.

Many of these fish species evolved primarily as lake-dwelling (lacustrine) populations inhabiting Lake Bonneville during the Pleistocene. As Lake Bonneville began to recede, some fish moved up stream in search of cooler water while others adapted to the shrinking remnant lake. In the upper reaches of the Bear River, seasonal migrations from larger to smaller rivers is a common reproductive strategy for many fluvial fishes—those produced or found by a river or stream.

Species of Special Concern

Several federally listed species live in or have home ranges that overlap the proposed conservation area, as described in the following:

- The historical range of the endangered black-footed ferret includes the far eastern part of the watershed. Where ferrets have been reintroduced,

they are considered experimental–nonessential; however, unconfirmed sightings of naturally occurring ferrets continue to be reported (Utah Division of Wildlife Resources 2005a).

- Grizzly bear and Canada lynx, both listed threatened, can be found in the high country.
- The threatened plant Ute ladies'-tresses occurs within the proposed project area and is found in wet meadows and along perennial streams.
- Maguire primrose, a threatened plant that grows in rocky areas and on cliff faces, is highly localized near Logan, Utah.
- Candidate species such as the yellow-billed cuckoo occupy mature cottonwood–willow riparian habitats.
- Greater sage-grouse, a candidate for listing, is dependent on sagebrush and grassland habitats found throughout the watershed.
- The wolverine, a candidate species, occurs in higher elevation forested areas of the watershed.
- Whitebark pine, a coniferous tree occurring in subalpine to alpine sites above 8,000 feet, is a candidate species.

Steve Caicco / USFWS

Maguire primrose is a threatened plant.

Cultural Resources

Humans have inhabited the Bear River area for more than 12,000 years. Their uses of the land are as diverse as the regional topography and environments and reflect both changes through time and localized adaptations. The following brief summary of the prehistory and history of the Bear River area provides an overview of some of the major themes that have influenced the human interaction with the land.

Prehistory

Paleo-Indian Period

Current archaeological evidence shows that the earliest humans, called the paleo-Indians, migrated to the region near the close of the last ice age approximately 12,000 years ago. These people had a highly mobile lifestyle that depended on big game hunting including for mammoths and the huge, now-extinct bison. The hallmarks of most paleo-Indian sites are the beautiful but deadly spear points that are generally recovered from animal kill and butchering sites and small temporary camps, or from isolated occurrences.

Recorded paleo-Indian sites are rare in the Bear River drainage, probably indicating the need for more surveys and research rather than reflecting actual prehistoric use patterns. Several early sites have been recorded in the general region, and many of these are found in the numerous caves that characterize parts of the Great Basin. Sites are also found near wetlands and along the shorelines of ancient lakes, indicating the use of the abundance of floral and faunal resources that would have been available in these locations. The warming and drying climatic trend that began at the start of the Paleo-Indian Period continued and, by approximately 8,000 years ago, contributed to a change in settlement patterns and local adaptations.

Archaic Period

There was a gradual but definite shift in the pattern of human use of the region beginning about 8,000 years ago and continuing until approximately 2,500 years ago. The changes were the result of a combination of regional climatic fluctuations and an increasing population, coupled with technological innovation and regional influences. Although the Archaic Period is better represented in the archaeological record than the preceding Paleo-Indian Period, the interpretation of the remains is difficult. A greater diversity of tools and

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Springtime wetlands at Cokeville Meadows National Wildlife Refuge, Wyoming.

the use of a larger variety of plants and animals are found on many sites. The semipermanent occupation of small villages, the use of smaller spear points, and the creation of basketry, cloth, and cordage are hallmarks of this period. As with the earlier inhabitants, the Archaic peoples made extensive use of the many caves and the wetland environments in the region.

Late Prehistoric and Protohistoric Period

Beginning approximately 2,500 years ago, several innovations greatly influenced life in the Bear River region. Although these changes were adopted at different rates and degrees throughout the area, the advent of pottery, the bow and arrow, and agriculture, coupled with a larger and more sedentary population, defines the period until approximately 800 years ago.

Approximately 1,500 years ago, people archaeologists refer to as the Fremont began to settle the Bear River drainage. Although five distinct Fremont variants have been identified in the archaeological record of the Great Basin, the use of pit houses, agriculture, granaries, and distinctive artistic motifs are common throughout the region. Fremont subsistence included cultivated corn, beans, and squash but also relied heavily on hunting and the intensive exploitation of native plants. Archaeologists suspect that a major staple of the Fremont diet along the Bear River would have been cattail and other seeds ground into meal. Animal species exploited included bison, pronghorn, and mule deer as well as shellfish, fish, and waterfowl. Evidence of the Fremont in the archaeological record disappears about 700 years ago.

About 600 years ago, the people living in the Bear River watershed began to blend culture traits with Shoshonean people living to the east of the Uinta Mountains and abandoned some Fremont cultural traits. These people continued to live in part on wild foods available in the marsh, but probably lived in smaller groups and exploited a broader range of resources. It is not known if the Fremont people were replaced or the two groups integrated. When the first trappers arrived in the early 1800s, people of the Shoshone and Bannock Tribes were living in the area.

History

The Historic Period for the Bear River drainage begins with the recurring contact of the Native Peoples with people of European descent and ends in the mid-twentieth century. This interaction generally followed many years of occasional contact—usually for

the exchange of trade goods—and occurred at different times throughout the area. As with the prehistory of the area, the history of the Bear River watershed reflects both broad themes and individual stories. The narrative below briefly summarizes some of the major historic influences in the region.

The earliest documented European in the area was fur trapper Robert Stuart in 1812. The region quickly gained fame for its abundant resources and became the site of both the 1827 and 1828 trappers' rendezvous on the southern end of Bear Lake near the current town of Laketown, Utah. These annual gatherings were held from 1825 to 1840 to allow the trappers to sell their furs and restock their supplies.

Border disputes between the United States and Spain in various parts of North America, including the Bear River drainage, were addressed in the Adams–Onis Treaty of 1819. As a part of this treaty, the land north of the 42nd Parallel—the State boundary between Idaho and Utah—became United States territory and the lands below the parallel that of New Spain (Mexico after 1821).

Several major trails, sometimes referred to as the Emigrant Trails, crossed the Bear River drainage. The Oregon Trail in this area often followed the route of earlier fur trapper foot and horse trails but did not become a wagon trail until 1836. Coming from the east, the main trail takes a sharp north turn at Fort Bridger in southwest Wyoming before heading northwest along the northern banks of the Little Muddy Creek. It crosses over the Bear River Divide and joins the Bear River just south of the Cokeville Meadows National Wildlife Refuge. From there, it never strays far from the Bear River and is most often along the east or north sides of the river. Just west of Soda Springs, where the river cuts to the south, the trail diverges from the river and heads northwest toward Fort Hall. The California Trail follows a similar path through the watershed, but splits from the Oregon Trail at Fort Hall.

The grade of the Union Pacific Railroad, built as a part of the Transcontinental Railroad, crosses the watershed just north of the Bear River Migratory Bird Refuge. The Union Pacific began in Omaha, Nebraska, and headed west until joining the Central Pacific Railroad at Golden Spike, approximately 10 miles to the north of the Bear River Migratory Bird Refuge in 1869. The completion of this railroad and its links to rail systems in the eastern United States had a profound effect on the settlement of the West.

USFWS

American avocets feed in a wetland while cattle graze the adjacent grassland.

The first European resident of the area is reported to have been Thomas "Peg Leg" Smith, who ran a trading post from 1842–57 near Dingle, Idaho, on the northeastern shores of Bear Lake. The influx of settlers accelerated greatly during the early 1850s following the initial waves of Mormon immigrants arriving from the east. The towns of Brigham City and Willard in the southwest corner of the watershed were both founded in 1851 by Mormon pioneers. In 1860, Mormons settled the town of Franklin, Idaho, located along the Cub River just north of the Utah–Idaho boundary, which became the first town settled in what is now Idaho. In 1867, the Fort Hall Reservation near Pocatello, Idaho, was established for the Shoshone and Bannock Tribes.

Socioeconomic Environment

The proposed Bear River Watershed Conservation Area is located in a vast basin covering 14 counties across Idaho, Utah, and Wyoming. The watershed spans roughly 7,500 square miles: 1,500 square miles in Wyoming, 2,700 square miles in Idaho, and 3,300 square miles in Utah (Utah Division of Water Resources 2004).

The 14-county region (which excludes the three out-of-watershed counties) has a population of roughly 2.9 million people (U.S. Census Bureau 2010) (see table LPP–2). Population growth is expected throughout much of the region, with most of the growth centered in the Cache Valley. Located in the western part of the Bear River watershed in Utah, the Cache Valley is the most populated area in the watershed, and its population is estimated to double from 2000 levels to 297,597 by 2050 (Utah Division of Water Resources 2004). Population growth in the Cache Valley is partly due to the valley's proximity to the metropolitan Wasatch Front. In Wyoming, Lincoln County has seen 24.3 percent population growth over the last decade (U.S. Census Bureau 2010), with about 200 new homes built each year (Royster and Gearino 2006), and Uinta County has experienced a 7.0 percent population growth over the decade. Idaho counties within the proposed conservation area have seen less growth, with Bear Lake and Caribou Counties seeing a decline in population over the decade. Of the proposed conservation area counties in Idaho, Franklin and Bannock Counties have experienced the greatest growth, with 12.9 percent and 9.6 percent growth over the decade, respectively.

Total nonfarm employment was more than 265,000 individuals in 2010 (U.S. Census Bureau 2011) in the combined 14-county region. The highest percentage of total employment was found in educational services, health care, and social aid at 20 percent of nonfarm employment. This percentage is, in part, because of the high population and abundance of educational and health care centers in Cache County, Utah (home to Utah State University) and Weber County, Utah. The second and third highest percentage of total employment in 2010 was in manufacturing at 14 percent and retail trade at 12 percent. Agriculture, forestry, fishing, hunting, and mining made up an estimated 4 percent of the total employment by sector.

Mining represents a relatively small percentage of total employment for many of the counties in the region, but has increased slightly since 1998 (U.S. Census Bureau 2011, Headwaters Economics 2011). Mining accounted for less than 1 percent of total employment in 2009 for all but three counties in the 14-county region.

Landownership

The Upper Bear River area is located in parts of Summit County, Utah, and Lincoln and Uinta County, Wyoming. The headwaters of the Bear River, near the border of Summit and Uinta Counties, is forested; the remaining land cover in the high-elevation Upper Bear River area is primarily grassland and shrubland, with about three-quarters of the land used for grazing (Utah Water Research Laboratory 2011). As of 2006, about 63 percent of the land in the Upper Bear River counties was federally owned, primarily by the Bureau of Land Management and the USDA Forest Service; about 24 percent of the land was privately owned, 4 percent was State owned, and 7 percent was tribally owned (Headwaters Economics 2011). The Upper Bear River area is lightly populated. The largest municipalities in the region are Evanston and Cokeville, Wyoming, and Randolph and Woodruff, Utah (Utah Water Research Laboratory 2011).

The Middle Bear River area is located in parts of Bear Lake, Caribou, Franklin, Bannock, Oneida, and Power Counties in Idaho. Grassland and shrubland account for about 77 percent of the land cover in the Middle Bear River counties, and croplands account for about 11 percent of the land cover (Headwaters Economics 2011). As of 2006, urban development accounts for only about 0.2 percent of the land cover in these counties; the largest municipalities in the region are Grace, Preston, Montpelier, Soda Springs, and Malad City, Idaho, and Richmond, Smithfield, North Logan, and Garden City, Utah (Headwaters Economics 2011; Utah Division of Water Resources 2004). As of 2006, landownership in the Middle Bear River counties was 48 percent private, 38 percent Federal, 5 percent State, and 6 percent tribal (Headwaters Economics 2011).

The Lower Bear River area is in parts of Box Elder, Cache, Rich, Weber, and Morgan Counties in

Table LPP–2. Population statistics for Wyoming and counties in and near the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

	Residents (2010)	*Persons per square mile*	*Population % change since 2000*
Utah	2,763,885	33.6	24
Cache County	112,656	96.7	64
Rich County	2,264	2.2	16
Summit County	36,324	19.4	22
Weber County	231,236	401.8	18
Morgan County	9,469	15.5	33
Box Elder County	49,975	8.7	17
Idaho	1,567,582	18.9	21
Power County	7,817	5.6	4
Bannock County	82,839	74.4	10
Oneida County	4,286	3.6	4
Franklin County	12,786	19.2	13
Caribou County	6,963	3.9	–5
Bonneville County*	101,234	55.8	26
Teton County*	10,170	22.6	70
Bear Lake County	5,986	6.2	–7
Wyoming	563,626	5.8	14
Uinta County	21,118	10.1	7
Teton County*	21,294	5.3	17
Lincoln County	18,106	4.4	24

Source: Utah Governor's Office of Planning and Budget (2008).
**Outside the proposed Bear River Watershed Conservation Area.*

Utah. The rich soil and abundant water in this part of the Bear River watershed support a mix of urban and agricultural uses. About 9 percent of the land cover in the Lower Bear River counties is water. Mixed croplands account for 21 percent of the land cover in the Lower Bear River counties, with croplands concentrated in Cache, Weber, and Morgan Counties (Headwaters Economics 2011). As of 2006, about 1.6 percent of the land in these counties is urban development, with much of the development concentrated in the Cache Valley (Headwaters Economics 2011). Major municipalities in the Lower Bear River area include Ogden, Brigham City, Logan, and Tremonton, Utah. As of 2006, landownership in the Lower Bear River counties was 52 percent private, 31 percent Federal, and 6 percent State (Headwaters Economics 2011).

While the population of the proposed Bear River Watershed Conservation Area has declined in two counties in Idaho, some parts of the proposed conservation area as well as areas next to it have experienced significant growth trends over the past decade (see table LPP–2).

Property Tax

Property taxes are assessed based on the value of property. For most types of properties, county assessors use fair market value to determine property tax liabilities. In many States, however, the assessed value of agricultural land is determined based on the productive value of the land rather than on the fair market value of the property. The fair market value of land is the estimate of a property's sale price. This value includes both the productive value of the land and any speculative value associated with the possibility of developing the land.

Conservation easements reduce the fair market value of a property by removing the speculative value associated with possible development; however, conservation easements generally do not affect the productive value of agricultural land. The proposed Bear River Watershed Conservation Area encompasses three States: Idaho, Utah, and Wyoming. In all three States, property taxes for agricultural land are assessed based on the productive value of the land.

Most properties that enter into conservation easement agreements with the Service are classified as agricultural land; therefore, there would be little or no impact on the current property tax base for the 14-county area.

Public Use and Wildlife-Dependent Recreational Activities

According to the "2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation," approximately 2.9 million residents took part in wildlife-associated recreational activities in Idaho, Utah, and Wyoming in 2006 (USFWS 2008a). It was estimated that residents and visitors spent $3.3 billion on wildlife-associated recreational activities in 2006 in the three States combined. Among participants, wildlife watching was the most frequently reported activity followed by fishing and hunting. In Wyoming, 84 percent of individuals surveyed watched wildlife, 27 percent fished, and 13 percent hunted; in Utah, 77 percent watched wildlife, 33 percent fished, and 15 percent hunted; and in Idaho, 75 percent watched wildlife, 35 percent fished, and 19 percent hunted (USFWS 2008a). Following the national trend, wildlife viewing has become increasingly popular, while hunting and fishing have decreased or remained stable in popularity. From 1996 to 2006, it was found that the number of Idaho residents who fished declined by 21 percent while those who hunted declined by 33 percent. Wyoming residents who fished declined by 19 percent, while hunting and wildlife viewing numbers remained relatively constant. During the same timeframe, Utah residents who watched wildlife increased by 30 percent, while hunting and fishing numbers remained relatively constant.

Killdeer at Cokeville Meadows National Wildlife Refuge, Wyoming.

Draft LPP Chapter 3—Threats to and Status of Resources

Threats to the Resources

The diverse habitats in the Bear River watershed support a variety of fish, mammal, reptile, and amphibian species as well as a large number of resident and migratory bird species. The Bear Lake (with Oxford Slough Waterfowl Production Area), Bear River, and Cokeville Refuges provide habitat for waterfowl, wading birds, shorebirds, and landbirds that migrate through these refuges on their way to and from Canada and Alaska. More than 270 different wildlife species have been identified using the habitats associated with the three refuges. The Bear River watershed provides linkages and migration corridors for seasonal movements of wildlife between various habitats within the watershed as well as between other protected lands and ecosystems in the region.

Historically, the abundant wildlife, availability of water, diverse vegetation, productive soil, and favorable topography found in riparian areas attracted both Native Americans and early Euro-American settlers to these areas. As a result, a high percentage of riparian habitat is privately owned today. Most communities in the Bear River watershed are located near riparian zones, which are used for agriculture, recreation, travel, water development, and housing (Wyoming Game and Fish Department 2010). These types of development are expected to continue to occur in riparian corridors and valleys within the watershed. An increase in development along riparian areas will likely remove areas of connectivity between wetland and upland habitat types. Stream quality could become degraded from continued development, adversely affecting Bonneville cutthroat trout, leatherside chub, and many other native fish species. With increasing development, more barriers to fish passage are likely to be constructed.

Cache County is one of the fastest growing counties in Utah, with a 64 percent population increase since 2000. With nearly 83,000 residents, Bannock County has the largest population of the Idaho counties in the watershed and has grown by 10 percent since 2000. Lincoln County, home to the Cokeville Meadows National Wildlife Refuge, has grown by 24 percent since 2000. Just to the north of Cokeville are the Star Valley and the Teton Valley, which span the Idaho–Wyoming border into Teton County, Idaho, and Teton County, Wyoming. The populations in Teton County, Idaho, and Teton County, Wyoming, have increased by 70 percent and 17 percent, respectively, since 2000.

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Two willets keep a watchful eye over a nearby wetland.

With projected development patterns (Utah State University 2010), ground-water aquifers will receive more demand, resulting in potential degradation to the hydrology of some wetland areas and affecting the three refuges in the Bear River watershed.

By planning for future expected development and other changes in land use, we can maintain the quality and quantity of habitat that more than 270 wildlife species depend on.

Effects on the Physical Environment

The physical environment comprises the water and soil resources and climate of the Bear River watershed. In addition, climate change is discussed. Anticipated effects on these features are described.

Water and Soil Resources

Conservation easements under the proposed conservation area would hold the historical water rights on the easement property and not allow any water rights to be sold or otherwise separated from the property. The easements would not allow changes to or alterations in points of diversion, timing, or place of use for any water rights. Historical water use would be maintained in accordance with current practices.

Water resources on up to 920,000 acres of conservation easements would be protected from increased nonpoint source pollution from residential subdivisions, commercial development, and draining of wetlands, all of which are prohibited under the proposed easement program. A long-term commitment to keeping vegetative cover with minimal soil disturbance would help conserve local microclimate patterns and soil processes. By limiting development on some prime agricultural and wildlife habitat areas, communities would be ensuring future ground-water supplies and reducing the need to develop more water resources to meet growing demand (Toth 2010). This protection would improve water resources throughout the Bear River watershed as well as for the three refuges. This alternative may also negatively affect local mitigation efforts by reducing ways to conserve and store carbon through land protection and habitat restoration.

Climate

By protecting habitat, reducing fragmentation, and keeping connectivity, the proposed action would help maintain the ability of native species and ecosystems to adapt to a changing climate. Climate change mitigation efforts would be positively affected by this alternative because carbon sequestration now provided by native vegetation would be conserved.

While exact temperature and precipitation changes and habitat and wildlife response to those changes are unknown, it is clear that changes are coming to the Bear River basin. Keeping adequate densities of wetlands, robust riparian corridors, and open spaces will become increasingly important to allow fish and wildlife to adapt to a changing environment.

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Bear River South of Woodruff Narrows, Wyoming

Historically, the destruction of wetlands through changes in land use has had the largest effects on the carbon fluxes and consequent radiative forcing (the measure of the amount that the Earth's energy budget is out of balance) of North American wetlands. The primary effects have been a reduction in their ability to sequester carbon (a small to moderate increase in radiative forcing), oxidation of their soil carbon reserves upon drainage (a small increase in radiative forcing), and reduction in methane emissions (a small to large decrease in radiative forcing).

USFWS

A white-faced ibis foraging in a shallow wetland.

Effects on the Biological Environment

This section describes the anticipated effects on habitat and wildlife. The Bear River watershed's habitat ranges from river and the adjacent riparian areas to wetland, grassland, and shrubland. This section also describes effects on the wildlife and species of concern that use these habitats.

Habitat and Wildlife

The availability of large, intact areas of diverse habitat types is essential for various wildlife species. Habitat connectivity provides a migration corridor between winter and summer ranges for mule deer, pronghorn, and elk; between breeding, nesting, and brood-rearing areas for birds including neotropical migrants; and between spawning and rearing habitat for native fish. Connectivity between different habitat types increases wildlife population resiliency by facilitating movement to new areas during environmental challenges such as drought or flooding as well as by allowing an exchange of individuals and genes from different subpopulations. Privately owned lands next to the Bear Lake, Bear River, and Cokeville Meadow Refuges provide connectivity between the refuges and other Federal lands, thus creating a larger block of permanently protected wildlife habitat. Through protection of important migration corridors and habitats, the proposed action would have long-term beneficial effects on fish and wildlife populations.

Riverine Areas, Riparian Areas, and Wetland

The Bear River is the lifeblood of the three refuges located along its course. Large populations of waterfowl, shorebirds, and native fishes depend on the refuges and adjacent habitat areas to meet their breeding, migration, and nutritional needs. The proposed action would protect privately owned wetlands, irrigated meadows, and fields that now provide important wildlife habitat. This would help maintain healthy riparian areas that recharge aquifers, reduce soil erosion, filter chemical wastes, moderate stream temperatures, and buffer water loss from upland drainages.

Protecting essential travel corridors for wildlife by maintaining riparian areas will become an increasingly important part of effective mitigation plans for human development as well as climate change ("Wyoming State Wildlife Action Plan" 2010). Additionally, connectivity among different riverine habitat types is important for allowing fish access to suitable spawning and rearing grounds while providing adequate main stem habitat for adult growth and survival.

Conservation of riparian areas would benefit a variety of species of special conservation concern that depend on riparian habitat, such as Lewis's woodpecker and many neotropical migratory birds.

Upland, Grassland, and Shrubland

The proposed action would conserve large patches of sagebrush that occur on the easements that are targeted for acquisition. Keeping and restoring existing large patches of sagebrush would create a mosaic of sagebrush habitats that would be an important step toward reversing the population declines of sagegrouse and other sagebrush-dependent species, such as sage sparrow, sage thrasher, and Brewer's sparrow (Hanser and Knick 2011).

Species of Special Concern

With the additional habitat protection measures in the watershed under the proposed action, there is a

greater likelihood that common species can be kept common. There are relatively few species with Federal status in the Bear River watershed. Under the proposed action, there would be a reduced probability of more species needing to be added to the State lists of conservation concern or to be federally listed as threatened or endangered.

The effects of the proposed easement program on endangered, threatened, and candidate species vary by the specific area under consideration because of differences in species' ranges, their habitat affinities and restrictions, and elevations.

Effects on Cultural Resources

As a Federal agency, the Service is required to comply with numerous laws pertaining to cultural resources including the National Historic Preservation Act (16 U.S.C. 470 et seq., Public Law 89–665); the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa–470mm, Public Law 96–95), as amended; and the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001 et seq., Public Law 101–601). Although conservation easements would preclude or limit most forms of surface disturbance, these requirements may not apply to or be fully effective in protecting cultural resources on private lands with easements. The proposed action provides more protection to cultural resources than does the no-action alternative.

Effects on the Socioeconomic Environment

This section describes the anticipated effects on landownership, land use, public use, and development.

Landownership and Land Use

The proposed action would affect only lands where the Service has acquired a conservation easement. The location, distribution, and sale of development rights by landowners on adjacent lands without Service easements would not be affected. Traditional agricultural uses such as ranching, grazing, and haying would be allowed to continue on easement lands.

Because this alternative would keep open space on a large scale, it would preserve a rural lifestyle and associated tourism and economic activities. The purchase of an easement would not result in a transfer of land title, so private landowners would continue to pay property taxes.

Because the sale of conservation easements provides landowners with more revenue, easement purchases may inject new money into local economies. Landowners may spend some percentage of this money on such items as purchasing new real estate, consumer goods, or local services. This spending activity would directly affect local industries such as construction and various service sectors.

Conservation easements may help keep regional character by protecting working landscapes and a traditional agricultural way of life. Land with historical commercial uses such as ranching, forestry, and farming is often compatible with or beneficial to wildlife refuge objectives (Jordan et al. 2007, Rissman et al. 2007). Conservation easements provide financial benefits for landowners that enable them to preserve the natural and historic value of their farm, ranch, and open space lands and to pass this legacy on to their children and grandchildren.

The easement program would have no effect on tribal jurisdiction or tribal rights, because it is outside of reservation lands and deals only with willing private sellers.

Public Use

Conservation easements bought on private tracts would not change the landowners' rights to manage public use and access to property. Under the proposed easement program, landowners would keep full control over private property rights, including hunting and fishing on their lands. Under the proposed action, wildlife-dependent recreational opportunities such as hunting, fishing, and wildlife observation would not be diminished because of declining wildlife populations. According to the "2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation," approximately 2.9 million residents took part in wildlife-associated recreation activities in Idaho, Utah, and Wyoming in 2006. It was estimated that residents and visitors spent $3.3 billion on wildlife-associated recreation activities in the three States combined (USFWS 2008a).

Development

The proposed action would protect up to 920,000 acres of wetland, riparian, grassland, and shrubland habitat from more fragmentation and loss by precluding surface occupancy and infrastructure development.

Subsurface Development

Conservation easements typically do not affect subsurface estates (mineral, oil, and gas deposits) because the Service only acquires rights associated with surface ownership. The proposed easement program would preclude mining or oil and gas exploration or development requiring surface occupancy on easement land only when the landowner owns the subsurface rights. In many places, including in the Bear River watershed, the subsurface estate has been severed from surface ownership, and the landowner does not own the subsurface rights. In these cases, the easement that the Service acquires from the landowner is junior to the subsurface rights.

For easements that have been put in place on land where the owner has not sold or leased the mineral or subsurface estates (mineral, oil, and gas deposits), the Service easement would be senior to any subsurface interests later acquired by a developer. Because development of the mineral estate could significantly affect the resources that the Service is attempting to protect, the Service would require that a potential developer access minerals from off site as a term of the easement.

Commercial and Residential Development

The Service's easement program would enhance the protection of wildlife species dependent on unfragmented upland habitat through protection from surface disturbance or development of commercial or residential infrastructure. This program would also provide financial compensation to landowners through the sale of easements, offsetting potential revenue loss from the sale of development rights or leases. The proposed project would affect only lands on which the Service has acquired a conservation easement. Development on adjacent lands that do not have Service conservation easements would not be limited.

Land acreage with potential for wind energy development is relatively low in Idaho (1.67 percent) and Utah (1.19 percent), while Wyoming has a higher development potential at 43.58 percent (National Renewable Energy Laboratory 2011). Most land with potential for wind energy development in each State would still be available under the proposed action.

Designated open space and protected natural areas can increase surrounding property values (see McConnell and Walls 2005 for a comprehensive review). The value of open space for nearby property values would vary, depending on landscape characteristics and proximity to the conserved area (Kroger 2008). Permanence of the open space also influences property values. Typically, open space that is permanently protected—such as refuge lands and lands protected with perpetual conservation easements—would generate a higher enhancement value to local properties than land that has the potential for future development (Geoghegan et al. 2003). Location and demographic factors in the region can also influence the relative level of property enhancement value. For instance, open space may generate larger amenity premiums for property in more urbanized areas and where median incomes are higher (Netusil et al. 2000, Vrooman 1978, Phillips 2000, Crompton 2001, Thorsnes 2002). Private lands protected by conservation easements benefit residents through increased biodiversity, recreational quality, and hunting opportunities on adjacent publicly accessible wildlife refuges and on some private lands (Rissman et al. 2007).

Other Conservation Impacts

Under the proposed action, wetland, riparian, grassland, and shrubland habitats would remain intact. Because this alternative keeps intact wildlife habitat on working lands through conservation easements, ecosystem services would be available for local residents (Millennium Ecosystem Service Assessment 2005).

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American avocets are common throughout the watershed.

Ecosystem services such as pollination, water purification, nutrient cycling, carbon sequestration, soil conservation, and control of pest insect populations by birds are often unrecognized, or are considered "free." These services would not be provided in areas that have undergone residential or commercial development.

The proposed action would help protect valuable ecosystem services as shown in figure LPP–7. Furthermore, it would prevent the prohibitively high cost of future habitat restoration.

Wetlands in both native and restored habitat had the greatest value for each of the ecosystem services examined. The most valuable ecosystem services that wetlands provided were disturbance regulation and nutrient cycling. The greater value per area of wetlands did not translate to an equally large disparity in total value because the total area of wetlands is substantially less than that of terrestrial ecoregions within the United States (Dodds et al. 2008).

Conservation easements on private lands would strengthen habitat resiliency and provide opportunities for wildlife movement and adaptation for years to come.

Potential benefits to public safety are another benefit of conservation easements that limit development in wetlands and riparian areas. Some areas within the Bear River watershed have a high to moderate likelihood of a natural disaster that could cause harm to both the residents and structures in these areas. The major hazards that are located within the watershed include flooding, landslides, earthquakes, and soils that are susceptible to liquefaction (Toth 2010).

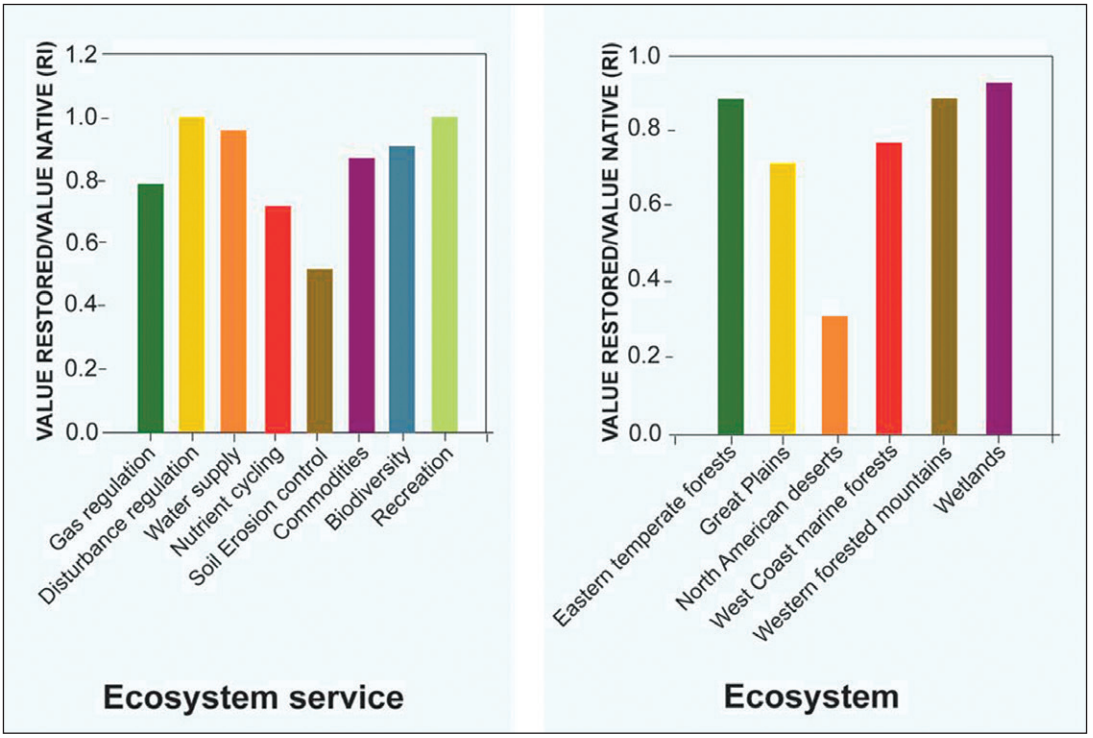

Figure LPP–7. Chart of the relative native and restored benefits of ecosystem goods and services. *Source: Dodds et al. 2008.*

Note: The relative value is determined as the ratio of estimated benefits derived from native and restored acreages per year.

Unavoidable Adverse Impacts

No direct or indirect, unavoidable, adverse impacts to the environment would result from the selection of the proposed action. The easement program would not result in unavoidable adverse impacts on the physical or biological environment. The selection of an approved boundary would not, by itself, affect any aspect of landownership or values. Management of lands to protect wildlife habitat would benefit ranching operations, but would limit future development options for landowners.

Additional conservation easements acquired by the Service could have unavoidable minimal to moderate adverse effects on the local economy by precluding new mining oil, gas, wind, and residential development on easement lands. However, these

impacts would be offset in part by protecting these areas from adverse impacts to watersheds, which are important to aquifer recharge and water quality, from further degradation or loss of native ecosystems, and from conversion of prime agricultural lands.

Irreversible and Irretrievable Commitments of Resources

There would not be any irreversible or irretrievable commitments of resources associated with establishing the conservation easement program; however, any easements that are acquired with Land and Water Conservation Funds would require an irretrievable and irreversible commitment of resources (such as expenditures for fuel and staff for monitoring) for the long-term administration of the easement provisions.

The introduction of new residential and commercial infrastructure to the Bear River watershed would be greatly restricted on conservation easement lands, so this alternative would reduce the likelihood of an irretrievable loss of habitat associated with development. The irretrievable loss of habitat caused by the development of new residential and commercial infrastructure in the Bear River watershed that would eventually lead to an irreversible loss of both species and habitat could be minimized under the proposed action.

With the protection measures provided by the wetland conservation easements, some of the current water uses and applications could be retained and irreversible impacts to wetlands and riparian ecosystems related to water loss could be reduced or avoided.

Short-Term Use versus Long-Term Productivity

This section describes the short-term effects versus long-term productivity from the proposed action.

The increased ability to acquire perpetual conservation easements would conserve important wetland and upland areas and reduce long-term loss and fragmentation of important habitats. These habitats are important for a variety of wildlife species, including threatened and endangered species.

The proposed conservation easement program would help maintain the Bear River watershed's long-term biological productivity, biological diversity, linkages, and migration corridors to other ecosystems and adjacent large blocks of protected land.

The ability to sell conservation easements would provide an immediate economic benefit to participating landowners while keeping the long-term agricultural heritage and productivity of the area.

These habitat types would be preserved not only for the species that now depend on them, but also so that future generations of Americans may enjoy and benefit from them. The public would retain long-term opportunities for wildlife-dependent recreational activities.

Cumulative Impacts

Cumulative impacts are defined by the National Environmental Policy Act as the impacts on the environment that result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR § 1508.7).

This section describes the cumulative impacts on the environment that may result from the combination of reasonably foreseeable actions with other biological and socioeconomic conditions, events, and developments.

Past Actions

Previous land protection efforts within the Bear River watershed have included the establishment of three national wildlife refuges—Bear Lake National Wildlife Refuge (18,089 acres), Bear River Migratory Bird Refuge (74,421 acres), and Cokeville Meadows National Wildlife Refuge (9,259 acres)—and the Thomas Fork Unit of Bear Lake National Wildlife Refuge (1,015 acres), and the Oxford Slough Waterfowl Production Area (1,878 acres). The Sagebrush Steppe Regional Land Trust, Wyoming Land Trust, and Wyoming Stock Growers Agricultural Land Trust have worked with a variety of partners to acquire conservation easements in the watershed.

Present Actions

The Service's proposed Bear River Watershed Conservation Area easement program, which would establish up to 920,000 acres of conservation easements in the Bear River watershed, is the only known present action of similar scope and scale for land protection in the region. Once approved, it would take several years for the program to begin to have a noticeable effect. Acquisition of easements would depend on available funding and willing sellers.

White-faced Ibis at Sunset

Reasonably Foreseeable Future Actions

Reasonably foreseeable actions are actions and activities that are independent of the proposed action but could result in cumulative or additive effects when combined with the proposed action. They are anticipated to occur regardless of which alternative is selected. Commercial (oil and gas, mining, and wind) and residential development, increased water demands, and future conservation efforts by a variety of organizations are the primary reasonably foreseeable actions occurring in the Bear River watershed.

Development

Overall, mining represents a relatively small percentage of total employment for many of the counties in the region, but it has increased slightly since 1998 (U.S. Census Bureau 2011, Headwaters Economics 2011). In particular, nonmetallic mineral mining increased by 124 percent, oil and gas extraction decreased by 64 percent, and metal ore mining decreased to zero jobs by 2009 (U.S. Census Bureau 2011, Headwaters Economics 2011). One of the most economically significant nonmetallic mining activities during the past 50 years has been phosphate extraction, with roughly 40 percent of the U.S. reserves located in southeastern Idaho (Van Every 2004).

The acreage with potential for wind energy development is relatively low in Idaho and Utah, with 1.67 percent and 1.19 percent of the States available for such development, respectively. Wyoming has a higher available potential for wind energy development at 43.58 percent (National Renewable Energy Laboratory 2011). Most of the land with potential for wind energy development would still be available under the proposed action.

Population growth is expected throughout much of the region, with most of the growth centered on the Cache Valley. Located in the western part of the Bear River watershed in Utah, the Cache Valley is the most populated area in the watershed. It has experienced a population increase of 64 percent since 2000, and its population is estimated to double by 2050 (Utah Division of Water Resources 2004).

Lincoln County, home to the Cokeville Meadows National Wildlife Refuge, has grown by 24 percent

since 2000, giving it the fastest growing population among the Wyoming counties in the proposed conservation area.

Bannock County has the largest population of the Idaho counties in the watershed and has grown by 10 percent since 2000. Two other Idaho counties, Caribou County and Bear Lake County, have decreased in population by 5 percent and 7 percent, respectively.

The proposed action would protect up to 920,000 acres of wildlife habitat from the combined effects of various future development activities by precluding development and the resultant increase in infrastructure and fragmentation of habitat.

Other Conservation Efforts

The USDA's Conservation, Grassland, and Wetland Reserve Programs provide ongoing programs in the watershed. Additionally, many nongovernmental organizations are active in the area including Bridgerland Audubon, The Nature Conservancy, Ducks Unlimited, Trout Unlimited, and Wyoming Stock Growers Agricultural Land Trust. These organizations are expected to continue to offer multiple programs to landowners. The proposed action would augment these current conservation efforts by collaborating with landowners to protect wildlife, fisheries, and working agricultural lands. The Service would continue to work with other agencies, organizations, and individuals to ensure conservation of migratory birds, threatened and endangered species, and other species of special concern.

The Service's Partners for Fish and Wildlife program would likely continue to help landowners in the watershed under either alternative. With the proposed action, Partners for Fish and Wildlife efforts in the watershed may increase because of more Service interaction with local landowners and the added benefit of habitat restoration and enhancement on lands protected by perpetual conservation easements.

Landscape-Scale Conservation

Through the proposed easement program, up to 920,000 acres of privately owned wetland, riparian, grassland, and shrubland habitats could be added to the 2.53 million acres within the proposed project area that already have some level of protection. This would have long-term positive impacts on wildlife habitat and result in the long-term conservation of migratory birds, threatened and endangered species, resident wildlife species, native plants, and the overall biological diversity of the proposed Bear River Watershed Conservation Area.

Draft LPP Chapter 4—Project Implementation

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Riparian habitat along the Thomas Fork of the Bear River, Idaho

Land Protection Options Not Analyzed in Detail

During development of the alternatives for this project, the Service considered the following land protection options:

- voluntary landowner zoning
- county zoning
- fee-title acquisition
- smaller project area
- short-term easements
- expansion of the project

The Service found that none of the above protection options would meet the purpose, need, or objectives of the proposed Bear River Watershed Conservation Area, and they were therefore not analyzed in further detail in the EA.

No Action

Under the no-action alternative evaluated in the EA, habitat enhancement or restoration projects on private lands, such as water developments, grazing systems, and grassland management, could continue through cooperative efforts with private landowners. Public agency and private land trusts would continue conservation efforts by securing easements.

The large numbers of native birds, fish, and other wildlife supported by the diversity of habitat types in the Bear River watershed are a tribute to the conservation efforts of ranchers, landowners, and a variety of agencies and organizations. Although these conservation efforts have been essential to sustaining wildlife populations in the past, they are not expected to be enough to meet future development and climate change challenges.

Under the no-action alternative, many of the privately owned wetlands and riparian corridors

vulnerable to development would be lost. The burden to protect wetlands and riparian and upland areas would rest more heavily on private landowners without compensation. Future wetland protection would rely primarily on the Wetland Reserve Program and conservation organizations such as Ducks Unlimited, The Nature Conservancy, and Trout Unlimited. The future of wildlife and the habitat they depend on would be less certain without a collaborative landscape-scale conservation project like the proposed conservation area.

Proposed Easement Program

Conservation easements are the most cost-effective, politically acceptable means to ensure landscape-scale level protection of crucial wildlife habitat within the proposed Bear River Watershed Conservation Area. Although fee-title acquisition would be preferable in some locations, it is not required and is not preferable to establishing conservation easements in the Bear River watershed. Fee-title acquisition would triple or quadruple the cost of land acquisition besides adding significant increases in long-term management and operational costs for the Service. The Service views conservation easements as the most viable means of protecting habitat integrity and wildlife resources on the scale necessary to maintain the resiliency of the proposed conservation area and its connectivity to adjacent ecosystems.

Under the proposed easement program, the Service would seek to buy perpetual conservation easements from willing sellers on privately owned lands that are providing valuable wildlife habitat. The easement contract language would reduce confusion about any restrictions, facilitate enforcement, and specify the necessary level of protection and limitations on development for wetland and upland habitat for trust species.

The Service has standard conservation easement agreements that have been used successfully in other easement conservation areas of the United States. With appropriate modifications for the resources of the Bear River watershed, the Service would develop a standard document with similar language and terms for the proposed Bear River Watershed Conservation Area easements.

Development for residential and commercial or industrial purposes, such as energy and aggregate extraction, may not be permitted on properties under a conservation easement. Alteration of the natural topography and conversion of native grassland, shrubland, or wetland to cropland would be prohibited. In addition, the conservation easements would prohibit the draining, filling, or leveling of protected lands.

All land would remain in private ownership, and property tax and land management, including invasive weed control, would remain the responsibility of the landowner. The Service would seek to provide participating landowners with more help for invasive weed control and habitat restoration. Control of public access to the land would remain under the control of the landowner.

The easement program would be managed by staff located at the three wildlife refuges located within the Bear River watershed. The Service staff located at Bear Lake National Wildlife Refuge in Montpelier, Idaho; Bear River Migratory Bird Refuge in Brigham City, Utah; and Cokeville Meadows National Wildlife Refuge in Cokeville, Wyoming, would be responsible for monitoring and administering all easements on private land. Monitoring would include periodically reviewing land status through correspondence and meetings with the landowners or land managers to make sure that the stipulations of the conservation easement are being met. Photo documentation would be used at the time the easements are established to document baseline conditions.

Project Objectives and Action

The purposes of establishing the Bear River Watershed Conservation Area are to:

- maintain healthy populations of native wildlife species, including migratory birds and threatened and endangered species;
- protect and maintain water quality and quantity;
- conserve aquatic, riparian, wetland, and upland habitats associated with the full diversity of Bear River ecosystems;
- provide wildlife habitat connectivity and migratory corridors;
- promote partnerships to coordinate implementation of watershed-level wildlife conservation actions;
- increase the resiliency of the watershed to sustain wildlife and important habitat during climate and land use changes.

Through the Bear River Watershed Conservation Area project, the Service proposes to buy or receive through donations up to 920,000 acres of perpetual conservation easements from willing landowners within the watershed boundary. The Service seeks to connect existing protected lands and to complement

ongoing conservation efforts by working with partners. Within the project boundary, the Service would strategically identify the most important areas to acquire wetland and upland conservation easements from interested landowners on a voluntary basis.

Evaluation of Easement Potential

The relative importance of a potential easement would be determined by the ability of the parcel to help protect the habitat types that trust wildlife resources and species of conservation concern depend on. The prioritization modeling described below, along with evaluation criteria that would be developed, would be used by Service biologists and realty specialists to evaluate individual tracts of land to determine which should be considered as the "best of the best" for habitat conservation.

Contaminants and Hazardous Materials

Fieldwork for pre-acquisition contaminant surveys would be conducted, on a tract-by-tract basis, before the purchase of any land interest. Any suspected problems or contaminants requiring more surveys would be referred to contaminants specialists located in the Service's Ecological Services offices in Idaho, Utah, or Wyoming to make sure that policies and guidelines for contaminants assessment are followed before any easements are acquired.

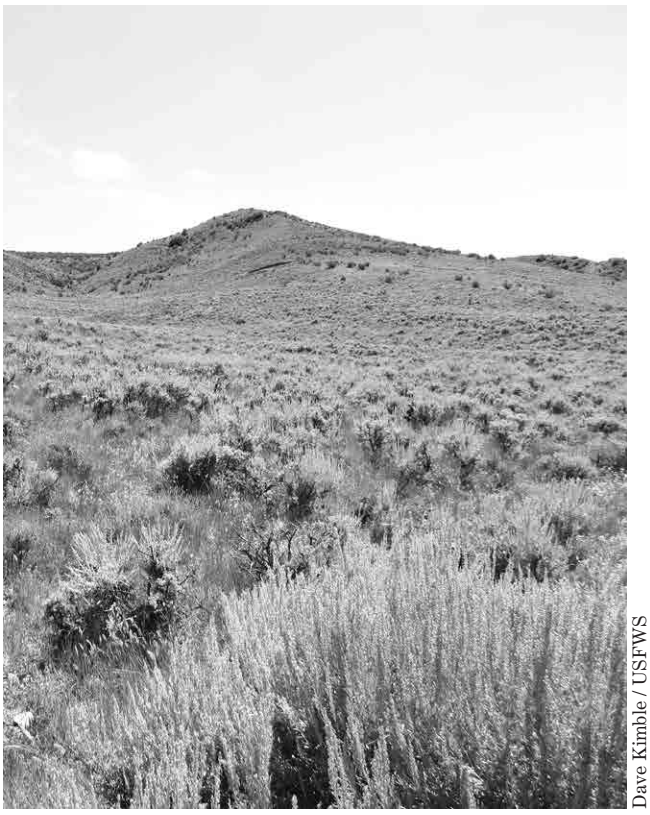
Cost of Project Implementation

The per-acre cost for conservation easements would vary by location in the watershed, habitat type, and the type of restrictions or rights acquired through the easement. Easements would be valued by a qualified outside appraiser using an adjusted land value (Service policy 341 FW6) based on a percentage (usually between 20 percent and 50 percent) of the full fee-title value of the land. Land values within the proposed conservation area vary from $400 per acre to $3,700 per acre, depending on whether the land is upland or wetland and irrigated or non-irrigated, and where it is located in the watershed. Based on a watershed-wide average cost of $810 per acre, the one-time initial cost for acquisition of easements is estimated to be about $745 million if all the potentially approved acreage is eventually acquired. Costs for landowner contacts and staff time would be divided among the three refuges and would depend on the level of landowner participation and available funding.

Easement Acquisition Funding

The primary source for acquisition of easements in the proposed Bear River Watershed Conservation Area would be Land and Water Conservation Funds. These funds are not derived from general taxes; rather, they are derived primarily from Outer Continental Shelf oil and gas lease revenues, motorboat fuel taxes, and the sale of surplus Federal property. Land and Water Conservation Funds are intended for land and water conservation projects; funding is subject to annual appropriations by Congress for specific acquisition projects.

Money from other sources may also be considered for use in the proposed project area. If approved by the Migratory Bird Conservation Commission, Migratory Bird Conservation Funds from the sale of Federal Duck Stamps may also be used for wetland conservation. Management activities associated with easements may be funded through sources such as The Nature Conservancy, Partners for Fish and Wildlife, and other private and public partners. Additionally, the Service would consider accepting voluntary donations of easements.



Dave Kimble / USFWS

Sagebrush habitat in the Bear River watershed.

Ecosystem Management and Landscape Conservation Cooperatives

To successfully implement the Bear River Watershed Conservation Area, the Service would work with the three landscape conservation cooperatives that encompass the proposed project area. The Great Northern, Great Basin, and Southern Rockies Landscape Conservation Cooperatives cover parts of 10 western States and part of Canada (see figure LPP–8). Landscape conservation cooperatives function across broad landscapes with many partners at the scale necessary to address the needs of wildlife populations.

Strategic Habitat Conservation and Protection Priorities

Strategic habitat conservation (see figure LPP–9) incorporates five key principles into an ongoing process that changes and evolves:

- biological planning (setting targets)
- conservation design (developing a plan to meet the goals)
- conservation delivery (implementing the plan)

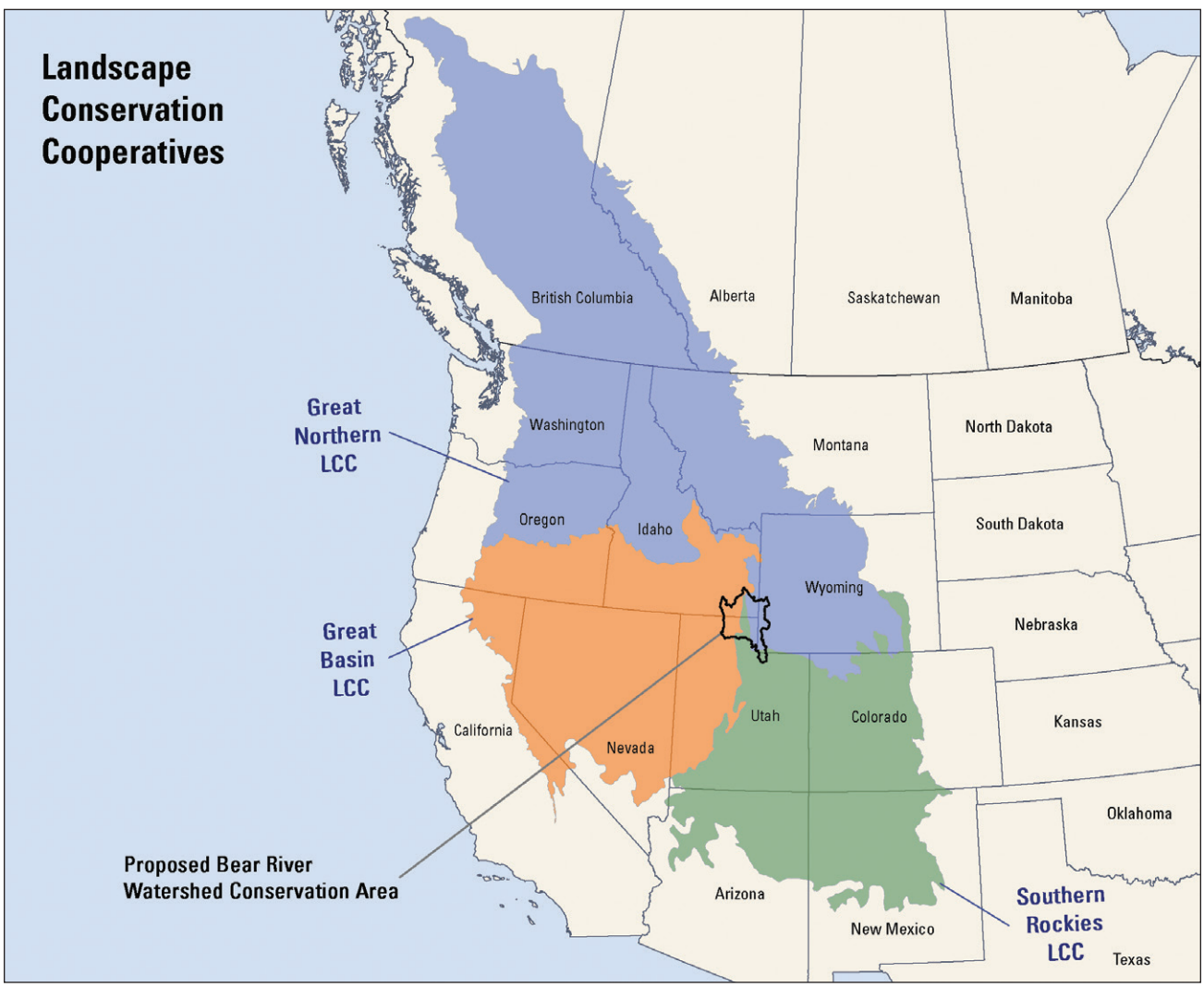


Figure LPP–8. Map of the three landscape conservation cooperative areas that cover the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

- monitoring and adaptive management (measuring success and improving results)
- research (increasing our understanding)

These steps are essential in dealing with a range of landscape-scale resource threats, such as development, invasive species, and water scarcity—all magnified by accelerating climate change.

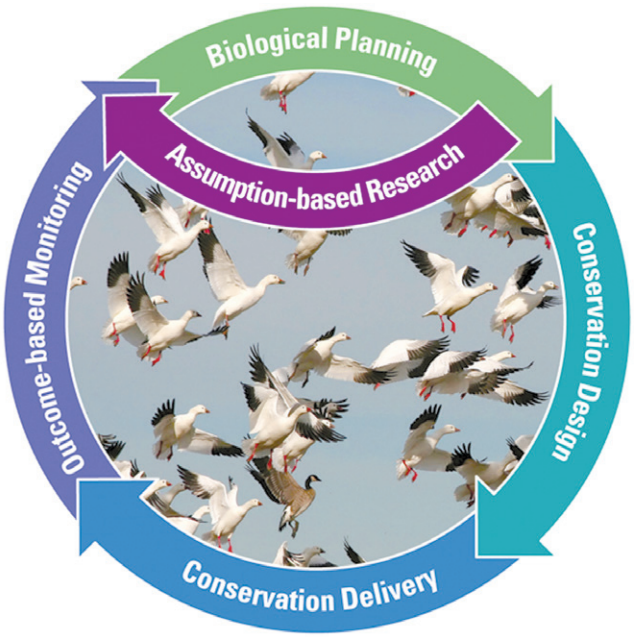


Figure LPP–9. Elements of strategic habitat conservation.

Biological Planning

Biological planning requires the identification of priority species, development of population objectives, and identification of landscape-level limiting factors that keep the populations of priority trust species below desired levels.

The need and opportunity for strategic conservation to benefit fish and wildlife in the Bear River watershed are articulated in the following regional plans reviewed by the planning team:

- "Conservation Action Plan for the Bear River Watershed"
- State Wildlife Action Plans for Idaho, Utah, and Wyoming
- "Intermountain West Regional Shorebird Plan"
- "Intermountain West Waterbird Conservation Plan"
- "Partners In Flight"
- "Audubon Society Globally Important Bird Areas"
- "National Fish Habitat Action Plan 2006"
- "North American Waterfowl Management Plan"
- "U.S. Shorebird Conservation Plan"

Based on these plans and input from local stakeholders and partners, initial biological planning uses four focal or "surrogate species" to model the distribution and habitat needs of a larger group of wildlife species with similar needs. This information would also be used to set priorities for Service conservation efforts within the proposed project area.

Protection Priorities

The Service and its partners recognize the tremendous opportunity within the Bear River watershed to expand existing blocks of conservation lands, including lands under fee-title or easement ownerships by State, Federal and conservation-oriented nongovernmental organizations. There is considerable interest by landowners in an additional landscape-scale conservation effort and funding source within the proposed conservation area.

Determination of which habitat resources are the most important to conserve for the long-term sustainability of wildlife populations requires a prioritization strategy. The Service evaluated the conservation priorities and concerns in many regional plans, including the "North American Waterfowl Management Plan," "Intermountain West Joint Venture Waterbird and Shorebird Plans," Partners in Flight plans, State Wildlife Action Plans (Idaho, Utah and Wyoming), and the comprehensive conservation plans under development for the three national wildlife refuges.

In applying conservation ecology, focal or surrogate species have been used as a practical bridge between single- and multiple-species approaches to wildlife conservation and management prioritization. Initial biological planning by the Service used four focal species to model the distribution and habitat of a larger group of wildlife species with similar needs.

Focal Species

Bonneville Cutthroat Trout. All three State comprehensive wildlife strategies identified the Bear River and its tributaries as playing an important role in providing habitat for an assemblage of native cool- and cold-water fish species and for Bonneville cutthroat trout in particular.

Bonneville Cutthroat Trout

Once thought to be extinct because of habitat loss and overharvesting, Bonneville cutthroat trout were rediscovered in recent decades, with relatively pure populations continuing to persist along the periphery of the Bonneville basin in Utah, Idaho, Wyoming, and Nevada. The Bear River watershed supports the largest remaining migratory populations, including both fluvial and adfluvial forms, while other metapopulations and strongholds also occur in the Northern Bonneville basin (Haak et al. 2011).

Declines in populations of native salmonids, including Bonneville cutthroat trout, can result from the combined effects of habitat degradation and fragmentation, blocked migration corridors, degraded water quality or quantity, angler harvest and poaching, entrainment into diversion canals and dams, nonnative species interactions, and other factors (USFWS 2002). The quality of riparian habitat also greatly influences the quality of aquatic habitat. Riffle-dwelling species such as longnose dace and riffle-spawning salmonids require fine sediment levels associated with healthy riparian vegetation. Riparian habitat is also required by many amphibian and reptile species.

Bonneville cutthroat trout is used to represent a variety other native fish species found in the Bear River watershed including northern leatherside chub, mountain whitefish, mottled and Paiute sculpin, longnose and speckled dace, redside shiner, Utah sucker, and mountain sucker.

Sage Thrasher and Greater Sage-Grouse. Sagebrush ecosystems are among the most imperiled in North America because of a variety of human disturbances. Sagebrush habitat has been altered and fragmented, resulting in the decline in both the numbers and the distribution of many of the more than 350 species that depend on sagebrush habitat for all or part of their life cycles (Wisdom et al. 2005.) Shrub–steppe and grassland habitats make up about 60 percent of the Bear River watershed land cover that supports such species as greater sage-grouse, sage thrasher, sage sparrow, Columbian sharp-tailed grouse, burrowing owl, and long-billed curlew, all of which have been listed as "Species of Greatest Conservation Need" in Idaho, Utah, and Wyoming.

Habitat shifts have major implications for sagebrush-dependent vertebrates including sage thrasher, greater sage-grouse, and sage sparrow (Knick et al. 2003). Maintaining large areas of intact sagebrush is considered crucial to the long-term persistence of sage-grouse (Aldridge et al. 2008) as well as other sagebrush-dependent species.

Hanser and Knick (2011) found that the diversity of sagebrush habitats used by greater sage-grouse may provide an effective umbrella for a broader community of passerine bird species associated with sagebrush that are also declining in numbers. Brewer's sparrow, sage sparrow, and sage thrasher were found to have moderate to strong associations with sage-grouse. However, it is important to analyze the habitat needs of grouse and passerines separately due to the large difference in the scale of home range sizes as well as their specific habitat needs within sagebrush communities.

Sage-grouse are considered a landscape-scale species (Connelly et al. 2004, Crawford et al. 2004), and home ranges for individual sage-grouse may vary from hundreds to thousands of acres (Connelly et al. 2004, Rowland et al. 2006). Migratory populations of sage-grouse may use areas of 1,042 square miles (2,700 square kilometers) or more in size (Connelly et al. 2000 and Leonard et al. 2000). By contrast, territories for many passerines, such as sage thrashers and sage sparrows, are about 200 acres for an individual bird (Rowland et al. 2006, Martin and Carlson 1998). To persist, nesting thrasher populations require patches of sagebrush–steppe of at least 247 acres (100 hectares) (Casey 2000, Nicholoff 2003).

Sage-grouse use a variety of patch sizes arranged in a mosaic across the landscape, a reflection of their high mobility and large home ranges (Connelly et al. 2004, Crawford et al. 2004). Sage thrasher populations are found to be positively correlated with specific landscape characteristics, such as structure (for example, presence of "robust" woody plants like big sagebrush), increasing horizontal and vertical heterogeneity, and high horizontal patchiness. Sage thrasher occurrence is greater in shrub steppe located on loamy and shallow soils than on sandy soils (Vander Haegen et al. 2000), Thrasher populations seem to be negatively correlated with grass cover and spiny shrubs (for example, hopsage and budsage) (Rotenberry and Wiens 1980, Wiens and Rotenberry 1981, Dobler et al. 1996). Research suggests that thrashers do best in less disturbed communities that approach climax conditions (Vander Haegen et al. 2000); however, whether they are adversely affected by habitat fragmentation seems to be an unresolved

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Sage Thrasher

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Greater Sage-Grouse

issue (Knick and Rotenberry 1995, Vander Haegen et al. 2000, Nicholoff 2003).

A 2006 assessment by Rowland et al. found that the geographic ranges of sagebrush-dependent species overlap sufficiently with those of sage-grouse that most of their habitat falls within the range of sage-grouse. However, when the spatially explicit overlap in habitats for target species and sage-grouse was accounted for, only 10 of the 39 target species had their habitat both shared with sage-grouse and within the historical range of that species. Thus, conservation benefits to target species from habitat management applied to sage-grouse would be minimal for most species in our analysis. Even within sagebrush communities in the range of sage-grouse, vegetation manipulation tailored to benefit sage-grouse may not improve habitat for other species.

Because of the large difference in the spatial extent of areas used by sage-grouse and other sagebrush-dependent species, declining trends in individual sage-grouse populations may not be apparent until other species associated with sagebrush communities have experienced far more severe population declines that may be difficult to reverse (Rowland et al. 2006).

Because of the large amount and relative importance of sagebrush habitat within the proposed conservation area and the degree of uncertainty about the similarity of habitat needs of greater sage-grouse and sage thrasher, both species were included in the geospatial analysis and modeling for the project.

American Avocet. American avocet represents a larger group of waterbirds including white-faced ibis and long-billed curlew. Breeding Bird Surveys have shown that the population trend for American avocets in the watershed has trended downward through 2000 (Sauer et al. 2005). Habitat destruction and fragmentation of wetlands and marshes limit the population of several waterbird and waterfowl species because of the reduction or elimination of nesting, brooding, and foraging habitats. The proximity and quality of these various habitat types particularly affect the survival rates of young birds.

Besides the importance of breeding habitat, the quality and availability of spring migration habitat have direct implications for the survival and breeding productivity of the millions of migratory birds passing through the Bear River watershed each year. Complexes of wetlands, wet meadows, flooded pastures, and hayfields found in the Bear River watershed are used by many species of migrating waterfowl, shorebirds, and waterbirds including American avocet, sandhill crane, white-faced ibis, American bittern, marbled godwit, long-billed dowitcher, and northern pintail.

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American Avocet

Conservation Design

Conceptual and quantitative models have been developed to help predict key habitats used by the highest density of the four focal species populations and to aid in initial conservation design and delivery efforts.

Priority species, along with associated population goals, would continually be defined and updated throughout the implementation of this project, and additional landscape models would be developed for priority trust species.

Most wildlife species require more than one type of habitat during their life history. The wetland, riparian, grassland, and shrubland habitat found in the Bear River watershed allow multiple groups of species to meet their needs. The connectivity between the three national wildlife refuges, the waterfowl production area, and other large areas of protected lands maintains migration corridors for migratory and resident wildlife species. The connectivity within the Bear River watershed as well as to other ecosystems such as the Greater Yellowstone increases the resiliency of the region.

Numerous wide-ranging mammals that depend on the large blocks of intact habitat, wintering areas, and key migration linkages found in the Bear River watershed would benefit from the conservation strategy for the four focal species. The proposed Bear River Watershed Conservation Area project would help maintain overall habitat connectivity and keep travel corridors for many species including grizzly bear and Canada lynx (both listed as threatened), wolverine, (a candidate for Federal listing as threatened or endangered), as well as elk, mule deer, moose, and pronghorn.

Focal Species Models

HAPET biologists assessed land cover data in a Geographic Information System (GIS) to set priorities for the watershed for conservation easement acquisition, resulting in spatially explicit decision-support tools.

Bonneville Cutthroat Trout Models: For Bonneville cutthroat trout populations, the Service used models prepared by Trout Unlimited that evaluated species densities and genetic purity in Bear River watershed streams.

Sage Thrasher, Greater Sage-Grouse, and American Avocet Models: Methods were adapted from Niemuth et al. (2008) to design the conservation strategy for the proposed conservation area. North American Breeding Bird Survey data were collected from 1997 to 2010 on 32 roadside survey routes in and around the Bear River watershed. A subset of these data was used in conjunction with land cover information to model the spatial distribution and number of sage thrashers (figure LPP–10). Additionally, Breeding Bird Survey stop-level data were used with the land cover data to model habitat-occupancy relationships of American avocet in the watershed (see figure LPP–11). Predictor variables were sampled using radii of 1,312 feet, 2,625 feet, 3,937 feet, and 5,249 feet (400, 800, 1,200, and 1,600 meters) around Breeding Bird Survey stops; models fit best for sage thrasher at the 3,937-foot (1,200-meter) scale and best for American avocet at the 2,625-foot (800-meter) scale. Besides improving model fit, inclusion of trend surface and time-of-day variables substantially reduced positive spatial autocorrelation in model residuals. Spatial autocorrelation can lead to overestimation of the precision of model parameter estimates (Legendre 1993) and obscure ecological patterns (Carroll and Pearson 2000).

The top model for each species was tested for how well the model fits the data and validated using cross-validation techniques to test the predictive capabilities. The best model was then applied to the land cover data in GIS to set priorities for the watershed for conservation easement acquisition, resulting in spatially explicit decision-support tools. An existing landscape prioritization tool for greater sage-grouse, which identifies rangewide breeding densities (Doherty et al. 2010), was coupled with the decision-support tool for sage thrasher and American avocet. This provides watershed land managers with the best available information on landscape values for the four focal species.

New decision support tools would be developed through refinements of the focal species models described above as more data are collected and new modeling techniques implemented in an iterative, adaptive conservation framework. Further refinements in the conservation framework would be achieved by setting population objectives for focal species and evaluating conservation delivery through the elements of biological planning, conservation design, and monitoring and research. These new tools may result in challenges to currently held paradigms about the best conservation approach for target species (Reynolds et al. 2001).

Bonneville Cutthroat Trout Model: Ensuring the long-term survival of native cutthroat trout in an era of rapid environmental change requires a diverse conservation portfolio that spreads the risk of loss in an uncertain future across a variety of habitats, populations and management approaches. Rangewide diversity for native trout includes genetic integrity, life history diversity, and geographic (or ecological) diversity.

The Service worked with Trout Unlimited's existing data and assessment tools for modeling Bonneville

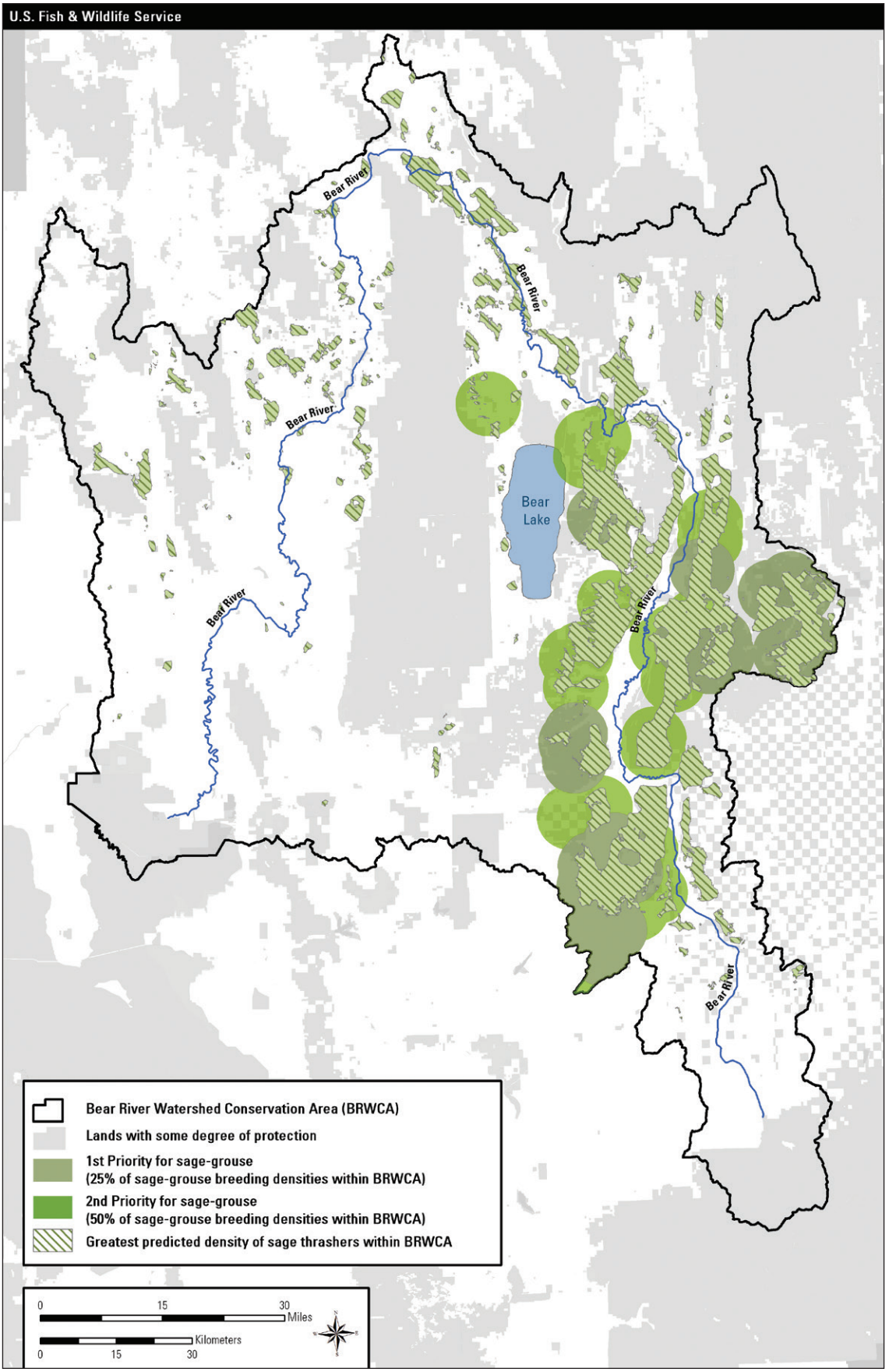

Figure LPP–10. Map of predicted sage thrasher and sage-grouse densities in the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming. *Source: HAPET West.*

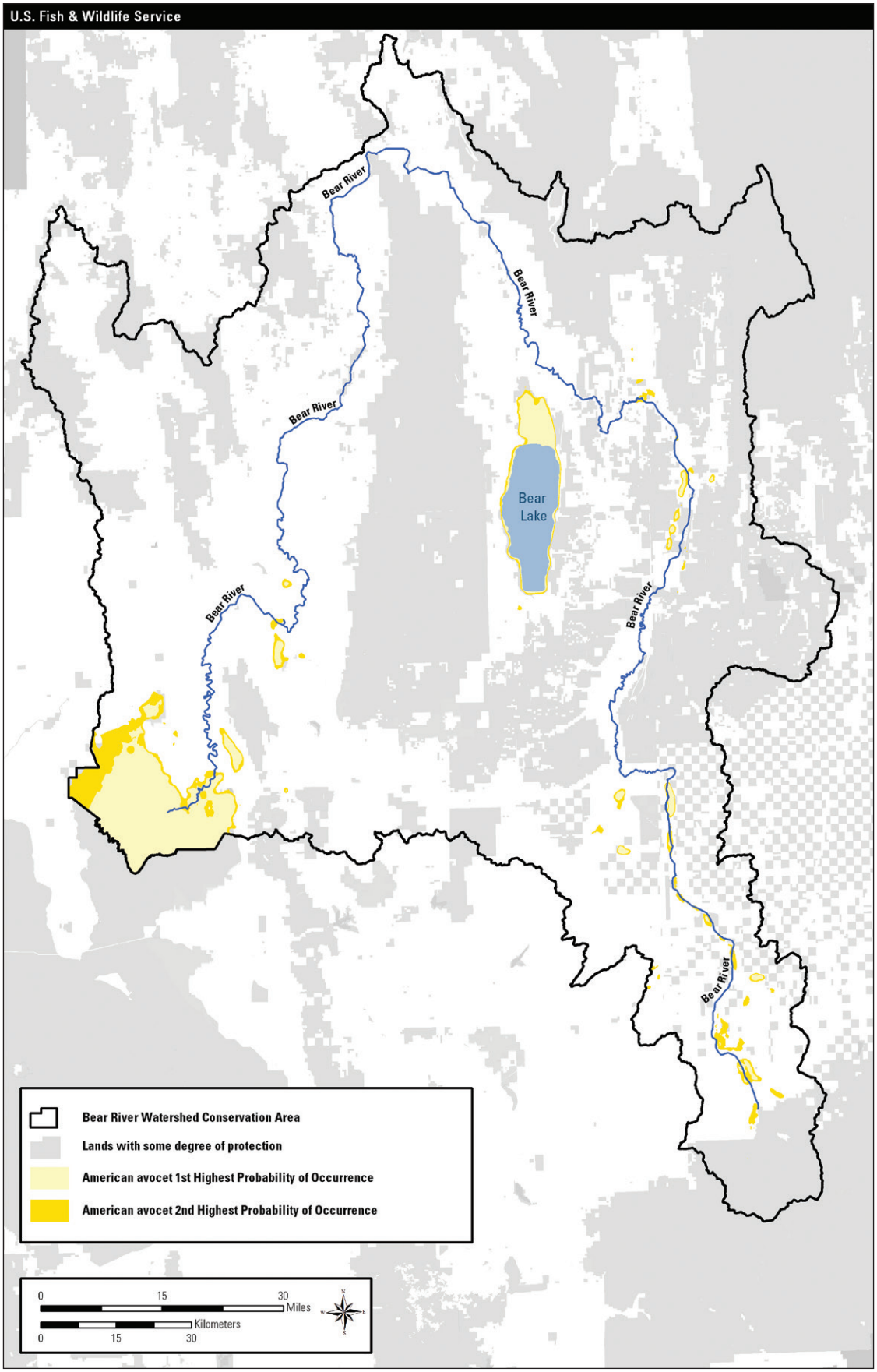

Figure LPP–11. Map of predicted American avocet densities in the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming. *Source: HAPET West.*

cutthroat trout habitat and species status for streams within the proposed conservation area. The Trout Unlimited management portfolio has multiple examples of these elements of diversity and large patches of interconnected habitat for resiliency to attempt to reduce the threat of biodiversity loss because of climate change. The 3–R framework (Schafer and Stein 2000) used by Trout Unlimited provides a structure for describing existing levels of diversity for a subspecies:

- *Representation*—saving existing elements of diversity
- *Resiliency*—having sufficiently large populations and intact habitats to facilitate recovery from large disturbances and rapid environmental change
- *Redundancy*—saving enough different populations so that some can be lost without jeopardizing the subspecies

All the drainages in Trout Unlimited dataset were classified as historically having contained Bonneville cutthroat trout. The next level of differentiation between streams where Bonneville cutthroat trout have been observed compared to those that were classified as having conservation populations. Trout Unlimited identified conservation populations of Bonneville cutthroat trout based on their ecological value, unique adaptation, or tendency to reach a large size (personal communication, Paul Burnett, Trout Unlimited). Population densities and genetic status were used by the Service to create a matrix of conservation prioritization (see table LPP–3). The matrix in table LPP–3 was used to rank the relative status of Bonneville cutthroat trout populations and to determine the conservation priorities displayed in the Bonneville cutthroat trout population status map (see figure LPP–12):

- *First Priority*—Conservation population streams with a combined genetic and populations score of "5"
- *Second Priority*—Conservation population streams with a combined genetic and populations score of "4"
- *Third Priority*—Conservation population streams with a combined genetic and populations score of "3"
- *Fourth Priority*—Conservation population streams with a combined genetic and populations score of "2"
- *Fifth Priority*—Conservation population streams with a combined genetic and populations score of "1"

Priority Categories

The proposed Bear River Watershed Conservation Area has been classified into three categories from the highest to lowest resource conservation priority based on modeling results from HAPET and Trout Unlimited data (see figure LPP–13).

- *High Conservation Rank*: Key wetland, riparian, grassland, and shrub habitat where the highest densities of the four focal species representing Federal trust resources (migratory birds and threatened and endangered species) occur.
- *Medium Conservation Rank*: Key wetland, riparian, grassland, and shrub habitat where the moderate to high densities of the four focal species representing Federal trust resources occur.

Table LPP–3. Matrix of Bonneville cutthroat trout fish densities and ranking criteria for genetic purity.

		Density (number of fish) per linear mile or per 10 acres of habitat for lake populations				
		Over 400	*151–400*	*50–150*	*0–50*	*Unknown*
*Genetic purity**	Criteria rank	5	4	3	2	1
unaltered, not tested–unaltered	5	5	4	4	3	3
90–99%	4	4	4	3	3	2
	3	4	3	3	2	2
80–89% not tested hybridized	2	3	3	2	2	1
< 80%	1	3	2	2	1	1

**Value definitions for genetic purity and population density were derived from Trout Unlimited "Conservation Success Index: Bonneville Cutthroat Trout: Sub-Watershed Scoring and Rule Set." The combined value of the averaged density and genetic purity rankings were rounded down to the next lowest number.*

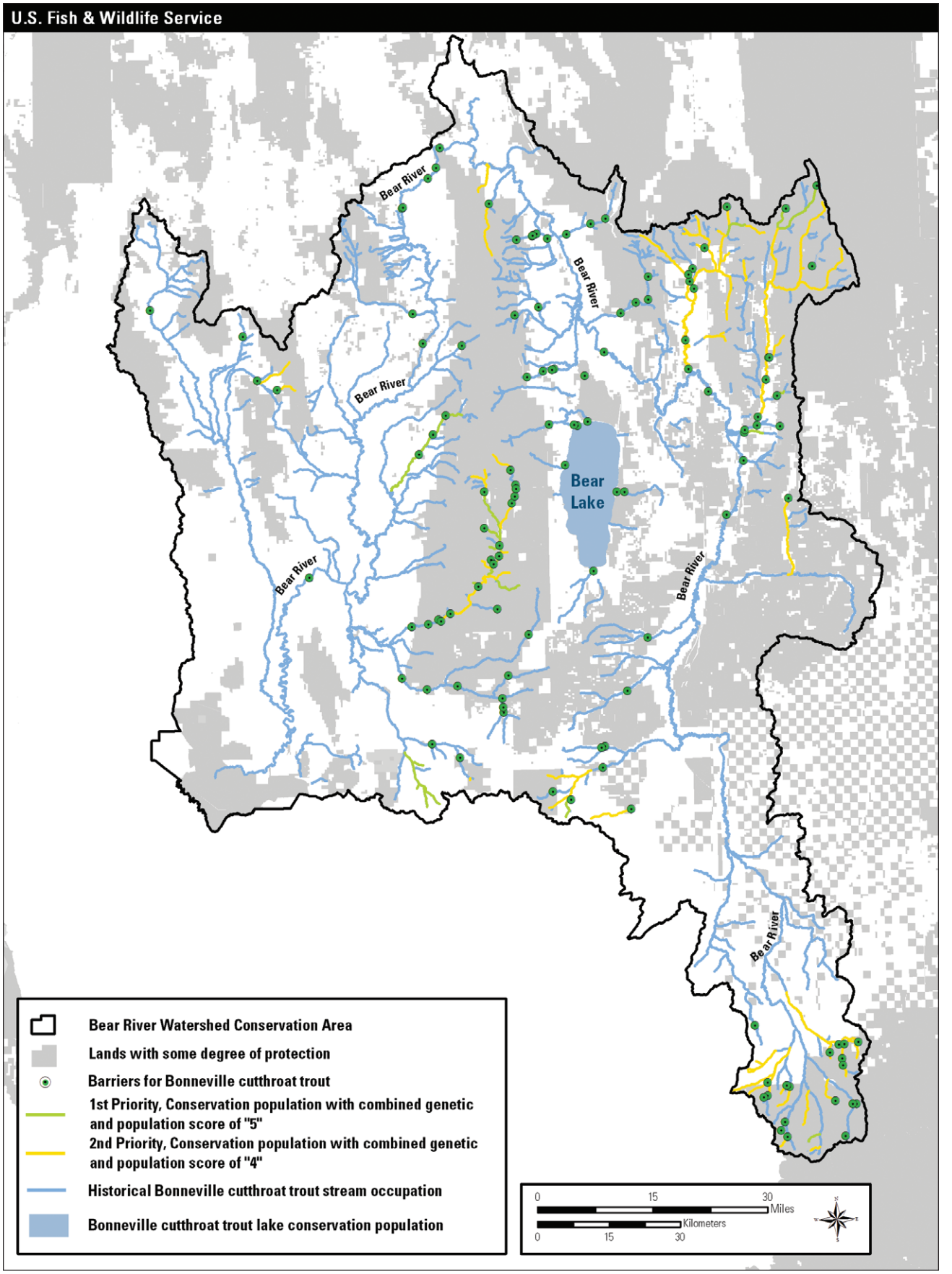

Figure 12. Map of the presence of Bonneville cutthroat trout in the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming. *Source: Trout Unlimited.*

- *Low Conservation Rank*: Low to moderate to high densities of the four focal species representing Federal trust resources occur.

Marxan-based Conservation Value Modeling

The conservation analysis software—Marxan (Ball et al. 2009)—can be used to model a wide range of management and conservation challenges such as climate change, land use change, and development, as well as key conservation priorities including maintaining habitat connectivity and migration corridors. Marxan was designed to provide a conservation design that maximizes conservation value based on goals and criteria while minimizing constraints.

The Service used a Marxan model incorporating the HAPET models for sage thrasher, greater sage-grouse, and American avocet along with the Bonneville cutthroat trout model based on data provided by Trout Unlimited (see figure LPP–14).

In addition, Marxan modeling was used to incorporate crucial wetland and riparian habitat depended on by a wide variety of migratory bird species including white-faced ibis, yellow warbler, flycatchers, yellow-billed cuckoo, for which there is insufficient data available to develop other types of models based on bird densities and abundance. The modeling allowed a habitat-based approach to be used to generate an alternate method of predicting likely areas of habitat use by migratory birds.

This model also allowed the Service to incorporate information provided by State partners and local organizations on important spawning and wintering areas for Bonneville cutthroat trout, and key migration corridors for mule deer, elk, and moose. Maintaining connectivity between habitat types and between larger areas of protected lands in the watershed and the region increases ecological resiliency and helps to ensure a functional landscape in a rapidly changing world.

Marxan sets priorities for areas based on their contribution to meeting conservation goals. Because the biological goals for ecological systems and species in the proposed conservation area are uncertain, goal levels that span a range of potentials were assessed. For some conservation features, such as priority winter rearing areas for Bonneville Cutthroat Trout, the mapped area was small relative to other species that occupy a larger range. Therefore, a goal level of 90 percent was kept constant across all Marxan runs. Table LPP–4 describes conservation targets, data sources, and how conservation goals were set for three different runs of the Marxan model. Marxan seeks to minimize constraints to the overall conservation design. For this analysis, a constraint of "ecological integrity" was based on the NatureServe Landscape Condition of the Conterminous United States (Comer and Hak 2009). This data set integrates stressors from human land uses including transportation corridors, urban and industrial development, mining, and modified land cover. Areas across all goal levels are in relatively better ecological condition.

Marxan will attempt to find a near-optimal selection of areas to meet a goal level of 30 percent for a conservation target. Areas selected in the 30-percent "low" goal level represent a selection that is in the best condition. More areas must be added to meet the 50 percent and 80 percent goals, so the selection is expanded to areas in a lower level of condition. This has implications for understanding the results described below. Priority 3 has few areas with high selection frequency at the 30-percent goal level.

Another Marxan variable is "connectedness" of the solution. By setting the connectivity variable properly, Marxan will force potential conservation areas to be adjacent. For example, conservation goals could be met with widely distributed areas. A more efficient spatial solution is to meet conservation goals in a spatially cohesive and connected design.

Table LPP–4. Conservation targets and goals for the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

Conservation target	*Conservation goal level*				*Notes and source*
	Measure	Low	Medium	High	
sage thrasher	potential bird density	30%	50%	80%	density models, HAPET modeling
sage-grouse	potential bird density	30% 30%	50% 50%	80% 80%	top 25% density, Doherty 2010 top 50% density, Doherty 2010
American avocet	potential bird density	30%	50%	80%	density models, HAPET modeling
Bonneville cutthroat trout	stream miles	30% 90% 90%	50% 90% 90%	80% 90% 90%	multiple, conservation success index priority areas, expert-based winter rearing, expert-based
emergent wetlands	acres	30%	50%	80%	National Wetland Inventory and GAP
riparian zones	acres	30%	50%	80%	National Wetland Inventory and GAP

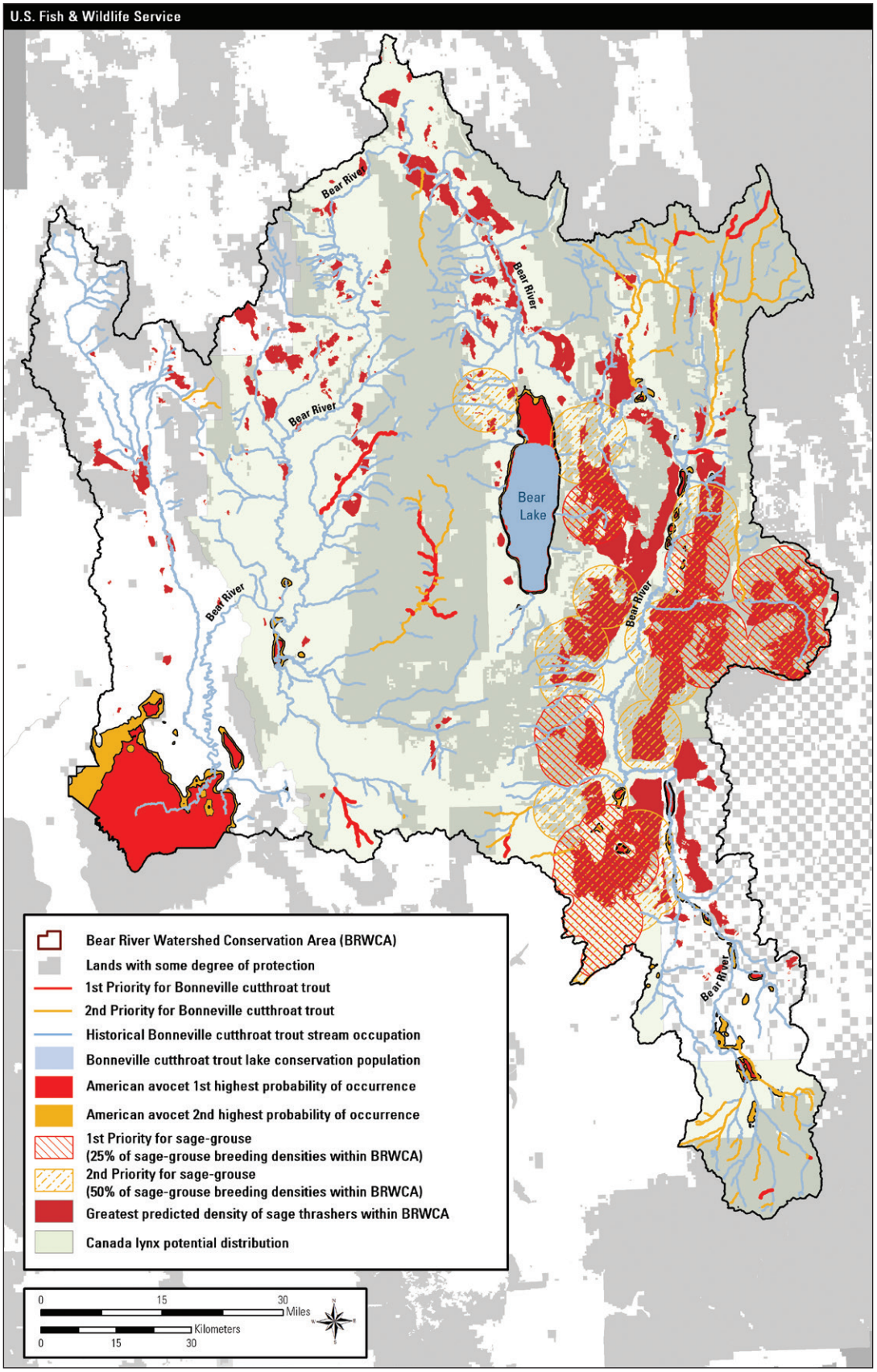

Figure 13. Map of combined species priority areas for the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming. *Source: Bonneville cutthroat trout (Trout Unlimited); bird modeling (HAPET West); Canada lynx (county-level data from Ecological Conservation Online System development group).*

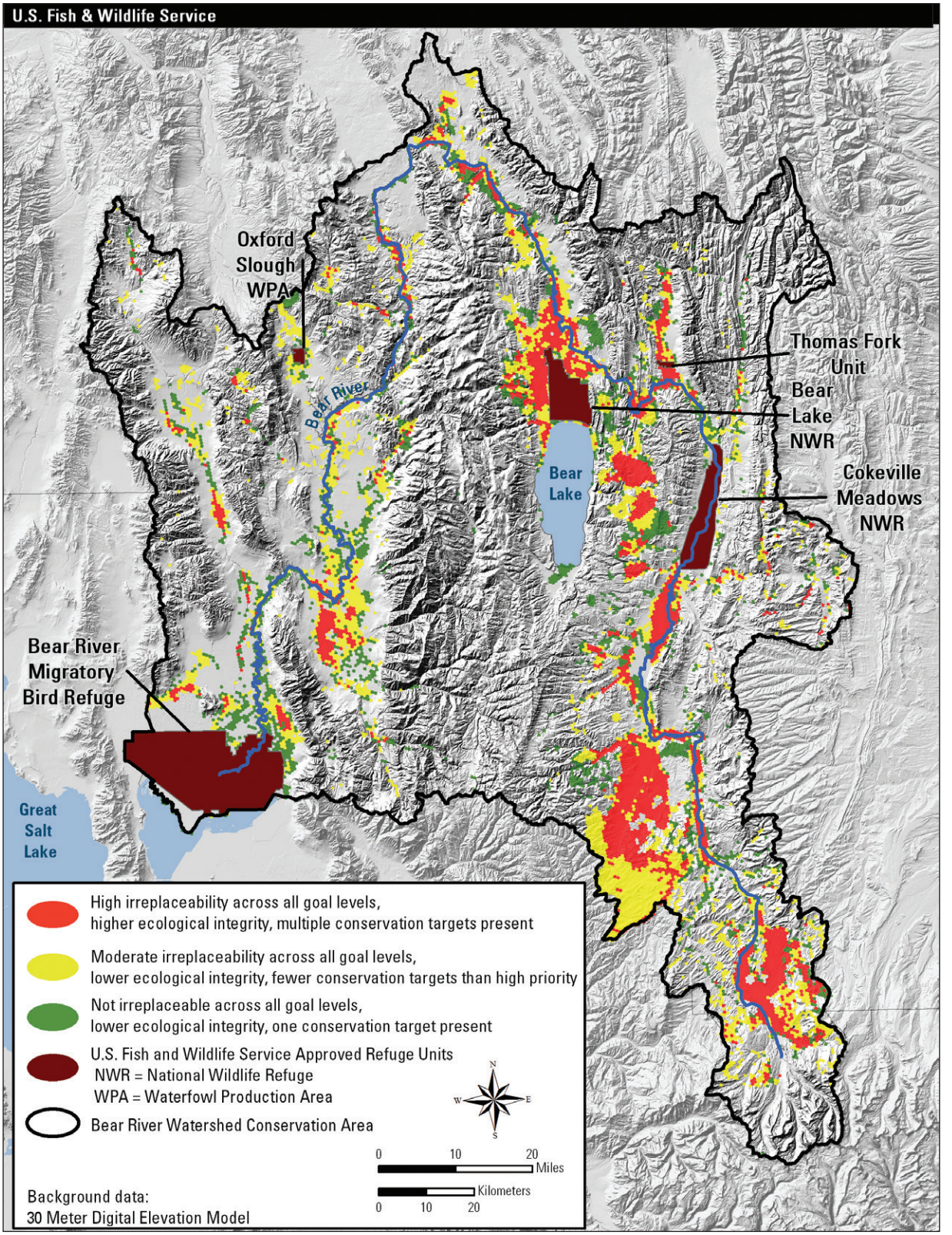

Figure 14. Map of conservation ranking priority areas for the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

Marxan Results. One of the key results from Marxan is the "selection frequency" of a given spatial planning unit. A spatial planning unit that has a high selection frequency indicates that it must be protected to meet conservation goals, based on input criteria. In other words, it is irreplaceable, and conservation goals cannot be met in an efficient manner without protecting such areas. The four conservation ranks described below are also displayed in figure LPP–14.

- *High Conservation Rank*: High irreplaceability across all goal levels, higher ecological integrity, and multiple conservation targets present.
- *Medium Conservation Rank*: Moderate irreplaceability across all goal levels, lower ecological integrity, and fewer conservation targets than high priority.
- *Low Conservation Rank*: Not irreplaceable across all goal levels, lower ecological integrity, and one conservation target present.
- *No Conservation Rank*: Not selected with the data that is now available.

The data were separated into five distinct groups based on their selection frequency multiplied by the number of conservation targets present. The top three groups represent areas with the highest conservation value. The high priority represents areas that (1) are connected, (2) are the best condition landscapes possible, (3) contain multiple conservation targets, and (4) are irreplaceable across all goal levels. The lowest priority still represents areas of conservation value but for typically one conservation target, although more may be present. The landscape condition will be lower and may not be irreplaceable across all goal levels.

The conservation ranking reflected in figure LPP–14, with potential acres shown in table LPP–5, would be used for initial prioritization of acquisition efforts in the proposed conservation area. Subsequently, the Service would reevaluate priorities as resource conditions in the watershed changed, as research needs were met, and as new decision-support tools became available.

Table LPP–5. Protection priority category acreages for acquisition in the proposed Bear River Watershed Conservation Area in Idaho, Utah, and Wyoming.

Description	*Priorities for easements Private: nonprotected*
Priority 1 high conservation rank	289,861 acres
Priority 2 medium conservation rank	385,362 acres
Priority 3 low conservation rank	244,777 acres
Total	920,000 acres

Integrated Conservation Delivery

Over the years, the staff from the three national wildlife refuges worked with a wide variety of agencies, nongovernmental organizations, and private landowners on wildlife conservation issues and opportunities. Partners for Fish and Wildlife biologists have worked with landowners on habitat restoration projects and developing partnerships that provide the foundation for a successful easement program. The ongoing involvement of the Partners for Fish and Wildlife program, landscape conservation cooperatives, and many partner organizations and agencies would be essential for the effective delivery of sustainable conservation programs. Application of the Strategic Habitat Conservation framework would build on existing partnerships and support the development of new partnerships for delivering conservation throughout the region. The spatially explicit decision-support tools being developed would allow for greater flexibility, increased responsiveness, and improved efficiency in meeting Service and partner conservation delivery needs.

The proposed Bear River Watershed Conservation Area would serve as a model for engagement in that it would work with landowners, nongovernmental organizations, State agencies, and Federal agencies. Education is a key part of engagement. The Bear River Migratory Bird Refuge has an extensive educational program that teaches children and adults about ecological functions, the importance of wetlands, and the diversity of plant and animal life and conservation.

Monitoring and Adaptive Management

Wetland and upland conservation easements are an essential tool for protecting important wildlife habitat on a landscape scale. The detailed LPP developed in conjunction with the EA provides the information necessary to carry out the conservation action of acquiring conservation easements on the "best of the best" habitat for priority species. As understanding of the functional relationships between priority species

Butterfly on Marsh Vegetation

and habitats increases, the Service would adapt the strategies used to target acquisition of the highest priority habitat for meeting the population objectives of priority species.

Contributions of conservation easements and other management actions toward meeting population goals for priority trust species would be evaluated using spatially explicit models, allowing estimation of population size on conservation easements and other land parcels of interest. This would allow the Service and conservation partners to evaluate the contribution of the program to meeting population goals and to refine conservation delivery to ensure greatest efficiency. Spatially explicit models would also enable the Service to show the contribution of the proposed conservation area to national and continental population goals for priority species.

The Service would work with the Great Basin, Great Northern, and Southern Rockies Landscape Conservation Cooperatives and numerous other partners to develop and refine predictive population models. The results of Breeding Bird Surveys, the annual monitoring the Service conducts on waterfowl, breeding shorebirds, other waterbirds, grassland birds, and raptors on the three wildlife refuges, and other appropriate State and local surveys would be used to assess the effectiveness of the conservation easement program.

Evaluation of the assumptions and uncertainties identified through the biological planning, conservation design, and conservation delivery elements would addressed by the Service in cooperation with partners such as nongovernmental organizations and universities.

Research

Although the importance of the Bear River watershed for migratory birds is widely recognized, there are knowledge gaps about the area resources. More Breeding Bird Survey routes, completion of the National Wetlands Inventory database, and incorporating information and research results from the large number of conservation agencies and organizations in the region would help to assess conservation needs and priorities in the region.

Research and monitoring emphasis would be placed on the highest priority species with the greatest degree of uncertainty about limiting factors and the effectiveness of management actions at minimizing and reducing limiting factors. Data from existing surveys such as the Breeding Bird Survey would be evaluated and incorporated into spatial models. When necessary, more data would be collected to evaluate assumptions used in the modeling process and assessments would be adjusted accordingly. These methods would provide an estimate of the population response of trust species on project (easement) lands and on noneasement properties.

Sociocultural Considerations

Much of the land cover in the proposed conservation area consists of a mix of public lands and large tracts of privately owned ranchlands and croplands. Private ranchlands and croplands provide dual benefits by supplying wildlife habitat on working landscapes. These valuable landscapes are threatened by residential development. In 2000, the American Farmland Trust identified 4 million acres of prime ranchlands[1] in Idaho, 3.4 million acres in Utah, and 2.6 million acres in Wyoming as being vulnerable to low-density residential development by the year 2020, with ranchlands located in high-mountain valleys and mixed grassland areas surrounding the Rocky Mountains at highest risk of conversion. Within the Rocky Mountain Region (which has 263 counties in Idaho, Montana, Wyoming, Utah, Colorado, Arizona, and New Mexico), Uinta County, Wyoming, and Summit County, Utah, ranked in the top 25 counties for acres of strategic ranchland[2] at risk (American Farmland Trust 2000).

[1]*Prime ranchlands are defined as ranchland with quality agricultural land and desirable wildlife characteristics.*

[2]*Strategic ranchlands are defined as both prime and threatened ranchlands. Threatened ranchlands are located in rural areas projected to grow to suburban density within 20 years or are along major road corridors in counties with growth rates greater than 10 percent per decade.*

Conserving the ranching heritage of the proposed Bear River Watershed Conservation Area would help make sure that wildlife populations are sustained and are available for long-term enjoyment by the American public.

Public Involvement and Coordination

The Service involves the public to get input on proposals and to make sure issues are addressed while conducting an environmental analysis that follows the National Environmental Policy Act.

Public Scoping

Six public scoping meetings were held in Idaho, Utah, and Wyoming in May 2011. Public comments were taken in Cokeville and Evanston, Wyoming; Brigham City and Logan, Utah; and Preston and Montpelier, Idaho, to identify issues to be analyzed for the proposed action. Approximately 130 landowners, members of various organizations, and elected representatives attended the meetings. Additionally, 10 letters providing comments were received by mail or email. A total of 327 comments and questions were received on the project proposal.

Refuge staff contacted tribal, Federal, State, and local officials as well as conservation groups that expressed an interest in the future of the Bear River watershed. Approximately 675 fact sheets were distributed, and they were also available on the refuges' Web sites.

Public meetings will be held to discuss the draft EA and LPP for the proposed project.

National Environmental Policy Act

As a Federal agency, the Service must comply with provisions of the National Environmental Policy Act. Under the act, an EA is required to evaluate reasonable alternatives that meet stated objectives and to assess the possible impacts to the human environment. The draft EA serves as the basis for determining whether implementation of the proposed project would constitute a major Federal action significantly affecting the quality of the human environment.

Land Protection Plan Distribution and Availability

The Service will distribute the draft EA (with the associated draft LPP in the same volume) to the project mailing list, which includes Federal and State legislative delegations, tribes, agencies, landowners, private groups, and other interested individuals.

Copies of the draft EA and LPP will also be available on the project Web site or by contacting the Service by email, postal mail, phone, or in person.

Project Web site: www.fws.gov/mountain-prairie/planning/lpp/ut/brr/brr.html

Project email: brwca_comments@fws.gov

Service Unit Contacts

Amy Thornburg, Planning Team Leader
Attn: Proposed Bear River Watershed Conservation Area
U.S. Fish and Wildlife Service, Region 6
Division of Refuge Planning
134 Union Boulevard
Lakewood, Colorado 80228
303 / 236 4345

U.S. Fish and Wildlife Service, Region 1
Division of Refuge Planning
911 NE 11th Avenue
Portland, Oregon 97232–4181
503 / 872 2897

U.S. Fish and Wildlife Service, Region 1
Bear Lake National Wildlife Refuge
P.O. Box 9
Montpelier, Idaho 83254
208 / 847 1757

U.S. Fish and Wildlife Service, Region 6
Bear River Migratory Bird Refuge
2155 West Forest Street
Brigham City, Utah 84302
435 / 734 6451

U.S. Fish and Wildlife Service, Region 6
Cokeville Meadows National Wildlife Refuge
P.O. Box 700
Green River, Wyoming 82935
307 / 875 2187

Glossary

adfluvial—Referring to fish that live in lakes and migrate to rivers and streams.

Beyond the Boundaries—National Wildlife Refuge Association program to expand conservation work to areas outside national wildlife refuge borders.

BRWCA—Bear River Watershed Conservation Area.

candidate species—A species of plant or animal for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the Endangered Species Act, but for which development of a proposed listing regulation is precluded by other higher priority listing activities.

CFR—Code of Federal Regulations.

CO_2—Carbon dioxide.

conservation easement—A legally enforceable encumbrance or transfer of property rights to a government agency or land trust for the purposes of conservation. Rights transferred could include the discretion to subdivide or develop land, change current land use practices, sever water rights, or others as appropriate, and are specified by contract between the landowner and the conservation entity.

conservation strategy—An adaptive approach for integrating biological priorities with current socioeconomic threats to habitat to target the acquisition of wetland and grassland easements in the Bear River of Region 6. The strategy focuses on the five, primary, upland-nesting duck species, which also provide for other trust species' benefits. To meet the goal of this strategy, there is an estimated need of an additional 1.4 million acres of high-priority wetland and 10.4 million acres of high-priority grassland.

EA—See environmental assessment.

endangered species—A species of plant or animal that is in danger of extinction throughout all or a significant part of its range.

Endangered Species Act—A law passed by Congress in 1973 with the purpose of protecting and recovering imperiled species and the ecosystems on which they depend.

environmental assessment (EA)—A public document for which a Federal agency is responsible. An environmental assessment provides evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact, aids an agency's compliance with the National Environmental Policy Act when no environmental impact statement is necessary, and facilitates preparation of a statement when one is necessary.

fluvial—Referring to fish that live in rivers and streams.

GCN—(A species of) greatest conservation need.

HAPET—Habitat and Population Evaluation Team.

Important Bird Areas Program—A global effort to find and conserve areas that are vital to birds and other biodiversity sponsored by the National Audubon Society.

Intermountain West Joint Venture—Diverse partnership of 18 entities including Federal agencies, State agencies, nonprofit conservation organizations, and for-profit organizations representing agriculture and industry. IWJV was founded in 1994 to facilitate bird conservation across the vast 495 million acres of the Intermountain West.

Intermountain West Joint Venture Implementation Plan—A plan that provides direction for integrating the conservation of all migratory birds under one framework. The process involves stepping down the objectives of the four plans for the international species groups of waterfowl, shorebirds, other waterbirds, and landbirds. Population and habitat trends, coupled with knowledge of how species respond to landscape change, would be used to build a biological foundation and set quantifiable goals.

landscape conservation cooperative (LCC)—A public–private partnership intended to facilitate cross-political boundary conservation in the face of a changing environment through application of science.

land protection plan (LPP)—Describes resource protection needs, proposes a refuge or conservation area boundary, and identifies in priority order the areas that the Service may buy land interests from willing sellers.

LCC—See landscape conservation cooperative.

LPP—See land protection plan.

Marxan—A software package used as a decision support tool for spatial conservation prioritization.

NRCS—Natural Resources Conservation Service, an agency of the U.S. Department of Agriculture.

NWR—National wildlife refuge.

Refuge System—National Wildlife Refuge System.

Region 1—An administrative unit of the Service known as the Pacific Region encompassing Hawaii, Idaho, Oregon, Washington and Pacific Island Territories and United States affiliated States.

Region 6—An administrative unit of the Service known as the Mountain–Prairie Region, which covers eight States: Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah, and Wyoming.

Service, or USFWS—U.S. Fish and Wildlife Service, an agency of the U.S. Department of the Interior.

strategic habitat conservation—A process used within the Service to set biological goals for priority species populations, make strategic decisions, and to reassess and improve management actions. Comprised of four stages: Biological Planning, Conservation Design, Delivery of Conservation Action, and Monitoring and Research.

threatened species—A species of plant or animal that is likely to become endangered in the foreseeable future.

trust species—Federal trust species include threatened and endangered species, as well as migratory birds such as waterfowl, wading birds, shorebirds, and neotropical migratory songbirds, anadromous (migratory) fish such as salmon.

U.S.C.—United States Code.

USDA—U.S. Department of Agriculture.

USFWS, or Service—U.S. Fish and Wildlife Service, an agency of the U.S. Department of the Interior.

WPA—Waterfowl production area.

Appendix A

List of Preparers and Reviewers

Author name	*Position*	*Work unit*
David Allen	realty specialist	USFWS, Region 1, Division of Realty, Portland, Oregon
Bob Barrett	project leader	USFWS, Region 6, Bear River Migratory Bird Refuge, Brigham City, Utah
Pamela Benn	realty specialist	USFWS, Region 1, Division of Realty, Portland, Oregon
Badge Blackett	Landscape Conservation Programs	National Wildlife Refuge Association, Washington, DC
Howard Browers	refuge biologist	USFWS, Region 6, Bear River Migratory Bird Refuge, Brigham City, Utah
Steve Caicco	conservation planner	USFWS, Region 1, Planning Division, Portland, Oregon
Tracy Casselman	project leader	USFWS, Region 1, Southeast Idaho Refuge Complex, Chubbock, Idaho
Annette deKnijf	refuge manager	U.S. Fish and Wildlife Service (USFWS), Region 1, Bear Lake National Wildlife Refuge, Montpelier, Idaho
Joann Dullum	wildlife biologist, Inventory and Monitoring GIS specialist	USFWS, Region 6, Benton Lake National Wildlife Refuge, Great Falls, Montana
Mark Ely	cartographer	USFWS, Region 6, Division of Refuge Planning, Lakewood, Colorado
Sean Fields	HAPET biologist	USFWS, Region 6, Benton Lake National Wildlife Refuge, Great Falls, Montana
Karl Fleming	Utah State coordinator for Partners for Fish and Wildlife program	USFWS, Region 6, Bear River Migratory Bird Refuge, Brigham City, Utah
Todd Gallion	refuge manager	USFWS, Region 6, Cokeville Meadows National Wildlife Refuge, Cokeville, Wyoming
Pat Gonzales-Rogers	tribal liaison	USFWS, Region 1, External Affairs, Portland, Oregon
Kim Greenwood	tribal liaison	USFWS, Region 6, External Affairs, Lakewood, Colorado
Mark Hogan	Wyoming State coordinator for Partners for Fish and Wildlife program	USFWS, Region 6, Partners for Fish and Wildlife State Office, Lander, Wyoming
David Kimble	biologist for Partners for Fish and Wildlife program	USFWS, Region 6, Partners for Fish and Wildlife State Office, Evanston, Wyoming
Tom Koerner	project leader	USFWS, Region 6, Cokeville Meadows and Seedskadee National Wildlife Refuges, Green River, Wyoming
Greg Langer	law enforcement officer	USFWS, Region 6, Lakewood, Colorado
Brant Loflin	archaeologist	USFWS, Region 6, Bozeman Fish Technology Center, Montana
David C. Lucas	division chief	USFWS, Region 6, Division of Refuge Planning, Lakewood, Colorado
Noel Matson	realty specialist	USFWS, Region 6, Division of Realty, Huron, South Dakota

Author name	*Position*	*Work unit*
Tom Miewald	geographer and conservation planner	USFWS, Region 1, Planning Division, Portland, Oregon
Carl Millegan	former project leader	USFWS, Region 6, Cokeville Meadows and Seedskadee National Wildlife Refuges, Green River, Wyoming
Linda Moeder	cartographer	USFWS, Region 6, Division of Realty, Lakewood, Colorado
Greg Mullin	law enforcement officer	USFWS, Region 6, Bear River Migratory Bird Refuge, Brigham City, Utah
Cary Myler	biologist for Partners for Fish and Wildlife program	USFWS, Region 1, Partners for Fish and Wildlife Program, Chubbock, Idaho
Sue Oliveira	former division chief	USFWS, Region 6, Division of Realty, Lakewood, Colorado
Kathi Stopher	visitor services manager	USFWS, Region 6, Bear River Migratory Bird Refuge, Brigham City, Utah
Amy Thornburg	land protection planning team leader	USFWS, Region 6, Division of Refuge Planning, Lakewood, Colorado
Anne Truslow	Strategic Programs and Development	National Wildlife Refuge Association, Washington, DC
Meg Van Ness	regional historic preservation officer	USFWS, Region 6, Refuges, Lakewood, Colorado
Sharon Vaughn	deputy project leader	USFWS, Region 6, Bear River Migratory Bird Refuge, Brigham City, Utah
Jeffrey Warren	wildlife biologist	USFWS, Region 6, Red Rock Lakes National Wildlife Refuge, Lima, Montana

Reviewer name	*Position*	*Work unit*
Scott McCarthy	branch chief , refuge planning	USFWS, Region 1, Planning Division, Portland, Oregon
Brooke McDonald	technical editor	North State Resources, Inc., Sacramento, California
Kathryn McDonald	managing editor	North State Resources, Inc., Sacramento, California
Noreen Walsh	deputy regional director	USFWS, Region 6, Lakewood, Colorado

Appendix B

Representative Plant and Animal Species

Plant Species

Scientific name	*Common name*
TREES	
Abies concolor	white fir
Abies lasiocarpa	subalpine fir
Acer grandidentatum	big-toothed maple
Acer negundo	boxelder
Juniperus osteosperma	Utah juniper
Juniperus scopulorum	Rocky Mountain juniper
Picea englemannii	Engelmann spruce
Picea glauca	white spruce
Picea pungens	blue spruce
Pinus albicaulis	whitebark pine
Pinus contorta	lodgepole pine
Pinus edulis	pinyon pine
Pinus flexilis	limber pine
Pinus monophylla	singleleaf pinyon
Populus tremuloides	quaking aspen
Pseudotsuga menziesii	Douglas-fir
Quercus gambellii	Gambel oak
SHRUBS and SUBSHRUBS	
Acer glabrum	mountain maple
Acer negundo	boxelder
Alnus incana	gray alder
Alnus tenuifolia	thinleaf alder
Amelanchier alnifolia	western serviceberry
Arctostaphylos uva-ursi	kinnikinnick
Artemisia tridentata ssp. *tridentata*	basin big sagebrush
Artemisia tridentata ssp. *wyomingensis*	Wyoming big sagebrush
Artemisia arbuscula	low sagebrush
Artemisia cana	silver sagebrush
Artemisia nova	black sagebrush
Artemisia tridentata ssp. *vaseyana*	mountain big sagebrush
Atriplex canescens	four-wing saltbush
Atriplex confertifolia	shadscale
Bassia americana	green molly
Berberis repens	creeping Oregon grape
Betula glandulosa	bog birch

Plant Species

Scientific name	*Common name*
Betula occidentalis	water birch
Cercocarpus ledifolius	curlleaf mountain-mahogany
Chrysothamnus viscidiflorus	green rabbitbrush
Cornus stolonifera	redosier dogwood
Dasiphora fruticosa	shrubby cinquefoil
Ericameria nauseosa	rubber rabbitbrush
Grayia spinosa	spiny hopsage
Juniperus communis	common juniper
Ledum glandulosum	Labrador tea
Lonicera involucrata	honeysuckle
Menziesia ferruginea	menziesia
Pachistima myrsinites	pachistima
Physocarpus malvaceus	ninebark
Physocarpus monogynus	mountain ninebark
Picrothamnus desertorum	bud sagebrush
Populus angustifolia	narrow-leaf cottonwood
Populus × *acuminata*	lance-leaf cottonwood
Prunus virginiana	chokecherry
Ribes lacustre	prickly currant
Ribes montigenum	mountain gooseberry
Rosa nutkana	wild rose
Salix boothii	Booth's willow
Salix drummmondiana	Drummond's willow
Salix exigua	coyote willow
Salix geyeriana	Geyer willow
Salix lucida	Pacific willow
Salix lutea	yellow willow
Salix wolfii	Wolf's willow
Sarcobatus vermiculatus	black greasewood
Shepherdia canadensis	russet buffaloberry
Spiraea betulifolia	white spiraea
Symphoricarpos albus	common snowberry
Symphoricarpos oreophilus	mountain snowberry
Tetradymia canescens	horsebrush
Vaccinium caespitosum	dwarf huckleberry
Vaccinium scoparium	grouse whortleberry
GRASSES and GRAMINOIDS	
Agropyron cristatum	crested wheatgrass
Agropyron desertorum	desert wheatgrass
Agropyron spicatum	bluebunch wheatgrass
Agrostis stolonifera	creeping bentgrass
Alopecurus aequalis	shortawn foxtail
Alopecurus pratensis	meadow foxtail
Beckmannia syzigachne	American sloughgrass

Plant Species

Scientific name	*Common name*
Bromus tectorum	cheatgrass
Calamagrostis canadensis	bluejoint
Calamagrostis rubescens	pinegrass
Carex aquatilis	water sedge
Carex athrostachya	slenderbeak sedge
Carex disperma	soft-leaved sedge
Carex geyeri	elk sedge
Carex hoodii	Hood's sedge
Carex lasiocarpa	American woollyfruit sedge
Carex microptera	smallwing sedge
Carex nebrascensis	Nebraska sedge
Carex praegracilis	clustered field sedge
Carex rossii	Ross' sedge
Carex rostrata	beaked sedge
Carex simulata	analogue sedge
Deschampsia cespitosa	tufted hairgrass
Distichlis spicata	saltgrass
Eleocharis acicularis	needle spikerush
Elymus elymoides	squirreltail
Elymus glaucus	blue wildrye
Elymus repens	quackgrass
Elymus trachycaulus	slender wheatgrass
Festuca idahoensis	Idaho fescue
Glyceria striata	fowl mannagrass
Hesperochloa kingii	spike fescue
Heterostipa comata	needle and thread
Hordeum jubatum	foxtail barley
Hordium brachyantherum	meadow barley
Juncus arcticus	mountain rush
Juncus bufonius	toad rush
Leymus cinereus	basin wildrye
Leymus triticoides	bearded wheatgrass
Luzula hitchcockii	smooth woodrush
Luzula spicata	spiked woodrush
Melica spectabilis	purple oniongrass
Muhlenbergia richardsonis	mat muhly
Mulenbergia asperifolia	scratchgrass
Pascopyrum smithii	western wheatgrass
Phalaris arundinacea	reed canarygrass
Phleum pratense	timothy
Phragmites australis	common reed
Poa fendleriana	muttongrass
Poa pratensis	Kentucky bluegrass
Polypogon monspeliensis	rabbitfoot

Plant Species

Scientific name	*Common name*
Puccinellia nuttalliana	Nuttall's alkaligrass
Schoenoplectus acutus	hardsterm bulrush
Schoenoplectus americanus	chairmaker's bulrush
Schoenoplectus tabernaemontani	softstem bulrush
Scolochloa festucacea	common rivergrass
Spartina gracilis	alkali cordgrass
Sporobolus airoides	alkali sacaton
Thinopyrum intermedium	intermediate wheatgrass
Triglochin maritima	seaside arrowgrass
Triglochin palustris	marsh arrowgrass
Trisetum spicatum	spike trisetum
Typha angustifolia	narrowleaf cattail
Typha latifolia	broadleaf cattail
HERBS and FORBS	
Achillea millefolium	yarrow
Aconitum columbianum	monkshood
Actaea rubra	baneberry
Alisma plantago-aquatica	European water plantain
Antennaria microphylla	littleleaf pussytoes
Aquilegia caerulea	Colorado blue columbine
Argentina anserina	silverweed cinquefoil
Arnica cordifolia	heartleaf arnica
Arnica latifolia	broadleaf arnica
Astragalus miser	timber milkvetch
Bassia scoparia	burningbush
Caltha leptosepala	white marsh marigold
Cardaria pubescens	hairy whitetop
Castilleja linariifolia	Wyoming Indian paintbrush
Castilleja minor	lesser Indian paintbrush
Castilleja rhexifolia	splitleaf Indian paintbrush
Cirsium arvense	Canada thistle
Cirsium vulgare	bull thistle
Cleome serrulata	Rocky Mountain beeplant
Conyza canadensis	Canadian horseweed
Delphinium barbeyi	subalpine larkspur
Downingia laeta	Great Basin calico flower
Epilobium ciliatum	fringed willowherb
Epilobium latifolium	fireweed
Epilobium palustre	marsh willowherb
Equisetum arvense	field horsetail
Erigeron peregrinus	subalpine fleabane
Eriogonum heracleoides	parshnip wild buckwheat
Fragaria virginiana	Virginia strawberry
Galium triflorum	fragrant bedstraw

Plant Species

Scientific name	*Common name*
Geranium richardsonii	Richardson's geranium
Geranium viscosissimum	sticky geranium
Glaux maritima	sea milkwort
Glycyrrhiza lepidota	American licorice
Grindelia squarrosa	curlycup gumweed
Helianthus nuttallii	Nuttall's sunflower
Heracleum lanatum	cow parsnip
Hymenoxys hoopesii	owl's-claws
Hyoscyamus niger	black henbane
Lactuca serriola	prickly lettuce
Lathyrus lanszwertii	Nevada pea
Lepidium perfoliatum	clasping pepperweed
Lupinus argenteus	silvery lupine
Maianthemum racemosum	feathery false lily-of-the-valley
Maianthemum stellatum	starry false lily-of-the-valley
Medicago sativa	alfalfa
Melilotus officinalis	sweetclover
Mertensia ciliata	bluebells
Monolepis nuttalliana	Nuttall's poverty weed
Mondardella odoratissima	mountain monardella
Myriophyllum sibiricum	shortspike watermilfoil
Orthocarpus luteus	yellow owl's-clover
Osmorhiza berteroi	sweet cicely
Osmorhiza occidentalis	western sweetroot
Pastinaca sativa	wild parsnip
Pedicularis groenlandica	elephanthead lousewort
Pedicularis racemosa	sickletop lousewort
Penstemon whippleanus	Whipple's beardtongue
Plagiobothrys leptocladus	finebranched popcornflower
Polemonium foliosissimum	towering Jacob's-ladder
Potamegeton gramineus	variableleaf pondweed
Potamogeton pectinatus	sago pondweed
Potamogeton richardsonii	Richardson's pondweed
Potentilla glandulosa	sticky cinquefoil
Potentilla gracilis	slender cinquefoil
Pseudostellaria jamesiana	tuber starwort
Ranunculus cymbalaria	alkali buttercup
Ranunculus longirostris	longbeak buttercup
Ranunculus sceleratus	cursed buttercup
Sagittaria cuneata	arumleaf arrowhead
Salicornia rubra	red swampfire
Scutellaria galericulata	marsh skullcap
Senecio hydrophiloides	tall groundsel
Senecio hydrophilus	water ragwort

Plant Species

Scientific name	*Common name*
Senecio integerrimus	lambstongue ragwort
Senecio triangularis	arrowleaf ragwort
Sisymbrium altissimum	tall tumblemustard
Sium suave	hemlock waterparsnip
Solanum triflorum	cutleaf nightshade
Sonchus arvensis	sow thistle
Sparganium euycarpum	broadfruit bur-reed
Spergularia salina	salt sandspurry
Streptopus amplexifolius	claspleaf twistedstalk
Suaeda calceoliformis	Pursh seepweed
Symphotrichum adscendens	western aster
Symphotrichum chilense	Pacific aster
Thalictrum fendleri	Fendler's meadow-rue
Thalictrum occidentale	western meadow-rue
Tragopogon dubius	salsify
Trollius laxus	American globeflower
Utricularia macrorhiza	common bladderwort
Viola nuttallii	Nuttall's violet
Xerophyllum tenax	common beargrass
FERNS and FERN ALLIES	
Asplenium adiantum-nigrum	black spleenwort
Asplenium septentrionale	northern spleenwort
Asplenium viride	green spleenwort
Athyrium distentifolium	alpine lady-fern
Azolla mexicana	waterfern
Botrychium boreale	northern grapefern
Botrychium lunaria	moonwort
Athyrium filix-femina	lady-fern
Cheilanthes feei	Fee's lipfern
Cheilanthes gracillima	lace-fern
Cryptogramma crispa	parsley-fern
Cystopteris fragilis	brittle-fern
Equisetum arvense	common horsetail
Equisetum hyemale	common scouringrush
Equisetum laevigatum	smooth scouringrush
Isoetes howellii	Howell's quillwort
Marsilea vestita	pepperwort
Pellaea breweri	Brewer's cliff-brake
Polystichum lonchitis	holly-fern
Polystichum scopulinum	rock holly-fern
Pteridium aquilinum	bracken fern
Selaginella densa	Rydberg's spikemoss
Selaginella mutica	awnless spikemoss
Woodsia oregana	Oregon woodsia

Plant Species

Scientific name	*Common name*
Woodsia scopulina	Rocky Mountain woodsia

Source: DeKnijf 2011, Mauk et al. 1984, Steele 1983, Welsh et al. 2003, West 1988, Windell et al. 1986, Youngblood et al. 1985.

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
DUCKS, GEESE, and SWANS					
Anser albifrons	greater white-fronted goose				
Chen caerulescens	snow goose				
Chen rossii	Ross's goose				
Branta hutchinsii	cackling goose				
Branta canadensis	Canada goose				
Cygnus buccinator	trumpeter swan		GCN		GCN
Cygnus columbianus	tundra swan				
Aix sponsa	wood duck				
Anas strepera	gadwall				
Anas penelope	Eurasian wigeon				
Anas americana	American wigeon				
Anas platyrhynchos	mallard				
Anas discors	blue-winged teal				
Anas cyanoptera	cinnamon teal				
Anas clypeata	northern shoveler				
Anas acuta	northern pintail		GCN		GCN
Anas crecca	green-winged teal				
Aythya valisineria	canvasback				GCN
Aythya americana	redhead				GCN
Aythya collaris	ring-necked duck				
Aythya marila	greater scaup				
Aythya affinis	lesser scaup		GCN		GCN
Histrionicus histrionicus	harlequin duck		GCN		GCN
Melanitta perspicillata	surf scoter				
Melanitta fusca	white-winged scoter				
Melanitta nigra	black scoter				
Clangula hyemalis	long-tailed duck				
Bucephala albeola	bufflehead				
Bucephala clangula	common goldeneye				
Bucephala islandica	Barrow's goldeneye				GCN
Lophodytes cucullatus	hooded merganser		GCN		
Mergus merganser	common merganser				
Mergus serrator	red-breasted merganser				
Oxyura jamaicensis	ruddy duck				

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
UPLAND GAMEBIRDS					
Callipepla californica	California quail				
Alectoris chukar	chukar				
Perdix perdix	gray partridge				
Phasianus colchicus	ring-necked pheasant				
Bonasa umbellus	ruffed grouse				
Centrocercus urophasianus	greater sage-grouse	candidate	GCN	tier II	GCN
Lagopus leucura	white-tailed ptarmigan				
Dendragapus obscurus	dusky grouse				
Tympanuchus phasianellus	Columbian sharp-tailed grouse		GCN	tier II	GCN
Meleagris gallopavo	wild turkey				
LOONS					
Gavia pacifica	Pacific loon				
Gavia immer	common loon				GCN
GREBES					
Podilymbus podiceps	pied-billed grebe				
Podiceps auritus	horned grebe				
Podiceps grisegena	red-necked grebe		GCN		
Podiceps nigricollis	eared grebe				
Aechmophorus occidentalis	Western grebe		GCN		GCN
Aechmophorus clarkii	Clark's grebe		GCN		GCN
CORMORANTS					
Phalacrocorax auritus	double-crested cormorant				
PELICANS					
Pelecanus erythrorhynchos	American white pelican		GCN	tier II	GCN
HERONS, EGRETS, and BITTERNS					
Botaurus lentiginosus	American bittern				GCN
Ardea herodias	great blue heron				GCN
Ardea alba	great egret		GCN		
Egretta thula	snowy egret		GCN		GCN
Bubulcus ibis	cattle egret		GCN		
Butorides virescens	green heron				
Nycticorax nycticorax	black-crowned night-heron		GCN		GCN
IBISES					
Plegadis falcinellus	glossy Ibis				
Plegadis chihi	white-faced Ibis		GCN		GCN
VULTURES					
Cathartes aura	turkey vulture				
HAWKS and EAGLES					
Pandion haliaetus	osprey			tier III	

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Haliaeetus leucocephalus	bald eagle	species of concern	GCN	tier I	GCN
Circus cyaneus	northern harrier				
Accipiter striatus	sharp-shinned hawk				
Accipiter cooperii	Cooper's hawk				
Accipiter gentilis	northern goshawk			tier I	GCN
Buteo lineatus	red-shouldered hawk				
Buteo platypterus	broad-winged hawk				
Buteo swainsoni	Swainson's hawk		GCN		GCN
Buteo jamaicensis	red-tailed hawk				
Buteo regalis	ferruginous hawk		GCN	tier II	CGN
Buteo lagopus	rough-legged hawk				
Aquila chrysaetos	golden eagle				
FALCONS					
Falco sparverius	American kestrel				
Falco columbarius	merlin		GCN		GCN
Falco rusticolus	gyrfalcon				
Falco peregrinus	peregrine falcon		GCN	tier III	GCN
Falco mexicanus	prairie falcon				
RAILS and COOTS					
Rallus limicola	Virginia rail				GCN
Porzana carolina	sora				
Gallinula galeata	common moorhen				
Fulica americana	American coot				
CRANES					
Grus canadensis	sandhill crane		GCN		GCN
SHOREBIRDS					
Pluvialis squatarola	black-bellied plover				
Pluvialis dominica	American golden-plover				
Charadrius alexandrinus	snowy plover			tier III	
Charadrius semipalmatus	semipalmated plover				
Charadrius vociferus	killdeer				
Charadrius montanus	mountain plover	species of concern		tier III	GCN
Himantopus mexicanus	black-necked stilt		GCN	tier III	
Recurvirostra americana	American avocet		GCN	tier III	
Actitis macularius	spotted sandpiper				
Tringa solitaria	solitary sandpiper				
Tringa melanoleuca	greater yellowlegs				
Tringa semipalmata	willet				
Tringa flavipes	lesser yellowlegs				
Numenius phaeopus	whimbrel				

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Numenius americanus	long-billed curlew		GCN	tier II	GCN
Limosa haemastica	Hudsonian godwit				
Limosa fedoa	marbled godwit				
Arenaria interpres	ruddy turnstone				
Calidris canutus	red knot				
Calidris alba	sanderling				
Calidris pusilla	semipalmated sandpiper				
Calidris mauri	western sandpiper				
Calidris minutilla	least sandpiper				
Calidris bairdii	Baird's sandpiper				
Calidris melanotos	pectoral sandpiper				
Calidris alpina	dunlin				
Calidris himantopus	stilt sandpiper				
Limnodromus griseus	short-billed dowitcher				
Limnodromus scolopaceus	long-billed dowitcher				
Gallinago delicata	Wilson's snipe				
PHALAROPES					
Phalaropus tricolor	Wilson's phalarope		GCN		
Phalaropus lobatus	red-necked phalarope				
Phalaropus fulicarius	red phalarope				
GULLS					
Xema sabini	Sabine's gull				
Chroicocephalus philadelphia	Bonaparte's gull				
Leucophaeus pipixcan	Franklin's gull		GCN		GCN
Larus canus	mew gull				
Larus delawarensis	ring-billed gull				
Larus californicus	California gull		GCN		
Larus argentatus	herring gull				
Larus thayeri	Thayer's gull				
Larus glaucescens	glaucous-winged gull				
Larus hyperboreus	glaucous gull				
TERNS					
Hydroprogne caspia	Caspian tern		GCN	tier III	GCN
Chlidonias niger	black tern		GCN		GCN
Sterna hirundo	common tern				
Sterna forsteri	Forster's tern		GCN		GCN
DOVES and PIGEONS					
Columba livia	rock pigeon				
Streptopelia decaocto	Eurasian collared-dove				
Zenaida asiatica	white-winged dove				
Zenaida macroura	mourning dove				

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
CUCKOOS					
Coccyzus americanus	yellow-billed cuckoo	candidate	GCN	tier I	GCN
OWLS					
Bubo virginianus	barn owl				
Otus flammeolus	flammulated owl		GCN		
Megascops kennicottii	western screech-owl				
Bubo virginianus	great horned owl				
Glaucidium gnoma	northern pygmy-owl				GCN
Athene cunicularia	burrowing owl		GCN	tier II	GCN
Strix occidentalis	spotted owl				
Asio otus	long-eared owl				
Asio flammeus	short-eared owl		GCN	tier II	GCN
Aegolius funereus	boreal owl		GCN	tier III	GCN
Aegolius acadicus	northern saw-whet owl				
NIGHTJARS					
Chordeiles minor	common nighthawk				
Phalaenoptilus nuttallii	common poorwill				
SWIFTS					
Chaetura vauxi	Vaux's swift				
Aeronautes saxatalis	white-throated swift				
HUMMINGBIRDS					
Archilochus alexandri	black-chinned hummingbird				
Stellula calliope	calliope hummingbird				
Selasphorus platycercus	broad-tailed hummingbird			tier III	
Selasphorus rufus	rufous hummingbird				
KINGFISHERS					
Megaceryle alcyon	belted kingfisher				
WOODPECKERS					
Melanerpes lewis	Lewis's woodpecker		GCN	tier II	GCN
Sphyrapicus thyroideus	Williamson's sapsucker			tier III	
Sphyrapicus nuchalis	red-naped sapsucker				
Picoides scalaris	ladder-backed woodpecker				
Picoides pubescens	downy woodpecker				
Picoides villosus	hairy woodpecker				
Picoides dorsalis	American three-toed woodpecker		GCN	tier II	GCN
Colaptes auratus	northern flicker				
FLYCATCHERS					
Contopus cooperi	olive-sided flycatcher				
Contopus sordidulus	western wood-pewee				
Empidonax traillii	willow flycatcher				GCN
Empidonax minimus	least flycatcher				

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Empidonax hammondii	Hammond's flycatcher				
Empidonax wrightii	gray flycatcher				
Empidonax oberholseri	dusky flycatcher				
Empidonax occidentalis	Cordilleran flycatcher				
Sayornis saya	Say's phoebe				
Myiarchus cinerascens	ash-throated flycatcher				GCN
Tyrannus verticalis	western kingbird				
Tyrannus tyrannus	eastern kingbird				
SHRIKES					
Lanius ludovicianus	loggerhead shrike				
Lanius excubitor	northern shrike				
VIREOS					
Vireo plumbeus	plumbeous vireo				
Vireo cassinii	Cassin's vireo				
Vireo gilvus	warbling vireo				
Vireo olivaceus	red-eyed vireo				
CORVIDS					
Perisoreus canadensis	gray jay				
Gymnorhinus cyanocephalus	pinyon jay		GCN		
Cyanocitta stelleri	Steller's jay				
Cyanocitta cristata	blue jay				
Aphelocoma californica	western scrub-jay				GCN
Nucifraga columbiana	Clark's nutcracker				
Pica hudsonia	black-billed magpie				
Corvus brachyrhynchos	American crow				
Corvus corax	common raven				
LARKS					
Eremophila alpestris	horned lark				
SWALLOWS					
Progne subis	purple martin				
Tachycineta bicolor	tree swallow				
Tachycineta thalassina	violet-green swallow				
Stelgidopteryx serripennis	northern rough-winged swallow				
Riparia riparia	bank swallow				
Petrochelidon pyrrhonota	cliff swallow				
Hirundo rustica	barn swallow				
CHICKADEES and TITMICE					
Poecile atricapillus	black-capped chickadee				
Poecile gambeli	mountain chickadee				
Baeolophus ridgwayi	juniper titmouse		GCN		GCN

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
BUSHTITS					
Psaltriparus minimus	bushtit				GCN
NUTHATCHES					
Sitta canadensis	red-breasted nuthatch				
Sitta carolinensis	white-breasted nuthatch				
Sitta pygmaea	pygmy nuthatch				GCN
CREEPERS					
Certhia americana	brown creeper				
WRENS					
Salpinctes obsoletus	rock wren				
Catherpes mexicanus	canyon wren				
Thryomanes bewickii	Bewick's wren				
Troglodytes aedon	house wren				
Troglodytes pacificus	Pacific wren				
Cistothorus palustris	marsh wren				
GNATCATCHERS					
Polioptila caerulea	blue-gray gnatcatcher				
DIPPERS					
Cinclus mexicanus	American dipper				
KINGLETS					
Regulus satrapa	golden-crowned kinglet				
Regulus calendula	ruby-crowned kinglet				
BLUEBIRDS and THRUSHES					
Sialia mexicana	western bluebird				
Sialia currucoides	mountain bluebird				
Myadestes townsendi	Townsend's solitaire				
Catharus fuscescens	veery				
Catharus ustulatus	Swainson's thrush				
Catharus guttatus	hermit thrush				
Turdus migratorius	American robin				
Ixoreus naevius	varied thrush				
MIMICS					
Dumetella carolinensis	gray catbird				
Mimus polyglottos	northern mockingbird				
Oreoscoptes montanus	sage thrasher			tier III	GCN
Toxostoma rufum	brown thrasher				
STARLINGS					
Sturnus vulgaris	European starling				
PIPITS					
Anthus rubescens	American pipit				

Bird Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
WAXWINGS					
Bombycilla garrulus	Bohemian waxwing				
Bombycilla cedrorum	cedar waxwing				
LONGSPURS and BUNTINGS					
Calcarius lapponicus	Lapland longspur				
Plectrophenax nivalis	snow bunting				
WARBLERS					
Seiurus aurocapilla	ovenbird				
Parkesia noveboracensis	northern waterthrush				
Mniotilta varia	black-and-white warbler				
Oreothlypis peregrina	Tennessee warbler				
Oreothlypis celata	orange-crowned warbler				
Oreothlypis ruficapilla	Nashville warbler				
Oreothlypis virginiae	Virginia's warbler		GCN	tier III	
Geothlypis tolmiei	MacGillivray's warbler				
Geothlypis trichas	common yellowthroat				
Setophaga ruticilla	American redstart				
Setophaga americana	northern parula				
Setophaga petechia	yellow warbler				
Setophaga striata	blackpoll warbler				
Setophaga palmarum	palm warbler				
Setophaga coronata	yellow-rumped warbler				
Setophaga nigrescens	black-throated gray warbler			tier III	
Setophaga townsendi	Townsend's warbler				
Cardellina pusilla	Wilson's warbler				
Icteria virens	yellow-breasted chat				
SPARROWS					
Pipilo chlorurus	green-tailed towhee				
Pipilo maculatus	spotted towhee				
Spizella arborea	American tree sparrow				
Spizella passerina	chipping sparrow				
Spizella pallida	clay-colored sparrow				
Spizella breweri	Brewer's sparrow		GCN	tier III	GCN
Pooecetes gramineus	vesper sparrow				
Chondestes grammacus	lark sparrow				
Amphispiza bilineata	black-throated sparrow				
Amphispiza belli	sage sparrow				GCN
Calamospiza melanocorys	lark bunting				GCN
Passerculus sandwichensis	Savannah sparrow				
Ammodramus savannarum	grasshopper sparrow		GCN	tier II	GCN
Passerella iliaca	fox sparrow				
Melospiza melodia	song sparrow				

Bird Species

Scientific name	Common name	Status or designation			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Melospiza lincolnii	Lincoln's sparrow				
Melospiza georgiana	swamp sparrow				
Zonotrichia albicollis	white-throated sparrow				
Zonotrichia querula	Harris's sparrow				
Zonotrichia leucophrys	white-crowned sparrow				
Zonotrichia atricapilla	golden-crowned sparrow				
Junco hyemalis	dark-eyed junco				
CARDINALS, BUNTINGS, and GROSBEAKS					
Piranga ludoviciana	western tanager				
Pheucticus ludovicianus	rose-breasted grosbeak				
Pheucticus melanocephalus	black-headed grosbeak				
Passerina caerulea	blue grosbeak		GCN		
Passerina amoena	lazuli bunting				
Passerina cyanea	indigo bunting				
BLACKBIRDS and ORIOLES					
Dolichonyx oryzivorus	bobolink			tier II	GCN
Agelaius phoeniceus	red-winged blackbird				
Sturnella neglecta	western meadowlark				
Xanthocephalus xanthocephalus	yellow-headed blackbird				
Euphagus cyanocephalus	Brewer's blackbird				
Quiscalus quiscula	common grackle				
Quiscalus mexicanus	great-tailed grackle				
Molothrus ater	brown-headed cowbird				
Icterus bullockii	Bullock's oriole				
FINCHES					
Leucosticte tephrocotis	gray-crowned rosy-finch				
Leucosticte atrata	black rosy-finch		GCN	tier III	GCN
Pinicola enucleator	pine grosbeak				
Carpodacus cassinii	Cassin's finch				
Carpodacus mexicanus	house finch				
Loxia curvirostra	red crossbill				
Loxia leucoptera	white-winged crossbill				
Acanthis flammea	common redpoll				
Spinus pinus	pine siskin				
Spinus psaltria	lesser goldfinch		GCN		
Spinus tristis	American goldfinch				
Coccothraustes vespertinus	evening grosbeak				
WEAVER FINCHES					
Passer domesticus	house sparrow				

[1]*Federally listed under the Endangered Species Act as an "endangered" or "threatened" species; a species that is a "candidate" for listing as endangered or threatened; a "recovered" species that is no longer listed; or a species not listed but recognized as a "species of concern."*

[2]*Listed as a States species of "Greatest Conservation Need" (GCN): "tier I" species (highest priority), "tier II" species (moderate priority), or a "tier III" species (lowest priority).*

Mammal Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Sorex merriami	Merriam's Shrew		GCN	tier III	
Sorex preblei	Preble's Shrew			tier II	GCN
Sorex vagrans	vagrant shrew				GCN
Sorex monticolus	montane shrew				
Sorex nanus	dwarf shrew		GCN	tier III	GCN
Sorex palustris	water shrew				GCN
BATS					
Myotis californicus	California myotis		GCN		
Myotis ciliolabrum	western small-footed myotis				GCN
Myotis yumanensis	Yuma myotis			tier III	
Myotis lucifugus	little brown myotis				GCN
Myotis evotis	long-eared myotis				GCN
Myotis thysanodes	fringed myotis			tier II	GCN
Myotis volans	long-legged myotis				GCN
Lasionycteris noctivagans	silver-haired bat				GCN
Pipistrellus hesperus	western pipistrelle				
Eptesicus fuscus	big brown bat				GCN
Lasiurus cinereus	hoary bat				GCN
Euderma maculatum	spotted bat			tier II	GCN
Antrozous pallidus	pallid bat				GCN
Corynorhinus townsendii	Townsend's big-eared bat		GCN	tier II	GCN
CARNIVORES					
Ursus americanus	black bear				
Ursus arctos	brown (grizzly) bear	threatened			GCN
Mustela nigripes	black-footed ferret	endangered		tier I	GCN
Bassariscus astutus	ringtail				
Procyon lotor	northern raccoon				
Martes americana	American marten			tier III	GCN
Martes pennanti	fisher				GCN
Mustela erminea	ermine				
Mustela frenata	long-tailed weasel				
Mustela vison	American mink				
Lontra canadensis	northern river otter			tier III	GCN
Gulo gulo	wolverine	candidate	GCN	tier III	GCN
Taxidea taxus	badger				
Spilogale gracilis	western spotted skunk				
Mephitis mephitis	striped skunk				
Canis latrans	coyote				
Canis lupus	gray wolf	recovery	GCN	tier I	
Vulpes vulpes	red fox				
Urocyon cinereoargenteus	common gray fox				
Vulpes macrotis	kit fox			tier II	
Felis concolor	mountain lion or cougar				

Mammal Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Lynx canadensis	Canada lynx	threatened	GCN	tier I	GCN
Lynx rufus	bobcat				
RODENTS					
Marmota flaviventris	yellow-bellied marmot				
Cynomys leucurus	white-tailed prairie dog	species of concern		tier II	GCN
Spermophilus variegatus	rock squirrel		GCN		
Spermophilus elegans	Wyoming ground squirrel		GCN	tier III	GCN
Spermophilus mollis	Great Basin ground squirrel/ Piute ground squirrel		GCN		
Spermophilus armatus	Uinta ground squirrel				GCN
Spermophilus tridecemlineatus	thirteen-lined ground squirrel			tier III	
Spermophilus lateralis	golden-mantled ground squirrel				
Cynomys parvidens	Utah prairie dog				
Neotamias minimus	least chipmunk				
Neotamias amoenus	yellow-pine chipmunk				
Neotamias dorsalis	cliff chipmunk		GCN		GCN
Neotamias umbrinus	Uinta chipmunk		GCN		
Tamiasciurus hudsonicus	red squirrel				
Glaucomys sabrinus	northern flying squirrel			tier III	GCN
Thomomys talpoides	northern pocket gopher				
Thomomys idahoensis	Idaho pocket gopher		GCN	tier III	GCN
Perognathus parvus	Great Basin pocket mouse				GCN
Dipodomys ordii	Ord's kangaroo rat				
Castor canadensis	American beaver				
Reithrodontomys megalotis	western harvest mouse				
Peromyscus crinitus	canyon mouse				GCN
Peromyscus maniculatus	deer mouse				
Peromyscus boylii	brush mouse				
Peromyscus truei	pinyon (pinon) mouse				GCN
Onychomys leucogaster	northern grasshopper mouse				
Neotoma cinerea	bushy-tailed woodrat				
Phenacomys intermedius	western heather vole				GCN
Microtus pennsylvanicus	meadow vole				
Microtus montanus	montane vole				
Microtus longicaudus	long-tailed vole				
Lemmiscus curtatus	sagebrush vole				GCN
Clethrionomys gapperi	southern red-backed vole				
Microtus richardsoni	water vole				GCN
Ondatra zibethicus	muskrat				
Rattus rattus	black rat				
Rattus norvegicus	Norway rat				
Mus musculus	house mouse				
Zapus princeps	western jumping mouse				

Mammal Species

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Erethizon dorsatum	North American porcupine				
Ochotona princeps	American pika			tier III	
Myocastor coypus	nutria				
LAGOMORPHS					
Brachylagus idahoensis	pygmy rabbit	species of concern	GCN	tier II	GCN
Lepus townsendii	white-tailed jackrabbit				
Lepus californicus	black-tailed jackrabbit				
Sylvilagus nuttallii	mountain cottontail				
Sylvilagus audubonii	desert cottontail				
Lepus americanus	snowshoe hare				
HOOFED MAMMALS					
Cervus canadensis	elk or wapiti				
Odocoileus hemionus	mule deer				tier III
Odocoileus virginianus	white-tailed deer				
Alces alces	moose			GCN	
Antilocapra americana	pronghorn				
Ovis canadensis canadensis	Rocky Mountain bighorn sheep				GCN
Oreamnos americanus	mountain goat		GCN		

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[2]*Listed as a States species of "Greatest Conservation Need" (GCN): "tier I" species (highest priority), "tier II" species (moderate priority), or a "tier III" species (lowest priority).*

Reptiles

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
SNAKES					
Thamnophis sirtalis	common gartersnake			tier III	GCN
Coluber constrictor	eastern yellow-bellied racer				GCN
Pituophis catenifer	Great Basin gophersnake				GCN
Crotalus oreganus lutosus	Great Basin (western) rattlesnake				
Lampropeltis triangulum	milksnake			tier III	GCN
Hypsiglena torquata	nightsnake			tier III	
Diadophis punctatus	ring-necked snake		GCN	tier III	
Charina bottae	rubber boa			tier III	GCN
Opheodrys vernalis	smooth greensnake			tier III	GCN
Masticophis taeniatus	striped whipsnake				
Thamnophis elegans	terrestrial gartersnake				GCN
LIZARDS					
Sceloporus graciosus	common sagebrush lizard				GCN
Uta stansburiana	common sideblotched lizard				

Reptiles

Scientific name	Common name	Status or designation			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Phrynosoma platyrhinos	desert horned lizard				
Sceloporus undulatus	eastern fence lizard				GCN
Crotaphytus bicinctores	Great Basin collared lizard				
Phrynosoma hernandesi	greater short-horned lizard				GCN
Gambelia wislizenii	long-nosed leopard lizard			tier II	
Urosaurus ornatus	ornate tree lizard				
Aspidoscelis tigris	tiger whiptail				
Eumeces skiltonianus	western skink			tier III	

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Amphibians

Scientific name	Common name	Status or designation			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
FROGS and TOADS					
Rana catesbeiana	American bullfrog				
Spea intermontana	Great Basin spadefoot				GCN
Bufo cognatus	Great Plains toad				GCN
Rana clamitans	green frog				
Rana pipiens	northern leopard frog		GCN	tier III	GCN
Pseudacris regilla	Pacific treefrog			tier III	
Bufo boreas	western (boreal) toad			tier II	GCN
Pseudacris triseriata	western chorus frog				
Bufo woodhousii	Woodhouse's toad		GCN		GCN
Pseudacris maculata	boreal chorus frog				
SALAMANDERS					
Ambystoma tigrinum	tiger salamander				GCN

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Fishes

Scientific name	Common name	Status or designation			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
SALMONIDS					
Oncorhynchus nerka	sockeye salmon (kokanee)				
Oncorhynchus clarkii utah	Bonneville cutthroat trout		GCN	tier I	GCN
Oncorhynchus mykiss	rainbow trout				

Fishes

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
Salmo trutta	brown trout				
Salvelinus namaycush	lake trout				
Salvelinus fontinalis	brook trout				
Prosopium gemmifer	Bonneville cisco		GCN	tier II	
Prosopium spilonotus	Bonneville whitefish		GCN	tier II	
Prosopium abyssicola	Bear Lake whitefish		GCN	tier II	
Prosopium williamsoni	mountain whitefish				GCN
Thymallus arcticus	Arctic grayling				CGN
MINNOWS					
Cyprinus carpio	common carp				
Carassius auratus	goldfish				
Gila atraria	Utah chub			tier III	
Gila copei	northern leatherside chub			tier II	GCN
Richardsonius balteatus	redside shiner			tier III	
Iotichthys phlegethontis	least chub	candidate		tier I	
Rhinichthys osculus	speckled dace			tier III	
Rhinichthys cataractae	longnose dace			tier III	
Pimephales promelas	fathead minnow				
Cyprinella lutrensis	red shiner				
SUCKERS					
Catostomus ardens	Utah sucker			tier III	
Catostomus latipinnis	flannelmouth sucker			tier I	GCN
Catostomus platyrhynchus	mountain sucker				GCN
Catostomus discobolus	bluehead sucker		GCN	tier I	GCN
Catostomus commersonii	white sucker				
CATFISH					
Ictalurus punctatus	channel catfish				
Ameiurus melas	black bullhead				
LIVEBEARERS					
Gambusia affinis	western mosquitofish				
SUNFISH					
Micropterus salmoides	largemouth bass				
Micropterus dolomieu	smallmouth bass				
Lepomis cyanellus	green sunfish				
Lepomis macrochirus	bluegill				
Archoplites interruptus	Sacramento perch				
Pomoxis nigromaculatus	black crappie				
PERCH					
Perca flavescens	yellow perch				

Fishes

Scientific name	*Common name*	*Status or designation*			
		Federal[1]	Idaho[2]	Utah[2]	Wyoming[2]
SCULPINS					
Cottus bairdii	mottled sculpin				GCN
Cottus extensus	Bear Lake sculpin		GCN	tier II	
Cottus beldingii	Paiute sculpin			tier III	GCN

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Bibliography

Aldridge, C.L.; Boyce, M.S. 2007. Linking occurrence and fitness to persistence: a habitat-based approach for greater sage-grouse. Ecological Applications 17:508–26.

Aldridge, C.L.; Nielsen, S.E.; Beyer, H.L.; [and others]. 2008. Range-wide patterns of greater sage-grouse persistence. Density and Distributions 14:983–94.

American Farmland Trust. 2000. Strategic ranchland in the Rocky Mountain west—mapping the threats to prime ranchland in seven western States. Washington, DC: American Farmland Trust. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p. <www.farmland.org/resources/rockymtn/default.asp> accessed September 5, 2011.

———. 2001. Cost of community service studies. Washington, DC: American Farmland Trust. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan. U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Baker, Jr., M.B.; Folliott, P.F.; DeBano, L.F.; Neary, D.G. 2004. Riparian areas of the Southwestern United States. Boca Raton, FL: Lewis Publishers. 408 p.

Ball, I.R.; Possingham, H.P.; and M. Watts. 2009. Marxan and relatives: software for spatial conservation prioritisation. In: Moilanen, A.; Wilson, K. A.; and Possingham, H.P.; editors. Spatial conservation prioritisation: quantitative methods and computational tools. Oxford, UK: Oxford University Press. 10 p. (chapter 14, 185–95).

Barnett, T.P.; Pierce, D.W.; Hidalgo, H.G.; [and others]. 2008. Human-induced changes in the hydrology of the Western United States. Science 319:180–1083.

Batchelet, D.; Neilson, R.P.; Lenihan, J.M.; Drapek, R.J. 2001. Climate change effects on vegetation distribution and carbon budget in the United States. Ecosystems 4:164–85.

Bates, W.; Jones, A. 2007. Least-cost corridor analysis for evaluation of lynx habitat connectivity in the Middle Rockies. <wildutahproject.org/files/images/Final%20Report.doc> [access date unknown].

Becker, J.M.; Duberstein, C.A.; Tagestad, J.D.; Downs, J.L. 2009. Sage-grouse and wind energy: biology, habits, and potential effects from development. U.S. Department of Energy Contract No. DE–AC05–76RL01830. [Place of publication unknown]: U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Wind & Hydropower Technologies Program. [Pages unknown].

Belsky, A.J.; Matzke, A.; Uselman, S. 1999. Survey of livestock influences on stream and riparian ecosystems in the Western United States. Journal of Soil and Water Conservation 54:419–31.

Binns, N.A. 1981. Bonneville cutthroat trout Salmo clarki utah in Wyoming. Fisheries Cheyenne, WY: Wyoming Game and Fish Department. Technical Bulletin No. 5.

Bradley, B.A. 2009. Regional analysis of the impacts of climate change on cheatgrass invasion shows potential risk and opportunity. Global Change Biology 15:196–208.

Braun, C.E. 2006. Sage-grouse habitat conservation strategies: a blueprint for conservation and recovery. Tucson, AZ: Grouse Inc. <www.sagebrushsea.org/pdf/Braun_Sage_Grouse_Blue Print.pdf> [access date unknown].

Bridgham, S.D.; Megonigal, J.P.; Keller, J.K.; Bliss, N.B.;Trettin, C. 2006. The carbon balance of North American wetlands. Wetlands. [Place of publication unknown]: The Society of Wetland Scientists. 26(4): 889–916.

Carrol, S.S.; Pearson, D.L. 2000. Detecting and modeling spatial and temporal dependence in conservation biology. Conservation Biology 14:1893–97.

Chaney, E.; Elmore, W.; Platts, W.S. 1990. Livestock grazing on western riparian areas. Eagle, ID: Northwest Resource Information Center, Inc., for the U.S. Environmental Protection Agency. 45 p.

Clark, T.W.; Paquet, P.C.; Curlee, A.P. 1996. Introduction to special section: large carnivore conservation in the Rocky Mountains of the United States and Canada. Conservation Biology 10:936–39.

Comer, P.J.; Hak, J. 2009. NatureServe Landscape Condition Model. Internal documentation for

NatureServe Vista decision support software engineering. Boulder, CO: NatureServe. [Pages unknown].

Connelly, J.W.; Braun, C.E. 1997. Long-term changes in sage grouse (*Centrocercus urophasianus*) populations in western North America. Wildlife Biology 3(4):123–28.

Connelly, J.W.; Browers, H.W.; Gates, R.J. 1988. Seasonal movements of sage grouse in southeastern Idaho. Journal of Wildlife Management 52:116–22.

Connelly, J.W.; Knick, S.T.; Schroeder, M.A.; Stiver, S.J. 2004. Conservation assessment of greater sage-grouse and sagebrush habitats. Unpublished report. On file at Western Association of Fish and Wildlife Agencies, Cheyenne, WY. [Pages unknown].

Connelly, J.W.; Schroeder, M.A.; Sands, A.R.; Braun, C.E. 2000. Guidelines to manage sage-grouse population and their habitats. Wildlife Society Bulletin 28:967–85. <http://sagemap.wr.usgs.gov/Docs/Sage_Grouse_Guidelines.PDF> [access date unknown].

Conner, R.; Seidl, A.; VanTassell, L.; Wilkins, N. 2001. United States grasslands and related resources: and economic and biological trends assessment. <http://twri.tamu.edu/media/256592/unitedstates grasslands.pdf> [access date unknown].

Copeland, H.E.; Doherty, K.E.; Naugle, D.E.; Pocewicz, A.; Kiesecker, J.M. 2009. Mapping oil and gas development potential in the US Intermountain West and estimating impacts to species. Public Library of Science One 4:1–7.

Copeland, H.E.; Tessman, S.A.; Girvetz, E.H.; [and others]. 2010. A geospatial assessment on the distribution, condition, and vulnerability of Wyoming's wetlands. Ecological Indicators 10:869–79.

Copeland, H.E.; Ward, J.M.; Kiesecker, J., 2007. Assessing tradeoffs in biodiversity, vulnerability and cost when prioritizing conservation sites. Journal of Conservation Planning (3):1–16.

Coupal, R.; Tayor, D.T.; McLeod, D. 2002. The cost of community services for rural residential development in Wyoming. Laramie, WY: Wyoming Open Spaces. 4 p. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; and Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Crawford, J.A.; Olson, R.A.; West, N.E.; [and others]. 2004. Synthesis paper—ecology and management of sagegrouse and sage-grouse habitat. Journal of Range Management 57: 2–19.

Crompton, J. 2001. The impact of parks on property values—a review of the empirical literature. Journal of Leisure Research 33(1):1–31.

D'Antonio, C.M.; Vitousek, P.M. 1992. Biological invasions by exotic grasses, the grass/fire cycle, and global change. Annual Review of Ecology and Systematics 23:63–87.

Dark-Smiley, D.; Keinath, D.A. 2003. Species assessment for white-faced ibis (*Plegadis chihi*) in Wyoming. Laramie, WY: University of Wyoming, Wyoming Natural Diversity Database.

Davies, K.W.; Boyd, C.S.; Beck, J.B.; [and others]. 2011. Saving the sagebrush sea: an ecosystem conservation plan for big sagebrush plant communities. Biological Conservation 144:2573–84.

Degiorgio, J.; McCarthy, P.; Cross, M.S.; [and others]. 2010. Bear River Climate Change Adaptation Workshop Summary. [Place of publication unknown]: Southwest Climate Change Initiative. [Pages unknown].

DeKnijf, A. 2011. Preliminary plant species list for Bear Lake National Wildlife Refuge, Montpelier, Idaho. In: Dickerson, K.K.; Hubert, W.A.; Bergman, H.L. 1996. Toxicity assessment of water from lakes and wetlands receiving irrigation drain water. Environmental Toxicology and Chemistry 15(7):1097–101.

Denton, C. 2007. Bear River: last chance to change course. Logan, UT: Utah State University Press. [Pages unknown].

DeVol, R.C.; Bedroussian, A; Klowden, K. 2011. Best performing cities 2011. [Place of publication unknown]: Milken Institute. [Pages unknown].

Dickerson, K.K.; Hubert, W.A.; Bergman, H.L. 1996. Toxicity assessment of water from lakes and wetlands receiving irrigation drain water. Environmental Toxicology and Chemistry 15(7):1097– 101.

Dion, N.P. 1969. Hydrologic reconnaissance of the Bear River basin in southeastern Idaho. [Place of publication unknown]: Idaho Department of Water Resources. Water Information Bulletin 13. 66 p.

Dobler, F.C.; Elby, J.; Perry C.; [and others]. 1996. Status of Washington's shrub–steppe ecosystem: extent, ownership and wildlife/vegetation relationships. Olympia, WA: Washington Department of Fish and Wildlife, Wildlife Management Program. [Pages unknown].

Dobson, A.; Ralls, K.; Foster, M. 1999. Connectivity: maintaining flows in fragmented landscapes. In: Soulé, M. E.; Terborgh, J.; editors. Continental conservation—scientific foundations of regional reserve networks. Washington, DC: Island Press. 129–70.

Dodds,W.K.; Wilson, K.C.; Rehmeier, R.L.; [and others]. 2008. Benefits of ecosystem goods and services associated with restored lands compared to native lands. BioScience 58(9):837–45.

Doherty, K.E.; Naugle, D.E.; Walker, B.L.; Graham, J.M. 2008. Greater sage-grouse winter habitat selection and energy development. Journal of Wildlife Management 72:187–95.

Doherty, K.E.; Tack, J.D.; Evans, J.S.; Naugle, D.E. 2010. Breeding densities of greater sage-grouse: a tool for range-wide conservation planning [Bureau of Land Management completion report]. Agreement No. L10PG00911. [Place of publication unknown]: [Publisher unknown]. [Pages unknown].

Downard, R. 2010. Keeping wetlands wet: the human hydrology of wetlands in the Bear River basin [master's thesis]. Logan, UT: Utah State University. [Pages unknown]. <http://digitalcommons.usu.edu/etd/829> [access date unknown].

Ehrlich, P.R. 1986. The loss of diversity. In: Wilson, E.O.; editor. Biodiversity. Washington, DC: National Academy Press. 21–27.

Ewing, K.L. 1978. Riparian ecosystems: conservation of their unique characteristics. In: Johnson, R.R.; McCormack, J.F.; editors. Strategies for protection and management of floodplain wetlands and other riparian ecosystems. Washington, DC: U.S. Department of Agriculture, Forest Service. General Technical Report WO–12. [Pages unknown].

Field, C.B.; Lobell, D.B.; Peters, H.A.; Chiariello, N.R. 2007. Feedbacks of terrestrial ecosystems to climate change. Annual Review of Environment and Resources 32:1–29.

Foster-Willfong, J.M. 2003. Census methodology and habitat use of long-billed curlews (*Numenius americanus*) in Saskatchewan. [master's thesis] Regina, SK, Canada: University of Regina. [Pages unknown].

Friedman, J.M.; Scott, M.L.; Auble, G.T. 1997. Water management and cottonwood forest dynamics along prairie streams. In: Knopf, F.L.; Samson, F.B.; editors. Ecology and conservation of Great Plains vertebrates. New York: Springer-Verlag. 49–71.

Gammonley, J.H. 2004. Wildlife of natural palustrine wetlands. In: McKinstry, M.C.; Hubert, W.A.; Anderson, S.H.; editors. Wetland and riparian areas of the Intermountain West. Austin, TX: University of Texas Press. 130–54.

Geoghegan, J.; Lynch, L.; Bucholtz, S. 2003. Capitalization of open spaces into housing values and the residential property tax revenue impacts of agricultural easement programs. Agricultural and Resource Economics Review 32(1): 33–45. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan. U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Giesen, K.M.; Connelly, J.W. 1993. Guidelines for management of Columbian sharp-tailed grouse habitats. Wildlife Society Bulletin 21(3):325–33.

Gregory, S.V.; Swanson, F.J.; McKee, W.A.; Cummins, K.W. 1991. An ecosystem perspective of riparian zones: Focus on links between land and water. Bioscience 41(8):540–49.

Gude, P.H.; Hansen, A.J.; Jones, D.A. 2007. Biodiversity consequences of alternative future land use scenarios in Greater Yellowstone. Ecological Applications 17:1004–18.

Haak, A.; Williams, J.; Colyer, W. 2011. Developing a diverse conservation portfolio for Bonneville cutthroat trout. [Place of publication unknown]:Trout Unlimited. [Pages unknown]. <http://tucsi.tu.org/Documents/Portfolios/bct-3r-summary_final.pdf> accessed February 9, 2012.

Haddad, N.M. 1999. Corridor use predicted from behaviors at habitat boundaries. American Naturalist 153:215–27.

Haddad, N.M.; Baum, K.A. 1999. An experimental test of corridor effects on butterfly densities. Ecological Adaptations 9:623–33.

Hagen, C.A.; Jamison, B.E.; Giesen, K.M.; Riley, T.Z. 2004. Guidelines for managing lesser prairie-chicken populations and their habitats. Wildlife Society Bulletin 32(1):69–82.

Hagen, C.A.; Sandercock, B.K.; Pitman, J.C.; Roberl, R.J. 2009. Spatial variation in lesser prairie-chicken demography: a sensitivity analysis of population dynamics and management alternatives. The Journal of Wildlife Management 73(8):1325–32.

Hansen, A.J.; Knight, R.L.; Marzluff, J.M.; [and others]. 2005. Effects of exurban development on biodiversity: patterns, mechanisms, and research needs. Ecological Applications 15:1893–905.

Hanser, S.E.; Knick, S.T. 2011. Greater sage-grouse as an umbrella species for shrubland passerine birds: a multi-scale assessment. In: Knick, S.T.; Connelly, J.W.; editors. Greater sage-grouse ecology and conservation of a landscape species and its habitats. Studies in Avian Biology 38:473–87.

Harris, L.D. 1984. The fragmented forest. Chicago, IL: University of Chicago Press. [Pages unknown].

Haws, F.W.; Hughes, T.C. 1973. Hydrologic inventory of the Bear River study unit. Logan, UT: Utah State University, Utah Water Research Laboratory. [Pages unknown].

Headwaters Economics. 2011. Economic profile system–human dimensions toolkit (EPS–HDT). [Pages unknown]. <http://headwaterseconomics.org/tools/eps-hdt> accessed September 5, 2011. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012, Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Higgins, K.F.; Woodward, R.O. 1986. Comparison of wetland drainage during and after protection by 20-year easements. Prairie Naturalist 18(4):229–33.

Holloran, M.J. 2005. Greater sage-grouse (*Centrocercus urophasianus*) population response to natural gas field development in western Wyoming. [Ph.D. dissertation]. Laramie, WY: University of Wyoming, Department of Zoology and Physiology. [Pages unknown].

Hughes, M.K.; Diaz, H.F. 2008. Climate variability and change in the drylands of Western North America. Global and Planetary Change. [Place of publication unknown]: National Oceanic and Atmospheric Administration, NOAA Research, Earth System Research Laboratory, Physical Sciences Division. [Pages unknown]. <www.esrl.noaa.gov/psd/pubs/2008/> [access date unknown].

Idaho Cooperative Fish and Wildlife Research Unit. 2011. Idaho GAP analysis. Moscow, ID: University of Idaho. <www.wildlife.uidaho.edu/idgap/Report/Chapter3.pdf> [access date unknown].

Idaho Department of Fish and Game. 1997. Conservation strategy for southeastern Idaho wetlands by Mabel Jankovsky-Jones. Boise, ID: Idaho Department of Fish and Game, Conservation Data Center. [Pages unknown].

———. 2005. Idaho comprehensive wildlife conservation strategy. Boise, ID: Idaho Department of Fish and Game, Idaho Conservation Data Center. [Pages unknown]. <http://fishandgame.idaho.gov/cms/tech/CDC/cwcs.cfm> [access date unknown].

———. 2007. Idaho Transportation Department—Districts 3, 4, and 5 fish and wildlife linkage project GIS layers final report. Missoula, MT: Geodata Services, Inc. [Pages unknown]. <http://fishandgame.idaho.gov/public/wildlife/collisionReport345.pdf> accessed December 14, 2011.

Ilya, M.D.; Maclean, M.M.; Rehfisch, S.D.; Robinson, R.A. 2008. The effects of climate change on migratory waterbirds within the African–Eurasian flyway: Proceedings, 8th meeting of the technical committee, African Eurasian Waterbird Agreement United Nations Environment Programme; [Date unknown]; [Place of proceedings unknown]. [Place of publication unknown]: [Publisher unknown]. [Pages unknown].

Ingelfinger, F.; Anderson, S. 2004. Passerine response to roads associated with natural gas extraction in a sagebrush steppe habitat. Western North American Naturalist 64:385–95.

Intermountain West Joint Venture. 2005. Coordinated bird conservation plan, version 1.1. [Place of publication unknown]: [Publisher unknown]. [Pages unknown]. <http://iwjv.org/567/science.html> [access date unknown].

———. 2010. The ecological value of agriculture managed wetlands for migratory and wetland birds within the Bear Watershed. Unpublished report. On file at Intermountain West Joint Venture, Missoula, MT. [Pages unknown].

Jibson, W.N. 1991. History of the Bear River Compact. Salt Lake City, UT: Bear River Commission. [Pages unknown].

Johnson, A.S. 1989. The thin green line: riparian corridors and endangered species in Arizona and New Mexico. In: Mackintosh, G.; editor. In defense of wildlife: preserving communities and corridors. Washington, DC: Defenders of Wildlife. 35–46.

Johnson, G.D.; Boyce, M.S. 1990. Feeding trials with insects in the diets of sage grouse chicks. Journal of Wildlife Management 54:89–91.

Johnson, R.; McCormack, J.; technical coordinators. 1978. Strategies for protection and management of floodplain wetlands and other riparian ecosystems. U.S. Department of Agriculture, Forest Service GTR–WO–12. Washington, DC: [Publisher unknown]. [Pages unknown].

Jordan, N.; Boody, G.; Broussard, W.; [and others]. 2007. Sustainable development of the agricultural bio-economy. Science 316:1570–71.

Kaczor, N.W.; Herman-Brunson, K.M.; Jensen, K.C.; [and others]. 2011. Resource selection during brood-rearing by greater sage-grouse. In: Sandercock, B.K.; Martin, K.; Segelbacher, G.; editors. Ecology, conservation, and management of grouse. Studies in Avian Biology 39: 169–77.

Kaiser, R.C. 2006. Recruitment by greater sage-grouse in association with natural gas development in western Wyoming. [master's thesis]. Laramie, WY: University of Wyoming, Department of Zoology and Physiology. [Pages unknown].

Kiesecker, J.M. 2002. Synergism between trematode infection and pesticide exposure: a link to amphibian limb deformities in nature? Proceedings of the National Academy of Sciences 99: 9900–04.

Knick, S.T.; Dobkin, D.S.; Rotenberry, J.T.; [and others]. 2003. Teetering on the edge or too late? Conservation and research issues for avifauna of sagebrush habitats. Condor 105:611–34.

Knick, S.T.; Rotenberry, J.T. 1995. Landscape characteristics of shrubsteppe habitats and breeding passerine birds. Conservation Biology 9:1059–71.

Knight, D.H. 1994. Mountains and plains: the ecology of Wyoming landscapes. New Haven, CT: Yale University Press. 338 p.

Knight, R.L.; Wallance, G.N.; Riebsame, W.E. 1995. Ranching the view: subdivisions versus agriculture. Conservation Biology 9:459–61.

Knopf, F.L.; Johnson, R.R.; Rich, T.; Samson, F.B.; Szaro, R.C. 1988. Conservation of riparian ecosystems in the United States. Wilson Bulletin 100:272–84.

Kroger, T. 2008. Open space property value premium analysis. Washington, DC: National Council for Science and the Environment, Wildlife Habitat Policy Research Program; Washington, DC: Defenders of Wildlife, Conservation Economics

Program. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Legendre, P. 1993. Spatial autocorrelation: trouble or new paradigm? Ecology [Washington DC] 74:1659–73.

Lemly, A.D.; Finger, S.E.; Nelson, M.K. 1993. Sources and impacts of irrigation drainwater contaminants in arid wetlands. Environmental Toxicology and Chemistry 12:2265–79.

Lemly, A.D.; Kingsford, R.T.; Thompson, J.R. 2000. Irrigated agriculture and wildlife conservation: conflict on a global scale. Environmental Management 25: 485–512.

Leonard, K.M.; Reese, K.P.; Connelly, J.W. 2000. Distribution, movements and habitats of sage grouse *Centrocercus urophasianus* on the upper Snake River Plain of Idaho: changes from the 1950s to the 1990s. Wildlife Biology (6):265–70.

Lohman, K. 2004. Wildlife use of riverine wetland habitats. In: McKinstry, M.C.; Hubert, W.A.; Anderson, S.H. Wetland and riparian areas of the Intermountain West. Austin, TX: University of Texas Press. 319 p. (74–86).

Lovejoy, T.E.; Bierregaard, R.O.; Rylands, A.B.; [and others]. 1986. Edge and other effects of isolation on Amazon forest fragments. In: Soulé, M.E.; editor. Conservation biology, the science of scarcity and diversity. Sunderland, MA: Sinauer Associates. 257–85.

Lyon, A.G.; Anderson, S.H. 2003. Potential gas development impacts on sage grouse nest initiation and movement. Wildlife Society Bulletin 31:486–91.

MaClean, I.M.D.; Austin, G.E.; Rehfisch, M.M.; [and others]. 2008. Climate change causes rapid changes in the distribution and site abundance of birds in winter. Global Change Biology 14: 2489–500.

Maestas, J.D.; Knight, R.L.; Gilgert, W.C. 2003. Biodiversity across a rural land-use gradient. Conservation Biology 17:1425–34.

Martin, J. W., and B. A. Carlson. 1998. Sage Sparrow (*Amphispiza belli*). In: Poole, A.; Gill, F.; editors. The birds of North America, no. 326. Philadelphia, PA: The Birds of North America, Inc. [Pages unknown].

Mauk, R.L.; Henderson, J.A. 1984. Coniferous forest habitat types of northern Utah. Ogden, UT: U.S. Department of Agriculture, Intermountain Forest and Range Experiment Station. General Technical Report INT–170. 89 p.

McConnell, V.; Walls, M. 2005. The value of open space: evidence from studies of non-market benefits. Washington, DC: Resources for the Future. 79 p.

Mech, S.G.; Hallett, J.G. 2001. Evaluating the effectiveness of corridors: a genetic approach. Conservation Biology 15:467–74.

Merrill, E.H.; Kohley, T.W.; Herdendorf, M.E.; [and others]. 1996. Wyoming gap analysis: a geographic analysis of biodiversity. Final report. Laramie, WY: University of Wyoming, Wyoming Cooperative Fish and Wildlife Research Unit. [Pages unknown].

Millennium Ecosystem Service Assessment. 2005. Ecosystems and human well-being—synthesis report. Washington, DC: Island Press. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012, Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Milligan, M.R. 2000. Glad you asked [article]. Survey Notes 32(1). <http://geology.utah.gov/surveynotes/snt32-1.pdf> [access date unknown].

Montgomery, G.L. 1996. Riparian areas: reservoirs of diversity. Working Paper No. 13. Lincoln, NE: U.S. Department of Agriculture, Natural Resources Conservation Service, Northern Plains Regional Office. [Pages unknown].

Naiman, R.J.; Beechie, T.J.; Benda, L.E.; [and others]. 1992. Fundamental elements of ecologically healthy watersheds in the Pacific Northwest coastal ecoregion. In: Naiman R.J.; editor. Watershed management: balancing sustainability and environmental change. New York: Springer-Verlag. 127–88.

National Audubon Society. 2012. Important Bird Areas Program. <http://web4.audubon.org/bird/iba/> [access date unknown].

National Renewable Energy Laboratory. 2011. Estimates of windy land area and wind energy potential by state. <www.windpoweringamerica.gov/pdfs/wind_maps/wind_potential_80m_30percent.pdf> [access date unknown].

The Nature Conservancy. 2010. Tri-state Bear River CAP. Revised February 22, 2010. <http://conpro.tnc.org/1561/> accessed September 5, 2011.

Netusil, N.R.; Boyd, E.; Griffen, Z.V.; LaMerrill, M.; Rainsberger, E. 2000. Can open space be self-financing? Choices 15(2): 21–23. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Nicholoff, S.H.; compiler. 2003. Wyoming Bird Conservation Plan. Version 2.0. Wyoming Partners In Flight. Lander, WY: Wyoming Game and Fish Department. [Pages unknown].

Niemuth, N.D.; Reynolds, R.E.; Granfors, D.A.; [and others]. 2008. Landscape-level planning for

conservation of wetland birds in the U.S. prairie pothole region. In: Millspaugh, J.J.; Thompson, F.R.; editors. Models for planning wildlife conservation in large landscapes. [Place of publication unknown]: Elsevier Science. 533–60.

Noss, R.; Wuerthner, G.; Vance-Borland, K.; Carroll, C. 2001. A biological conservation assessment for the Utah–Wyoming Rocky Mountains ecoregion. Corvallis, OR: Conservation Science. Report to the Nature Conservancy. [Pages unknown].

Noss, R.F. 1983. A regional landscape approach to maintain diversity. BioScience 33:700–06.

Noss, R.F.; Cooperrider, A.Y. 1994. Saving nature's legacy: protecting and restoring biodiversity. Washington, DC: Island Press. [Pages unknown].

Noss, R.F.; Quigley, H.B.; Hornocker, M.G.; Merrill, T.; Paquet, P.C. 1996. Conservation biology and carnivore conservation in the Rocky Mountains. Conservation Biology 10(4):949–63.

Omhart, R.D. 1994. The effects of human-induced changes on the avifauna of western riparian habitats. Studies in Avian Biology 15:273–85.

Omhart, R.D.; Anderson, B.W. 1982. North American desert riparian ecosystems. In: Bender, G.L.; editor. References handbook on the deserts of North America. Westport, CT: Greenwood Press. 433–79.

Paige, C.; Ritter, S.A. 1999. Birds in a sagebrush sea: managing sagebrush for bird communities. Boise, ID: Partners in Flight Western Working Group. 47 p.

Pampush, G.J.; Anthony, R.G. 1993. Nest success, habitat utilization and nest-site selection of long-billed curlews in the Columbia basin, Oregon. Condor 95:957–67.

Parrish, J.R.; Howe, F.P.; Norvell, R.E. 2002. Utah Partners in Flight avian conservation strategy version 2.0. Publication Number 02–27. Salt Lake City, UT: Utah Division of Wildlife Resources, Utah Partners in Flight Program. 302 p.

Parton, W.J.; Gutmann, M.P.; Williams, S.A; Easter, M.; Ojima, D. 2005. Ecological impact of historical land-use patterns in the Great Plains: a methodological assessment. Ecological Applications 15:1915–28.

Parton, W.J.; Ojima, D.S.; Schimel, D.S. 1994. Environmental change in grasslands: assessment using models. Climatic Change 28:111–41.

Phillips, S. 2000. Windfalls for wilderness—land protection and land value in the Green Mountains. In: Proceedings, McCool, S.F.; Cole, D.N.; Borrie, W.T.; O'Loughlin, J. Wilderness science in a time of change conference—volume 2—wilderness in the context of larger systems; Missoula, MT; May 23–27, 1999. RMRS–P–15–VOL–2:258–267: Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Poff, B.; Koestner, K.A.; Neary, D.G.; Henderson, V. 2011. Threats to riparian ecosystems in western North America: an analysis of existing literature. Journal of the American Water Resources Association 47:1241–54.

Reynolds, R.E.; Shaffer, T.L.; Renner, R.W.; Newton, W.E.; Batt, B.D.J. 2001. Impact of the Conservation Reserve Program on duck recruitment in the U.S. prairie pothole region. Journal of Wildlife Management 65:765–80.

Rissman, A.; Lozier, L.; Comendant, T.; [and others]. 2007. Conservation easements: biodiversity protection and private use. Conservation Biology 21(3), 709–18. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Ritter, S. 2000. Idaho Bird Conservation Plan, version 1. Hamilton, MT: Idaho Partners in Flight. [Pages unknown].

Robles, M.D.; Enquist, C. 2010. Managing changing landscapes in the Southwestern United States. Tucson, AZ: The Nature Conservancy. 26 p.

Rood, S.B.; Mahoney, J.M. 1990. Collapse of riparian poplar forests downstream from dams in western prairies: probable causes and prospects for mitigation. Environmental Management 14:451–64.

Rood, R.; Thatcher, L. Brief history of Utah. <http://historytogo.utah.gov/facts/brief_history/index.html> accessed January 8, 2012.

Rotenberry, J.T.; Wiens, J.A. 1980. Habitat structure, patchiness, and avian communities in North American steppe vegetation: a multivariate analysis. Ecology 61:1228–50.

Rowland, M.M.; Wisdom, M.J.; Suring, L.H.; Meinke, C.W. 2006. Greater sage-grouse as an umbrella species for other sagebrush-associated vertebrates. Biological Conservation 129:323–35.

Royster, W.; Gearino, J. 2006. Squeezed in Star Valley. Casper Star Tribune. October 15: [Section and column unknown].

Saalfeld, S.T.; Warren, C.; Conway, W.C.; [and others]. 2010. Multiscale habitat selection by long-billed curlews (*Numenius americanus*) breeding in the United States. Waterbirds 33(2):148–61.

Sauer, J.R.; Hines, J.E.; Fallon, J. 2005. The North American breeding bird survey, results and analysis 1966–2004. Version 2005.2. Laurel, MD: U.S. Geological Survey Patuxent Wildlife Research Center. <www.mbr-pwrc.usgs.gov/bbs/bbs.html> accessed February 17, 2012.

Sawyer, H.; Kauffman, M.J.; Nielson, R.M. 2006. Influence of well pad activity on winter habitat selection patterns of mule deer. Journal of Wildlife Management 73:1052–61.

Schroeder, M.A.; Young, J.R.; Braun, C.E., 1999. Sage-grouse (*Centrocercus urophasianus*). In: Poole, A.; Gill, F.; editors. The birds of North America, number 425. Philadelphia, PA: The Academy of Natural Sciences; Washington, DC: The American Ornithologists Union. [Pages unknown].

Schwartz, M.K.; Copeland, J.P.; Anderson, N.J.; [and others]. 2009. Wolverine gene flow across a narrow climatic niche. Ecology 90:3222–32.

Slater, S.J. 2006. Wyoming's riparian bird communities: issues of scale and human-caused vegetation and landscape change. [Ph.D. dissertation]. Laramie, WY: University of Wyoming, Department of Zoology and Physiology. [Pages unknown].

Snyder, W.D.; Miller, G.C. 1992. Changes in riparian vegetation along the Colorado River and Rio Grande, Colorado. The Great Basin Naturalist 52:357–63.

Steele, R.; Cooper, S.V.; Ondov, D.M.; Roberts, D.W.; Pfister, R.D. 1983. Forest habitat types of eastern Idaho—western Wyoming. Ogden, UT: U.S. Department of Agriculture, Intermountain Forest and Range Experiment Station. General Technical Report INT–144. 122 p.

Svejcar, T. 1997. Riparian zones: what they are and how do they work? Rangelands 19(4): 4–7.

Syphard, A.D.; Radeloff, V.C.; Hawbaker, T.J.; Stewart, S.I. 2009. Conservation threats due to human-caused increases in fire frequency in Mediterranean-climate ecosystems. Conservation Biology 23:758–69.

Syphard, A.D.; Radeloff, V.C.; Keeley, J.E.; [and others]. 2007. Human influence on California fire regimes. Ecological Application 17:1388–402.

Taylor, D.T.; Coupal, R.H. 2000. The cost of rural community services in Laramie, Wyoming. Laramie, WY: University of Wyoming, Department of Agricultural and Applied Economics. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Teuscher, D; Capurso, J. 2007. Management plan for conservation of Bonneville cutthroat trout in Idaho. [Place of publication unknown]: Idaho Department of Fish and Game; U.S. Department of Agriculture, Forest Service. [Pages unknown].

Theobald, D.M.; Crooks, K.R.; Norman, J.B. 2011. Assessing effects of land use on landscape connectivity: loss and fragmentation of western U.S. forests. In: Ecological Applications. Ecological Society of America 21: 2445–58.

Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Thorsnes, P. 2002. The value of a suburban forest preserve: estimates from sales of vacant residential building lots. Land Economics 78:426–41.

Toth, R.E.; Baker, J.B.; Bryner, C.L.; [and others]. 2005. Alternative futures for the Bear River Watershed. Logan, UT: Utah State University, College of Natural Resources. Final Project Report No. 2005–1. [Pages unknown].

Toth, R.E.; Edwards, T.; Lilieholm, R. 2004. The Great Salt Lake region: alternative futures. Logan, UT: Utah State University, Department of Environment and Society. [Pages unknown]. <www.cnr.usu.edu/envs/files/uploads/GSL_report.pdf> [access date unknown].

Toth, R.E.; Edwards, T.J.; Perschon, A.; White, D. 2010. The Bear River Watershed: its role in maintaining the Bear River Migratory Bird Refuge. Logan, UT: Utah State University, Department of Environment and Society, College of Natural Resources. [Pages unknown].

Trout Unlimited. 2010. Bonneville cutthroat trout species summary and conservation portfolio. <http://tucsi.tu.org/BonnevilleCutthroat_General.aspx?SpKey=31> [access date unknown].

U.S. Census Bureau. 2010. State and County QuickFacts. <http://quickfacts.census.gov/qfd/index.html> [access date unknown].

———. 2011. American FactFinder. Washington, DC: U.S. Census Bureau. [Pages unknown]. <http://factfinder2.census.gov/main.html> accessed November 14, 2011.

(USDA Farm Service Agency) U.S. Department of Agriculture, Farm Service Agency. 2007. Conservation reserve program: summary and enrollment statistics. <www.fsa.usda.gov/Internet/FSA_File/annual_consv_2007.pdf> [access date unknown].

(USDA NRCS) U.S. Department of Agriculture, Natural Resources Conservation Service. 2010a. Easements, acres and dollars. <www.nrcs.usda.gov/programs/frpp/2010_easements/acres-and-dollars.html> [access date unknown].

———. 2010b. Easements: protecting and enhancing our natural resources. <www.nrcs.usda.gov/programs/wrp/2010_contracts/contracts-and-dollars.html> [access date unknown].

(USDA Forest Service) U.S. Department of Agriculture, Forest Service. 2003. Wasatch–Cache, Ashley, and Uinta National Forests lynx analysis. <www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5076927.pdf> [access date unknown].

(USFWS) U.S. Fish and Wildlife Service. 1998. A system for mapping riparian areas in the Western

U.S. Washington, DC: U.S. Fish and Wildlife Service. [Pages unknown].

———. 2002. Bull trout (*Salvelinus confluentus*) draft recovery plan. Portland, OR: U.S. Fish and Wildlife Service. [Pages unknown].

———. 2006. Endangered and threatened wildlife and plants; 990-day finding on a petition to list the Columbian sharp-tailed grouse as threatened or endangered. Federal Register 71(224):[Pages unknown].

———. 2008a. 2006 national survey of fishing, hunting, and wildlife—associated recreation. Washington, DC: U.S. Fish and Wildlife Service and U.S. Census Bureau. 164 p.

———. 2008b. Endangered and threatened wildlife and plants; 12-month finding on a petition to list the Bonneville cutthroat trout as threatened or endangered. Federal Register 73(175):[Pages unknown].

———. 2010a. Endangered and threatened wildlife and plants; 12-month findings for petitions to list the greater sage-grouse (*Centrocercus urophasianus*) as threatened or endangered. Federal Register [Volume and number unknown]:[Pages unknown].

———. 2010b. Refuge profiles. <www.fws.gov/bearriver/history.html> [access date unknown].

———. 2010c. Rising to the urgent challenge—strategic plan for responding to accelerating climate change. Unpublished report. On file at U.S. Fish and Wildlife Service, Washington, DC. 36 p. <www.fws.gov/home/climatechange/pdf/CCStrategicPlan.pdf> [access date unknown].

———. 2011a. Bear Lake and Thomas Fork Unit National Wildlife Refuge and Oxford Slough Waterfowl Production Area: cultural resources review for comprehensive conservation planning. Sherwood, OR: U.S. Fish and Wildlife Service, Region 1. [Pages unknown].

———. 2011b. Draft land-based wind energy guidelines, September 13, 2011. [Place of publication unknown]: [Publisher unknown]. [Pages unknown]. <www.fws.gov/windenergy/docs/WEGSeptember132011.pdf> [access date unknown].

———. 2011c. Endangered and threatened wildlife and plants; 12-month finding on a petition to list northern leatherside chub as endangered or threatened. Federal Register 76(197): [Pages unknown].

———. 2011d. Endangered and threatened wildlife and plants; 12-month finding on a petition to list the northern leopard frog in the Western United States as threatened. Federal Register 76(193): [Pages unknown].

U.S. General Accounting Office. 1988. Public rangelands: some riparian areas restored, but widespread improvements will be slow. Washington, DC: U.S. General Accounting Office. GAO/RCED–88–105. [Pages unknown].

U.S. Geological Survey. 2005. Southwest Regional Gap Analysis Project. <http://fws-nmcfwru.nmsu.edu/swregap/> accessed February 8, 2012.

Utah Center for Climate and Weather. 2012. [Utah's climate]. <http://utahweather.org> accessed December 15, 2011.

Utah Division of Water Resources. 2002. Bear River basin planning for the future. Utah State Water Plan public review draft. Salt Lake City, UT: Utah Division of Water Resources. 107 p. <www.water.utah.gov/planning/swp/bear/all.pdf> [access date unknown].

———. 2004. Bear River basin: planning for the future. Salt Lake City, UT: Utah Division of Water Resources. [Pages unknown].

Utah Division of Wildlife Resources. 2005a. Black-footed ferret. <http://dwrcdc.nr.utah.gov/rsgis2/Search/Display.asp?FlNm=mustnigr> [access date unknown].

———. 2005b. Utah comprehensive wildlife conservation strategy (CWCS). Salt Lake City, UT: Utah Division of Wildlife Resources. [Pages unknown].

———. 2011. Utah's watershed restoration initiative. Utah Division of Wildlife Resources, 1594 West North Temple Salt Lake City, Utah. Salt Lake City, UT: Utah Division of Wildlife Resources. 2 p. <http://wildlife.utah.gov/pdf/fact_sheets/watershed_restoration.pdf> [access date unknown].

Utah Geological Survey. [No date]. Great Salt Lake, Lake Bonneville and Bear Lake. <http://geology.utah.gov/utahgeo/gsl/index.htm> [access date unknown].

Utah Governor's Office of Planning and Budget. 2008. 2008 Utah baseline—current conditions, trends, and projections. Salt Lake City, UT: Governor's Office of Planning and Budget, Envision Utah, Utah Quality Growth Commission. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Utah State University Extension. 2006. Journey through the Bear River Watershed—Project Wet International Foundation. Logan, UT: Utah State University Cooperative Extension. [Pages unknown]. In: Thomas, C.C.; Huber, C.; Gascoigne, W.; Koontz, L. 2012. Socioeconomic issues for the Bear River Watershed Conservation Land Area Protection Plan: U.S. Geological Survey Open-File Report 2012–1039. 15 p.

Utah Water Research Laboratory. 2011. The Bear River Watershed information system. <www.bearriverinfo.org> [access date unknown].

Vander Haegen, W.M;. Dobler, F.C.; Pierce. D. J.2000. Shrubsteppe bird response to habitat and landscape variables in eastern Washington, U.S.A. Conservation Biology 14:1145–160.

Van Every, L. 2004. Water quality impacts from selenium and other metals in the southeastern Idaho phosphate mining resource area. Proceedings: The Rocky Mountain (56th annual) and Cordilleran (100th annual) joint meeting; Boise, ID; May 3–5, 2004. Boulder, CO: Geological Society of America. <http://gsa.confex.com/gsa/2004RM/finalprogram/abstract_71959.htm> accessed September 5, 2011.

Vrooman, D. 1978. An empirical analysis of determinants of land values in the Adirondack Park. American Journal of Economics and Sociology 37(2):165–77.

Weiher, E.; Keddy, P.A. 1999. Relative abundance and evenness patterns along diversity and biomass gradients. Oikos 87:355–61.

Welsh, S.L.; Atwood, N.D.; Goodrich, S.; Higgins, L.C. 2003. A Utah flora. Third edition, revised. [Ferns and fern allies, gymnosperms]. Provo, UT: Brigham Young University. 912 p.

Wernick, B.G.; Cook, K.E.; Schreiber, H. 1998. Land use and stream water nitrate-N dynamics in an urban–rural fringe watershed. Journal of the American Water Resources Association 34:639–50.

West, N.E. 1988. Intermountain deserts, shrub steppes, and woodlands. In: Barbour, M.G.; Billings, W.D. North American terrestrial vegetation. First edition. New York: Cambridge University Press. 209–64.

White, D. 2011. Great Salt Lake watershed: its role in maintaining the wetlands of the Great Salt Lake. <www.cnr.usu.edu/quinney/htm/collections/theses-dissertations/publication=13328> [access date unknown].

Wiens, J.A.; Rotenberry, J.T. 1981. Habitat associations and community structure of birds in shrubsteppe environments. Ecological Monographs 51:21–41.

Windell, J.T.; Willard B.E.; Cooper D.J.; [and others]. 1986. An ecological characterization of Rocky Mountain montane and subalpine wetlands. Washington, DC: U.S. Department of the Interior, U.S. Fish and Wildlife Service, National Ecology Center. Biological Report 86(11):1–298.

Winward, A.H. 2000. Monitoring the vegetation resources in riparian areas. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRSGTR–47. 49 p.

Wisdom, M.J.; Rowland, M.M.; Suring, L.H.; editors. 2005. Habitat threats in the sagebrush ecosystem: methods of regional assessment an application in the Great Basin. Alliance Communications Group, Lawrence, Kansas.

World Resources Institute. Pilot analysis of global ecosystems: Grassland ecosystems <www.wri.org/publication/content/8272> [access date unknown].

Wyoming Game and Fish Department. 2005. A comprehensive wildlife conservation strategy for Wyoming. Cheyenne, WY: Wyoming Game and Fish Department. [Pages unknown]. <http://gf.state.wy.us/SWAP2010/Plan/index.asp> [access date unknown].

———. 2010. A comprehensive wildlife conservation strategy for Wyoming. Wyoming State Wildlife Action Plan. Cheyenne, WY: Wyoming Game and Fish Department. [Pages unknown]. <http://wgfd.wyo.gov/web2011/Departments/Wildlife/pdfs/SWAP_2010_FULL_OCT0003090.pdf> [access date unknown].

Youngblood, A.P.; Padgett, W.G.; Winward, A.H. 1985. Riparian community type classification of eastern Idaho-western Wyoming. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Region. R4–Ecol–85–01. 78 p.