4 Affected Environment

Located in northern Wyoming in a high plains basin ecosystem known as the Laramie Basin, the Laramie Plains refuges lie near the center of the Mountain–Prairie Region. Bamforth NWR, Hutton Lake NWR, and Mortenson Lake NWR support wetland complexes that provide resting, nesting, and breeding areas for migratory birds in a semiarid environment. In addition, Mortenson Lake NWR provides habitat for the endangered Wyoming toad.

This chapter describes the refuges' setting, as follows:

- physical environment
- biological resources
- cultural resources
- special management areas
- visitor services
- socioeconomic environment
- operations

4.1 Physical Environment

Global Warming

The U.S. Department of the Interior issued an order in January 2001 requiring federal agencies under its direction that have land management responsibilities to consider potential climate change effects as part of long-range planning endeavors.

The Department of Energy's report, "Carbon Sequestration Research and Development," concluded that ecosystem protection is important to carbon sequestration and may reduce or prevent loss of carbon currently stored in the terrestrial biosphere. The report defines carbon sequestration as "the capture and secure storage of carbon that would otherwise be emitted to or remain in the atmosphere."

The increase of carbon dioxide (CO_2) within the earth's atmosphere has been linked to the gradual rise in surface temperature commonly referred to as "global warming." In relation to comprehensive conservation planning for Refuge System units, carbon sequestration constitutes the primary climate-related effect to be considered in planning.

Vegetated land is an important factor in carbon sequestration. Large, naturally occurring communities of plants and animals that occupy major habitats—grasslands, forests, wetlands, tundra, and desert—are effective both in preventing carbon emission and in acting as biological "scrubbers" of atmospheric CO_2.

One service activity in particular—prescribed burning—releases CO_2 directly to the atmosphere from the biomass consumed during combustion yet results in no net loss of carbon because new vegetation quickly germinates and sprouts to replace the burned-up biomass. This vegetation sequesters an approximately equal amount of carbon as was lost to the air (Dai et al. 2006). Several other effects of climate change may need to be considered in the future:

- Habitat available in lakes and streams for cold-water fish such as trout and salmon could be reduced.
- Forests may change, with some plant species shifting their range northward or dying out and other trees moving in to take their place.
- Ducks and other waterfowl could lose breeding habitat because of stronger and more frequent droughts.
- Changes in the timing of migration and nesting could put some birds out of synchronization with the life cycles of their prey.

Climate

The Laramie Basin is considered a cold desert with annual precipitation averaging 11.53 inches (High Plains Regional Climate Center 2006). The average maximum temperature is 53.8°F, average minimum temperature is 26.8°F, and extremes range from a summer high of 95°F to a record low of –50°F. The area is known for persistent windy conditions, and the growing season is short, typically from late May to early September (U.S. Department of Agriculture [USDA] 1998).

Physiography, Geography, and Soils

The current physiography of the Laramie Plains was influenced by a shallow warm water sea, a crustal uplift affecting Colorado and southeast Wyoming, the Laramide Orogeny Mountain building episode, volcanic activity in the Yellowstone area, and influences of the ice ages. Most of the stable

landforms in the area today were created within the last hundred thousand years by glacial outwash waters. Many of the soils therefore have alluvial origins (USDA 1998). The high, flat nature of much of Wyoming is conducive to strong winds, and several features on the land suggest that wind has played an important role in past geological development as well. Data suggest that the Laramie Basin—including Bamforth NWR—is a deflation hollow formed by wind action (Morrison 1991). Bamforth Lake NWR is at about 7,000 feet in elevation with the benches reaching over 7,200 feet. Hutton Lake NWR and Mortenson Lake NWR lie between 7,200 feet and 7,300 feet.

Land Use

A large percentage of the Wyoming Basin (*see* figure 2) is in public ownership, with the Bureau of Land Management (BLM) owning much of the lower elevation shrub–steppe and grassland and the U.S. Forest Service owning a great deal of the higher-elevation wooded land. A checkerboard pattern of land ownership is a subtle problem that affects the consistency of land management over large areas. The primary land use in the Wyoming Basin has been for many years and continues to be grazing, although conversion to agriculture is also an issue. The effects of overgrazing and nonnative plant invasion should be mitigated to improve conditions for breeding birds. Maintenance of springs and riparian habitat may be crucial, particularly to sage grouse. Fencing or changing grazing systems may be effective in maintaining water flow. Oil and gas extraction and hard rock mining are relatively recent factors that may negatively affect the greater landscape needs of the sage-grouse. .

Water Resources

This section describes the hydrology and water rights of the Laramie Plains refuges.

Hydrology

The Laramie River is the primary water source for the county. With its headwaters beginning in the Rawah Mountains to the south in Colorado, as well as the Laramie Mountains to the east and Medicine Bow Mountains to the west, the river winds a course from south to north through Albany County, exits to the northeast and ultimately empties into the North Platte River near Wheatland, Wyoming (USDA 1998).

USFWS

Purple prairie clover

Water Rights

Water rights for the Laramie Plains refuges are listed in table 3.

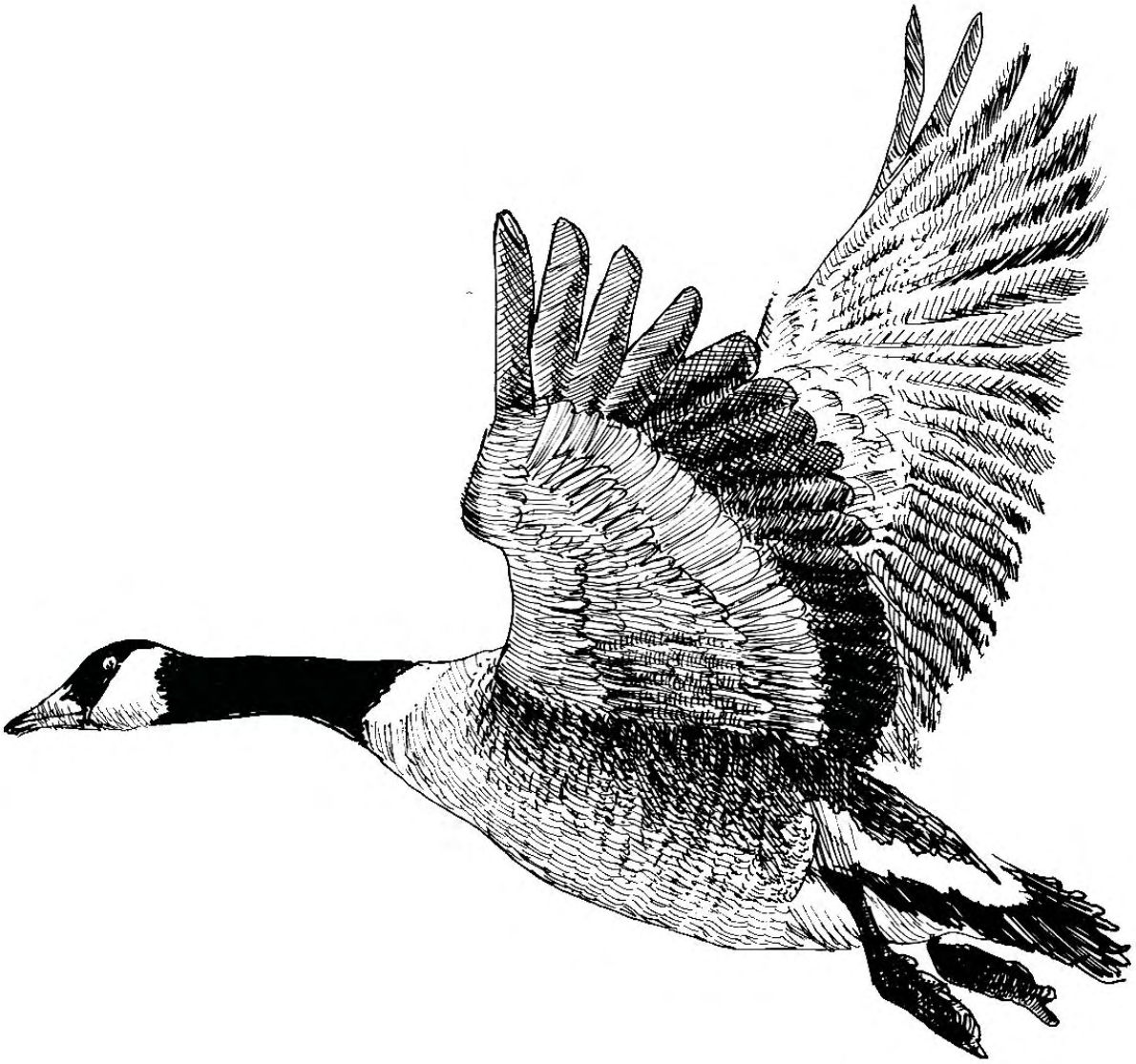
Air Quality

Air quality receives protection under several provisions of the Clean Air Act, including the national ambient air quality standards (NAAQS) and the prevention of significant deterioration program. NAAQS include maximum allowable pollution levels for particulate matter, ozone, sulfur dioxide, nitrogen dioxide, lead, and carbon dioxide.

Based on Wyoming's most current data, the state has relatively clean air. In the area of the refuges (Albany County), the levels of carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, particulate matter (diameter <2.5 micrometers), particulate matter (diameter <10 micrometers), and lead did not exceed federal standards at any monitoring site in 2006 ([U.S. Environmental Protection Agency] 2007a).

Table 3. Water rights for Laramie Plains refuges, Wyoming.

Permit No.	*Territorial Proof No.*	*Priority No.*	*Priority Date*	*County*	*Station*	*Name*	*Use*	*Source*	*CFS Rate*	*GPM Rate*	*Storage Acre-Feet*	*Additional Information*
20132			7/3/1947	Albany	Mortenson Lake NWR	Harman Ditch	Irrigation & Stock	Richard Draw	1.1			Direct flow. Unadjudicated.
20459			7/13/1949	Albany	Mortenson Lake NWR	Soda Lake Ditch	Irrigation, Domestic & Stock	Soda Lake Draw	2.29			Supplemental to 4/19/1879 right from Laramie River thru Pioneer Canal & secondary from 5617 res.
7259			4/14/1967	Albany	Mortenson Lake NWR	Mortenson Lake	Irrigation	Meeboer Draw			247.46	Seepage (Mortenson Lake Reservoir storage water not attached to specific lands).



The air quality index (AQI) is an approximate indicator of overall air quality, because it takes into account all of the criteria air pollutants measured within a geographic area. Air quality in Albany County is considered to be generally good, with no reported days of unhealthy air quality (EPA 2007b).

Prescribed burning is the refuge management activity that has the greatest effect on air quality (find more information in the description of the fire management program in appendix E). The management of smoke is incorporated into planning prescribed burns and, to the extent possible, in suppression of wildfires. Sensitive areas are identified and precautions are taken to safeguard visitors and local residents. Smoke dispersal is a consideration in determining whether a prescribed burn is within prescription. Generally, the fine-grass fuels and small burn size (80–600 acres) generate low volumes of smoke for short durations (4–5 hours).

4.2 Biological Resources

This section describes vegetation, wildlife, and their associated communities at the Laramie Plains refuges. Appendices F–I list species that can be found on the refuges for plants (appendix F), birds (appendix G), amphibians and reptiles (appendix H), and mammals (appendix I).

Habitat

Major habitat types of the Laramie Plains refuges include open water wetlands, uplands consisting of brush and grasslands, alkali flats, and irrigated meadows. The location and distribution of the major habitat types for the refuges are shown in the habitat maps for Bamforth NWR (figure 8), Hutton Lake NWR (figure 9), and Mortenson Lake NWR (figure 10).

Open Water Wetlands

The wetlands within the Laramie Plains refuges vary from natural basins to constructed impoundments and enhanced basins. The physical look of the refuges wetlands ranges from complete open water to rimmed with emergent vegetation to dominated by emergents. Natural runoff somewhat influences these areas, but most water added to these wetlands comes from water rights from irrigation ditches adjudicated through the state of Wyoming. The ability to manage waters in the different impoundments varies considerably.

In Albany County's semiarid environment, the natural and enhanced lakes and ponds on the refuges, as well as the other impoundments, are tightly regulated by the Wyoming State Engineer's Office. Prior to European settlement of Wyoming in the nineteenth century, the Laramie Plains lakes were playas, filling in high runoff years and drying up completely during sustained droughts. Although there are several streams in the county, most of the lakes are independent of their influence from flooding. Following settlement, a series of irrigation ditches were constructed to provide flood irrigation waters for hay and crop production. These ditches probably aided in maintaining more reliable water levels for some of the plains lakes, as return irrigation flows were captured in them, and some of the basins were developed to serve as storage reservoirs for irrigation.

The lower-priority irrigation rights owned by the Service for the refuges often result in little or no irrigation water reaching refuge impoundments, which potentially mimics natural historic conditions, as the wetlands receive more water in good water years and little to no water in drought years. However, good snowpacks in the mountains can result in higher water availability in the irrigation system being available for the Laramie Plains lakes, a condition that may not have obtained in presettlement days. Wildlife is a considered a viable water use category under Wyoming water law and is covered under either the irrigation or miscellaneous use categories.

Wetlands of Bamforth NWR

Records indicate Bamforth NWR has received little to no active wetlands management since its establishment in 1932. Bamforth NWR is located in a 4,000-acre natural depression known as the Big Basin northwest of Laramie. The bottom of the basin is dominated by alkali flats, small ponds, and Bamforth Lake, which encompasses approximately 250 acres when full. Bamforth Lake is owned mostly by the state of Wyoming with approximately 100 acres of the 550-acre lake located in the refuge boundary. The lake comprises half of the refuge, while the other half is upland habitat.

The Park ditch flows through the southwest portion of the refuge, and the Alsop ditch No. 1 flows along the northwest portion of the Big Basin. The refuge owns very junior irrigation water rights out of the Park ditch only, but water use in both ditches potentially influences refuge wetlands through irrigation return flows and subsurface water effects. Two small dikes are located on refuge lands—one is a stock watering pond, and the other is used for stock and irrigation storage, with most of the storage area located off refuge property. The ponds in the bottom of the basin are natural, with no inlet or outlet structures, resulting in little to no management capabilities. The soils along the bottom of the basin, including the ponds when dry, are strongly saline, resulting in minimal emergent or submergent vegetative growth. An island in Bamforth Lake, but not on refuge property, is used by white pelicans,

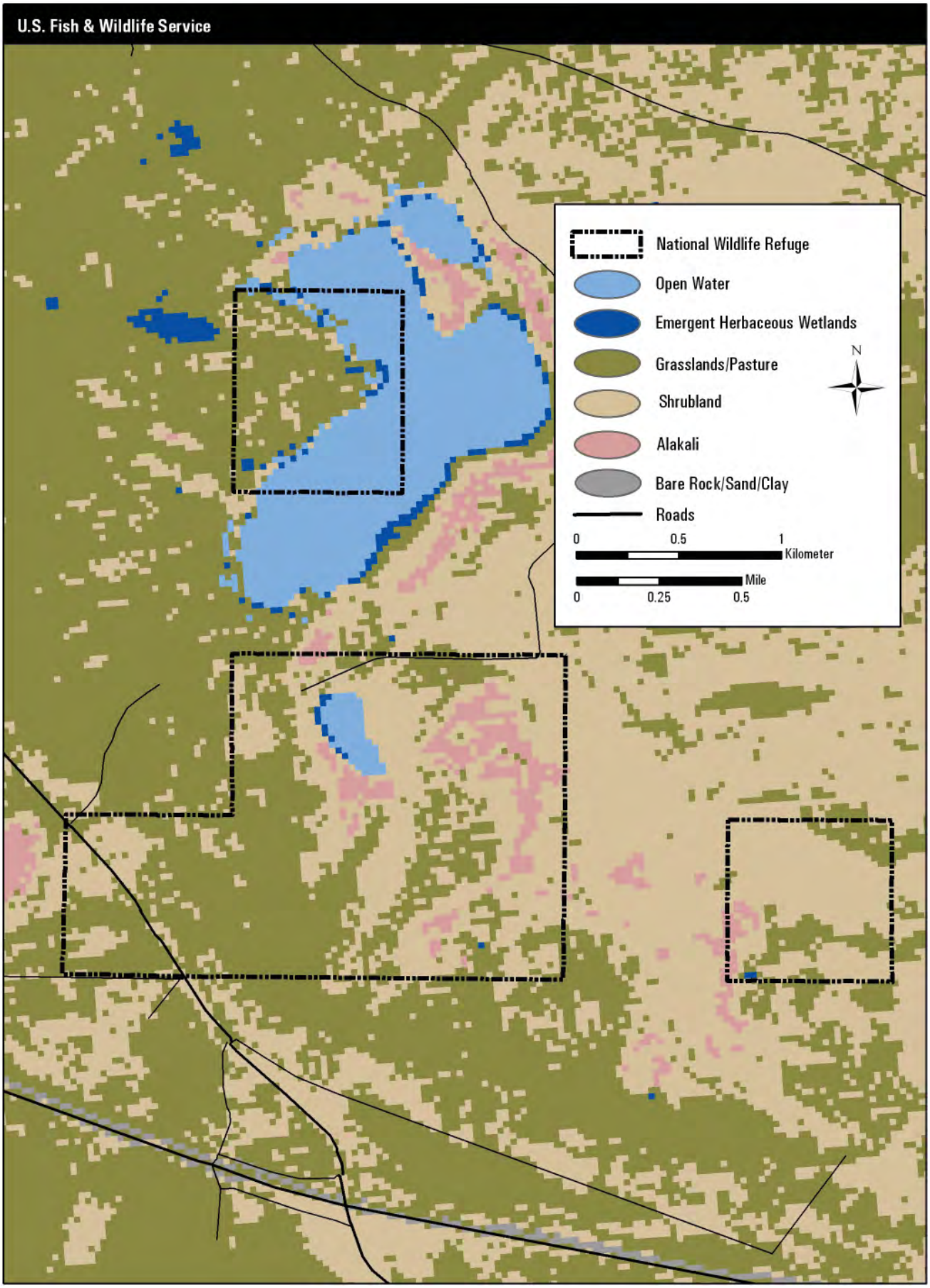


Figure 8. Habitats at Bamforth NWR, Wyoming.

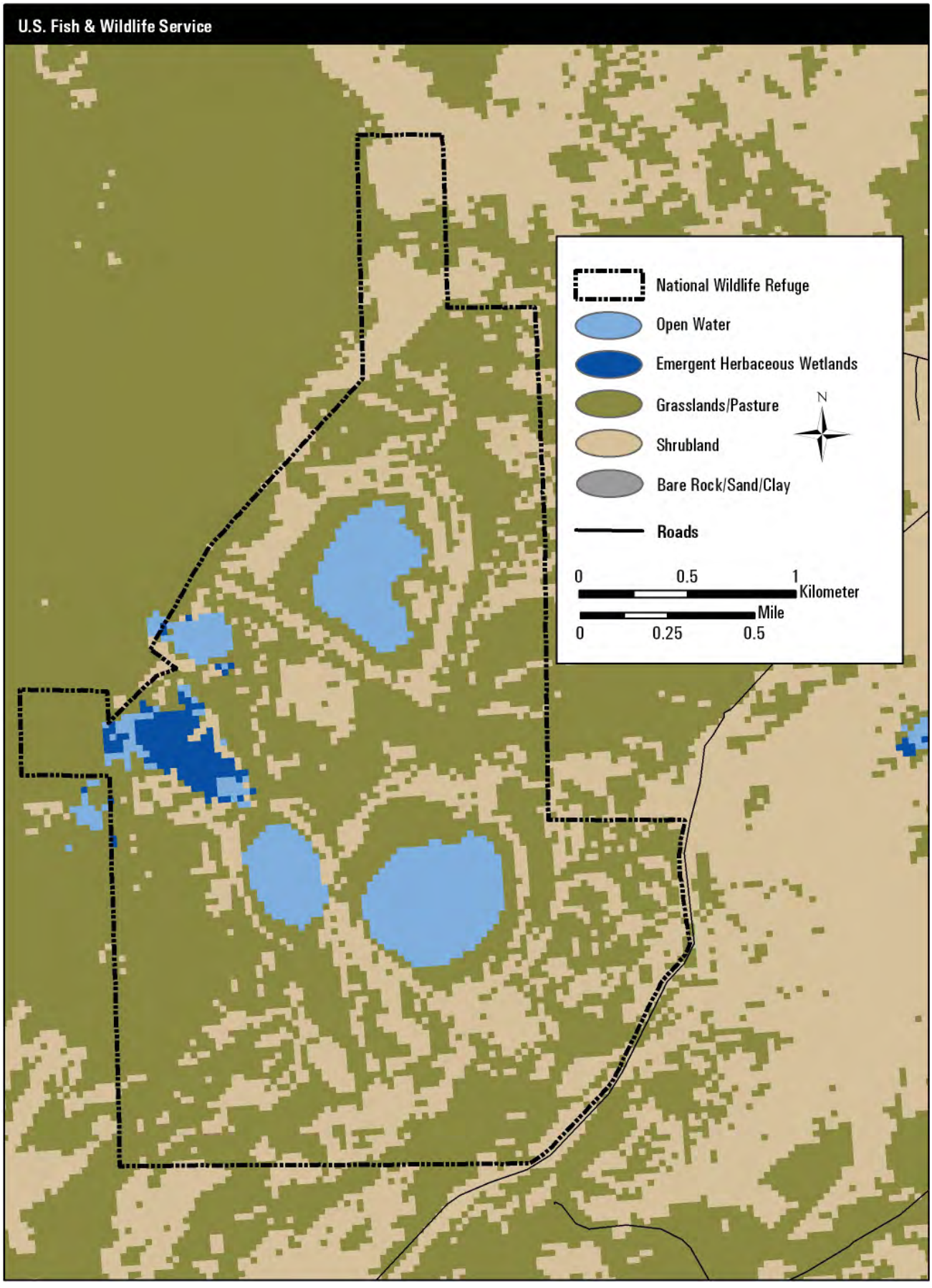


Figure 9. Habitats at Hutton Lake NWR, Wyoming.

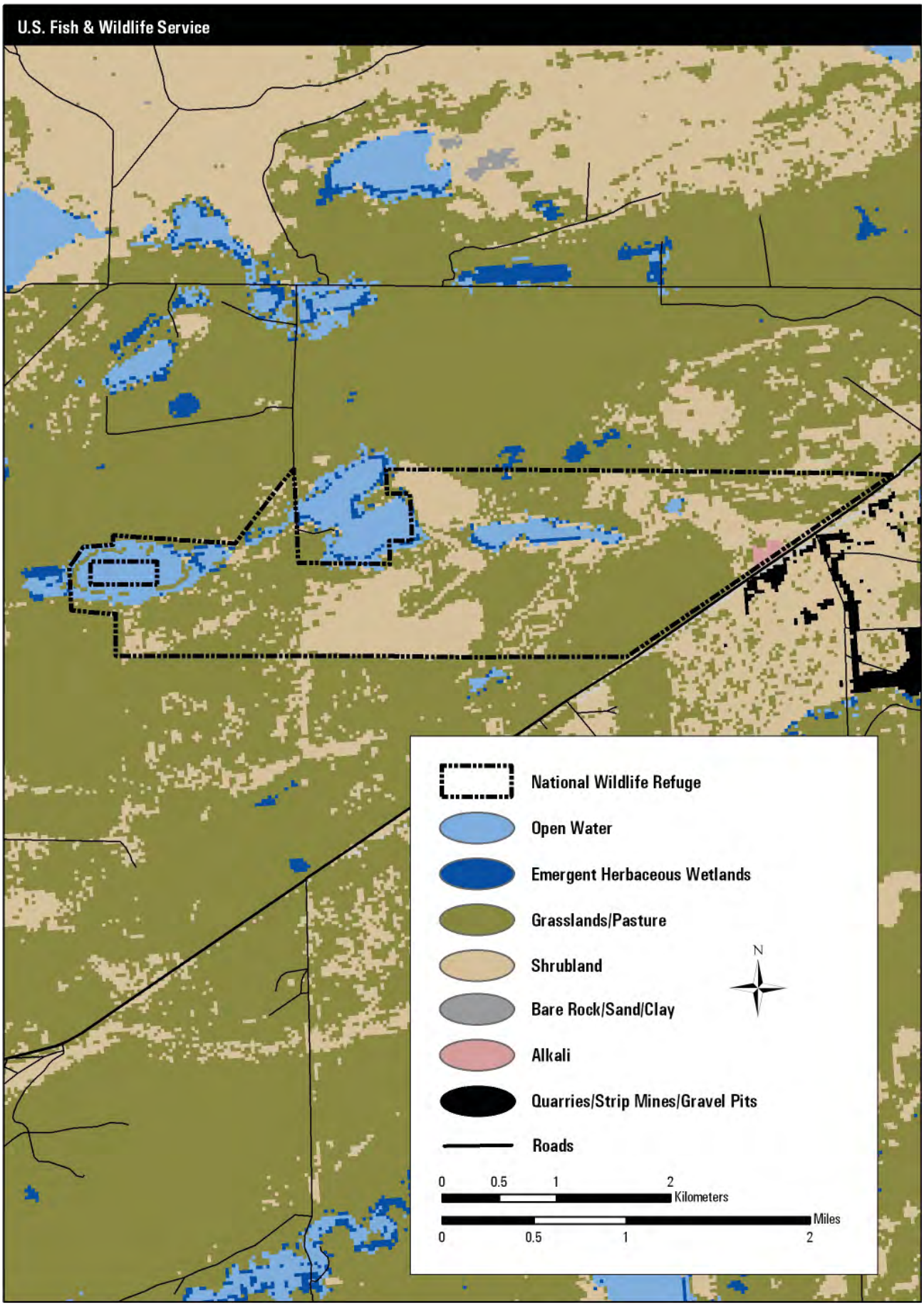


Figure 10. Habitats at Mortenson Lake NWR, Wyoming.

double-crested cormorants, and California gulls for nesting. The area is also used by American avocets and killdeer, and occasionally by other migrating shorebirds and waterfowl.

Remaining refuge habitats include greasewood-dominated upland, alkali flats, and a limited amount of grassland. Before 1950, Bamforth Lake was an important area for many wildlife species due to a fairly dependable water supply. With the full development of the Wheatland Irrigation District, however, Bamforth Lake lost its major water supply due to junior refuge water rights (USFWS 1980). The loss of water for the refuge minimized the importance of Bamforth NWR from the mid-1950s to present day.

Wetlands of Hutton Lake NWR

Hutton Lake NWR consists of five impoundments and surrounding uplands immediately adjacent to the floodplain of the Laramie River southwest of Laramie. Originally, there were likely only three separate basins—what is now Creighton Lake, Lake George, and Hutton Lake. Dikes were constructed to create Rush and Hoge lakes and along the west boundary of the refuge in an apparent attempt to keep water from reaching the floodplain to the west. A diversion structure was also placed in Sand Creek to move appropriated water from the creek to the refuge, and ditches were dug to connect Rush and Creighton lakes and Lake George for easier water movement between them.

Creighton Lake (210 surface acres or 2,525 acre-feet) and Hutton Lake (221 surface acres or 1,135 acre-feet) are large and fairly deep open water areas with no water management capabilities once water reaches them. They typically fluctuate between various water levels based on yearly water availability and evaporation, rarely being completely full or dry. The fluctuating water levels prevent the establishment of emergent vegetation on these two wetlands by either drying up or flooding out any plants that might try to take hold.

Lake George is a smaller natural basin (16 surface acres or 250 acre-feet), and receives water more often and more reliably than the larger pools. It maintains a water level stable enough for the establishment of a hardstem bulrush ring that completely encircles the lake.

Rush and Hoge lakes are larger than Lake George, but shallower and smaller than Hutton and Creighton lakes. Rush Lake (95 surface acres or 250 acre-feet) is the first in the system to receive water, so it generally benefits from available water from Sand Creek. It is also the shallowest pool and tends to dry up the quickest when water ceases to be available for recharge. Over 50 percent of Rush lake is emergent vegetation—hardstem bulrush and cattail—with numerous smaller areas of open water, and historic ditches through the lake to aid water movement to Hoge Lake and Lake George. Hoge Lake (75 surface acres or 200 acre-feet) has open water through its middle with significant stands of hardstem bulrush along the dike between it and Rush Lake and in the bay on its south side. Submergent vegetation is found in all pools but not in large amounts.

Creighton and Hutton lakes are important resting areas for waterfowl in the spring and fall, as rafts of redheads, scaup, canvasback, and coots numbering in the thousands are not uncommon. Canada geese use these lakes as molting areas in the summer. George Lake and Hoge and Rush lakes provide nesting habitat for coots, ruddy ducks, blackbirds, marsh wrens, pied-billed grebes, and soras, as well as feeding habitat for coots and dabbling ducks. Rush Lake also provides nesting habitat for white-faced ibis and black-crowned night-herons. Water levels are generally low enough on Creighton and Hutton lakes to allow nesting by American avocets and killdeer, but the lakes can potentially flood in high-water years.

During the summers of 2004 and 2005, California gull and double-crested cormorant rookery were established along the north shore of Hutton Lake. This activity had not been previously observed and is below the high waterline of the lake, so whether nesting would continue under high water conditions is yet to be determined.

From the time of its settlement to current day, the lack of good water rights for Hutton Lake NWR is a constant theme. In the arid Laramie plains, water is a key resource in managing habitat for the benefit of migratory bird species. Because the Service does not own senior water rights, refuge wetlands water levels are dependent on natural processes and the willingness of adjoining landowners holding watering rights in Sand Creek to share their rights.

Records from the 1970s indicate low water availability and difficulty in providing water to refuge wetlands due to minimal water rights for the refuge. This trend of low water is prevalent through the 1970s until 1979 and 1980, which were reportedly good water years. By 1981 water conditions were again reported as poor.

Since the 1980s, water control structures at the refuge have remained in place with no manipulation of the boards or screw gates to actively manage water levels (Pam Johnson, wildlife biologist, Arapaho NWR; personal communication, January 2007). Water levels must be high in Rush and Hoge lakes and Lake George before water can move to the other wetlands. A water diversion structure on Sand Creek is opened or closed as needed by the Wyoming water commissioner. From Rush Lake water can flow to Lake George or Hoge Lake, or both. Lake George connects to the largest lake

(Creighton Lake) and Hoge Lake connects to Hutton Lake (see figure 11).

Wetlands of Mortenson Lake NWR

Mortenson Lake NWR wetlands consist of four lakes positioned in a west to east line sharing what can be a common water source, an alkali playa, and an irrigation-dependent impoundment known as Harmon Reservoir. The current string of lakes was likely three playas prior to settlement. Springs to the south and west of the area, if natural, may have sustained water in Mortenson Lake proper, but it is unknown whether they are natural or induced from human activities. Mortenson Lake is the western-most lake followed by Garber Lake, Soda Lake, and Gibbs Lake. Meeboer Lake, which lies between Garber and Soda lakes, is owned by the Wyoming Game and Fish Department.

Mortenson Lake receives water from springs to the west and south, as well as irrigation return flows from waters out of the Pioneer ditch. The lake is mostly open water, with cattail and hardstem bulrush patches around the edges and extensive amounts of rushes and sedges along the north, west, and south shores. Prior to refuge acquisition, Mortenson Lake was used for irrigation of nearby lands and was typically at least partially drawn down in the summer.

Garber Lake is a small, mostly open water area immediately east of Mortenson Lake. Waters from Mortenson Lake are picked up in the Osterman ditch and feed into Garber Lake. An outlet on the lake's northeast corner allows water to flow out of Garber Lake and back into the Osterman ditch. Sedges and rushes border Garber Lake along with some hardstem bulrush.

Soda Lake, a long, narrow lake just east of the Meeboer Lake State Wildlife Area, receives water either from Meeboer Lake or from the South ditch, which comes in from the northwest. Both of these water sources can use and regularly do use water that has come through Mortenson Lake. Soda Lake is situated between steeper terrain on the north and south, resulting in little emergent vegetation along its shores. There are small areas of hardstem bulrush and some rushes and sedges.

Gibbs Lake is a small, shallow area that is prone to drying out. When dry it is very alkaline. Water can be moved to Gibbs Lake from the South ditch. There is little vegetation along this pool except for rushes and sedges at the extreme high waterline.

The playa is a small, low spot southeast of Gibbs Lake, which is split by Highway 230. There is no water source for this pond, and it is usually dry with an alkaline surface.

Harmon Reservoir is south of Soda Lake and consists of a fairly large dike crossing the natural drainage and a small outlet pipe that was historically used to supply ditches that ran on either side of the drainage for flood irrigation. Low priority limits the ability to use a water right due to holders of higher-priority rights using available water flows in all but wet years. Consequently, this area sees water rarely enough that most of the vegetation in the bottom and along shorelines is more typical of surrounding uplands habitat than wetlands.

Submergent vegetation is present in Mortenson, Garber, and Soda lakes but not in large quantities, probably due to the saline conditions of the substrate.

The endangered Wyoming toad is found along the shores of Mortenson Lake and occasionally around Garber Lake, along with boreal chorus frogs. Significant numbers of redheads, lesser scaup, canvasback, and bufflehead are seen during migration (June–July and September) on Mortenson, Garber, and Soda lakes. Various dabbling ducks, coots, eared and pied-billed grebes, Canada geese, and black and Forster's terns are regularly observed on these lakes in the summer. American avocets, killdeer, and dabblers use Gibbs Lake.

Established for the endangered Wyoming toad, and managed in conjunction with recommendations from the Wyoming Toad Recovery Team, the area around Mortenson Lake proper has received active management (grazing, rest, prescribed fire) for the benefit of the Wyoming toad.

In 1992, a cooperative agreement with an adjacent landowner was established regarding the exchange of water shares for grazing privileges. This agreement remains in effect, with refuge staff directing grazing on the refuge to benefit the Wyoming toad and receiving water for refuge purposes. Water management activities are performed by the grazing permittee and generally consist of opening the south ditch headgate, which allows water to flow into refuge wetlands from approximately May 1 to September 11. As a result, the refuge receives an average of 232 acre-feet of water per year. The majority of the water is used to fill wetlands on the eastern section of the refuge.

Water Management History of Mortenson Lake NWR

The prior landowner who purchased Mortenson Lake and surrounding land in 1972–73 would typically begin drawing down Mortenson Lake in May for irrigation and continue to draw it down until about July 1, when the area would be dried out for haying. It was not uncommon for the lake to refill by mid- to late August, when more irrigation would occur to moisturize the ground before winter. Water levels in the lake were held full throughout the summer when possible. In 1991, the Nature Conservancy (TNC) purchased Mortenson Lake and surrounding land.

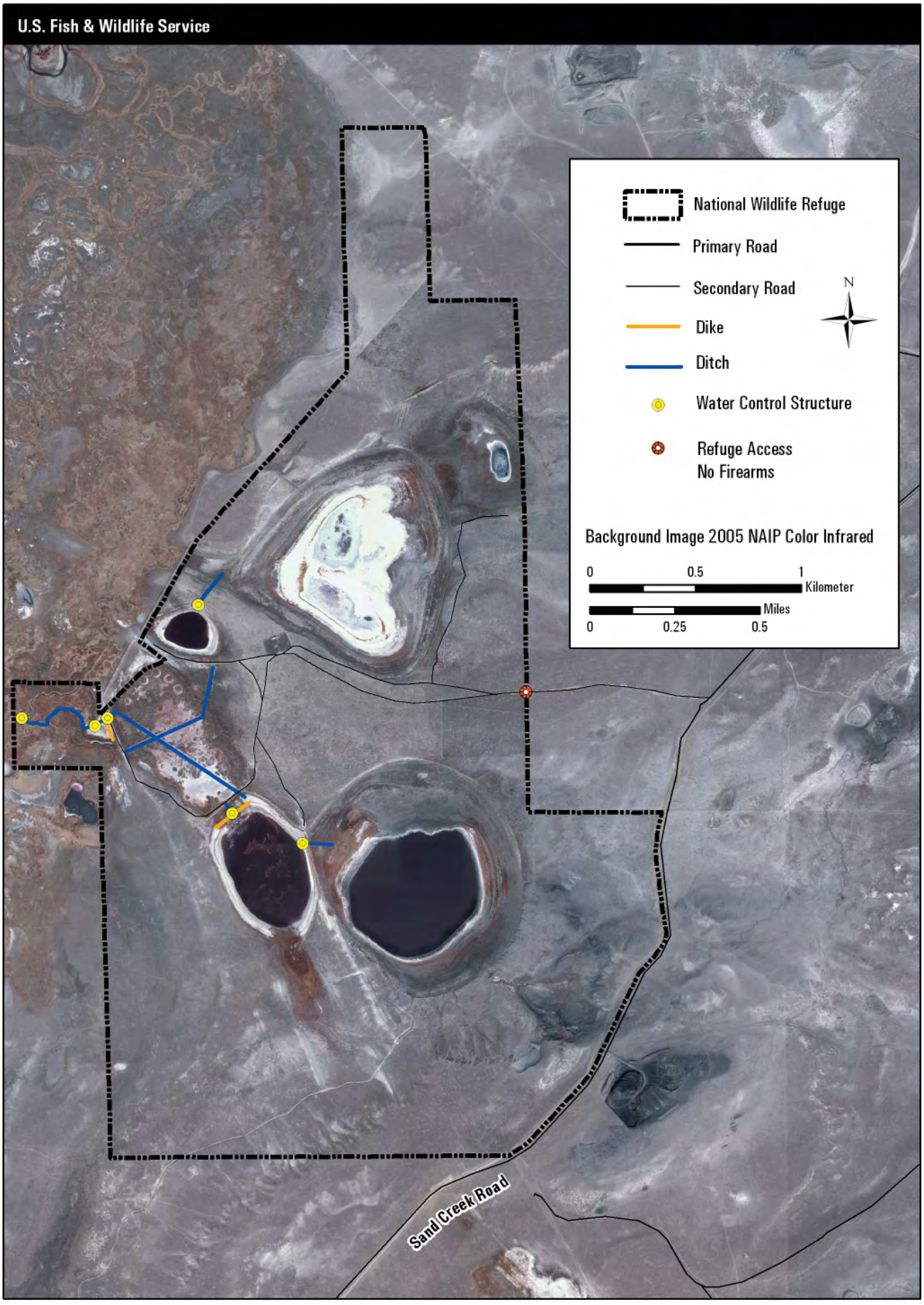


Figure 11. Infrastructure and public use areas at Hutton Lake NWR, Wyoming.

The Service purchased Mortenson Lake and surrounding area from TNC in May of 1993, creating what is now Mortenson Lake NWR. Sometime in the early 1990s, a water control structure was installed on the southern berm of the lake just off the dike, which raised the lake level. From 1993 through 2002, the water level in Mortenson Lake was held full from the spring through the fall. Boards were removed from the structure to slightly lower the water level each fall and reinstalled sometime in late March or early April. The reasons for lowering the lake level are twofold: (1) the high water levels through the winter are believed to negatively impact Wyoming toad hibernation, and (2) higher water levels and can erode the dike, especially when ice melts.

Due to drought conditions, lake levels in 2003 and 2004 were not as full as in the past. In 2005, water levels were intentionally dropped starting in May and continuing through June to mimic historic water management. Overall, the lake water level was dropped a little over 1 foot. In the fall of 2005, the lake level did not return to full as it had historically due to a dry year. In 2006, a managed drawdown was accomplished, with lake levels returning to normal by fall.

Upland Habitat: Brush and Grasslands

Uplands consisting of brush and grasslands is the dominant habitat type in the Laramie Basin, encompassing most of the lands not within an existing floodplain and below the mountains. Where access to water exists or has existed, some of these upland areas are in hay production, and the influence of past attempts at haying are still apparent from the existing vegetation. The uplands on the three Laramie Plains refuges are very similar, though subtle differences exist. Most of the soils in the uplands have alluvial origins, and many are influenced locally by differing water regimes that affect vegetation. In general, these lands appear to be unbroken, and given the undulating or sloped conditions of many sites thoughts of seeding in the past were likely dismissed.

Uplands of Bamforth NWR

Uplands range from the top of the bench forming the Big Basin through an area intermittently irrigated by the Park ditch to poorer soils abutting alkali flats or alkaline ponds. The vegetation on the bench is sparse grasses included western wheatgrass, needleandthread, and bluegrass, as well as some rabbitbrush and sagebrush. The area influenced by irrigation is more grass dominated with less bare ground; grasses are assumed to include western and bluebunch wheatgrass and possibly introduced forage-producing species. The area closer to the alkaline sites can be quite barren with 80–90 percent bare ground and only greasewood or black sage for vegetative cover, although certain spots include saltgrass in the mix.

Uplands of Hutton Lake NWR

Uplands range from the shorelines of Hutton and Creighton lakes up to the highest benches, approximately 100 feet above the lakes. Soil characteristics result in some vegetative variability. The relatively flat area between the lakes is dominated by a large prairie dog town. This area is sparsely vegetated, with few grasses, several types of annual weeds and forbs, prickly pear, and greasewood on the south. In general, the southern uplands are more grass dominated and the north holds a little more greasewood, but openings in the brush and greasewood plants can be found throughout the refuge. The greasewood plants are especially thick and tall (4–5 feet) northeast of Creighton Lake, east of Hutton Lake, and along the spoil piles northeast of Hoge and Rush lakes. An area in the southwest corner of the refuge has been irrigated in the past and holds a thicker, more grass dominated regime than the rest of the refuge uplands. Vegetative species include western and bluebunch wheatgrass, needleandthread, and rabbitbrush.

Uplands of Mortenson Lake NWR

The south half of Mortenson Lake NWR consists of a terrace of gravelly soils with a mound-intermound pattern of microrelief. This terrace slopes down to the lakes of the refuge to the north, where between the pools and waterways feeding them, more gravelly, well-drained upland soils exist. Vegetation on the terraces is dominated by needleandthread, western and bluebunch wheatgrass, larkspur, and rabbitbrush. On the uplands not associated with the terraces vegetation consists of mostly the same species but also includes greasewood and more open ground. The slopes contain most of the same species but also includes sparsely spaced big sagebrush plants.

Characteristic wildlife of the Laramie Plains uplands habitat includes pronghorn, horned larks, and meadow larks. White-tailed prairie dogs are common on Mortenson Lake NWR and Hutton Lake NWR.

Grazing Management History at Bamforth NWR

Grazing has occurred on Bamforth for at least the past 35 years, most recently in cooperation with an adjoining landowner. Lack of fencing limits the ability to adequately manage grazing, but it is assumed that the current grazing regime is not detrimental to the area, based on observations of similar grazing regimes used on refuges in the region. Future monitoring and evaluation will ensure that grazing management is appropriate and compatible.

Grazing Management History of Mortenson Lake NWR

The landowner who purchased Mortenson Lake and the surrounding land in 1972–73 would typically put cattle on the middle pasture known as the Meeboer pasture (south and east of Meeboer Lake) in March or April, usually feeding the cattle until new growth started. The cattle were not brought onto the Mortenson Lake pasture until the tall larkspur, which grows along the hillside south of the lake, had stopped flowering and was no longer poisonous to cattle. After the first of July, 200–225 pair of cattle were brought to the pasture and grazed for most of the summer. At that time, a much larger area was available for grazing, as the pasture included the area immediately north of the refuge boundary fence, just north of Mortenson Lake. This fairly well-irrigated north portion of the historic pasture is still in private ownership, producing good forage now and in the past. Consequently, it has seen a lot of use by the cattle, which has also resulted in greater use of the north shore of Mortenson Lake, as cattle come in from the north to water and graze and rest there. The former landowner has stated that cattle use of the north shore is noticeably diminished now compared to in the past due in part to the boundary fence and easier grazing to the south and east of Mortenson Lake. Another reason is a change in vegetation; the area is now mostly comprised of rushes and carex, making it less enticing to cattle.

During the period when TNC owned Mortenson Lake and the surrounding land (1991–93), grazing was discontinued. Reintroduced by the Service, grazing at Mortenson Lake NWR under Service management has changed over the years. For the first two years (1993–94), cattle were allowed to graze the whole pasture encompassing Mortenson Lake. In 1994, an electric fence was constructed in the field to protect the outlet portion of the lake, which was thought to be prime Wyoming toad habitat. The fence was also used to concentrate the cattle in the more alkali/bulrush vegetation surrounding the north side of the lake to thin the vegetation for the toads. The electric fence was maintained over the next six years, with cattle using annually in the fall 28–90 AUMs around the shore of Mortenson Lake and 180–340 AUMs in the rest of the field.

In 2000, the fence was modified to eliminate cattle access to the dike because of erosion issues. Each fall through 2003, cattle used 32–72 AUMs along the lakeshore and 52–340 AUMs in the rest of the field.

In the fall of 2003, the planned 2004 grazing regime was changed on the advice of the Wyoming Toad Recovery Team. Shoreline vegetation had become too dense, and the open habitats documented as needed by the Wyoming toad (Withers 1992) were no longer available. The density of the vegetation had also potentially decreased temperatures in historic breeding areas, making them less suitable for the toad. Although Withers (1992) had documented breeding on the northeast and southeast shores of Mortenson Lake, during 2001 and 2002 egg laying had only occurred on the northwest shore in areas with adjacent open vegetation, and in 2002 tadpoles had been found only on grazed lands adjacent to the northwest shore of Mortenson Lake.

In 2004, the following change to grazing was made based on the recommendations of the previous landowner whom the Service had contacted to discuss historic land use practices. The electric fence was installed and cattle were allowed to access the shore of Mortenson Lake from July 13 through September 1, using 102 AUMs. The cattle were then moved to the main pasture from September 9 through October 26, using 108 AUMs.

The electric fence was not installed in 2005, and cattle grazed in the fall from October through November, using 255 AUMs. This grazing occurred after a prescribed fire of 22 acres was conducted on the north side of the lake in the spring. The prescribed burn was an attempt to remove the heavy rush and carex vegetation along the north shore of the lake, as cattle grazing was not having the desired effect of reducing this vegetation.

In 2006, cattle were again allowed to graze the entire pasture (no electric fence) in July, using 94 AUMs. The cattle were removed in late July and then allowed back in the field in October, using another 58 AUMs.

Alkali Flats

Alkali flats are predominately flat lands and seasonally dried-up wetland basins with strongly saline soils. These areas are associated with or adjacent to playas or intermittent lakes. The alkaline/saline soils appear to severely restrict plant growth, as vegetation is very spotty throughout much of this area. Vegetation includes salt grass, alkali sacaton, and greasewood. Wildlife use of the alkali flats is generally limited to migratory shorebirds, mostly killdeer and American avocet (likely in association with water nearby).

Alkali Flats of Bamforth NWR

Approximately one-third to one-half of Bamforth NWR is alkali flats, depending on water levels.

Alkali Flats of Hutton Lake NWR

A small playa northeast of Creighton Lake on Hutton Lake NWR may be described as alkali flats.

Alkali Flats of Mortenson Lake NWR

Mortenson Lake NWR has one alkaline playa, and Gibbs Lake, when drawn down, becomes alkaline.

Irrigated Meadows

Irrigated meadows are found only in a small area on the west portion of Hutton Lake NWR and in a few scattered locations on Mortenson Lake NWR. These areas are characterized by the presence of hydric soils and plants, and no distinction has been made as to whether they are naturally occurring or a manufactured condition because the total area of land involved is minimal. Characteristic vegetation may include creeping meadow foxtail, and other species introduced for hay production, as well as Baltic rush, Nebraska sedge, cattail, and hardstem bulrush. Wildlife use include sora, Wilson's phalarope, yellow-headed blackbird, red-winged blackbird, white-faced ibis, waterfowl (dabblers), and marsh wrens.

Irrigated Meadows of Hutton Lake NWR

The meadows on Hutton Lake NWR are within the floodplain of Sand Creek and likely were historically flooded seasonally during runoff. The diversion structure on Sand Creek that brings water into the refuge is in this area. When the structure is open or if the neighbor is irrigating the adjacent ground, this area is flooded—sometimes for extended periods—depending on water availability.

Irrigated Meadows of Mortenson Lake NWR

Mortenson Lake NWR meadows include subirrigated areas on the northwest and south side of Mortenson Lake, as well as irrigated lands between Mortenson and Meeboer lakes and between Soda and Gibbs lakes. As previously mentioned, it is conceivable but unknown as to whether these areas were naturally wet meadows prior to European settlement. If the springs that help feed Mortenson Lake waters are a historic part of the landscape, they could have helped keep Mortenson Lake full, and overflowing, which would have irrigated some of these lands. If these springs are the result of uphill irrigation, well development, or other constructions, the irrigated meadows are fairly recent to the landscape.

Contaminant Assessment

Contaminant assessment for the Laramie Plains refuges are based on the results of baseline studies of environmental contaminants and land usage described below.

Contaminant Assessment for Bamforth NWR

A baseline study investigating trace elements in various media on the refuge was conducted from 1991 to 1993 (Dickerson and Ramirez 1993). Lead was slightly elevated in Bamforth Lake water samples (0.143–0.164 mg/l). Selenium was elevated in vegetation (3.28–4.26 ug/g) and sediment (28.6 ug/g). Selenium concentration in American avocet eggs ranged from 3.10 to 5.30 ug/g. Arsenic was slightly elevated in vegetation (24.5–49.2 ug/g) and aquatic invertebrates (23.1–33.1 ug/g), and boron was slightly elevated in vegetation (303 ug/g).

Cattle grazing and irrigated pasture lands are the primary use of the upland areas on the refuge. The possibility for spills to occur on or near the refuge is remote.

Contaminant Assessment for Hutton Lake NWR

A baseline study of environmental contaminants, primarily trace elements, was performed at Hutton Lake NWR in 1988 and 1989 (Ramirez and Armstrong 1992). Trace elements were not present in concentrations adverse to fish and wildlife. Aerial spraying for mosquito control is conducted on the private land located over 1 to 2 miles to the north. *Bacillus thuringiensis* (Bt) is applied on lands adjacent to the refuge for mosquito control. Grazing is the main use of this land.

Baseline sampling areas identified for Hutton Lake NWR include the four main lakes at the refuge: Hutton Lake, Rush Lake, Creighton lake, and Lake George. Contaminants assessment process information should be reviewed in 5 years. Managers should monitor mosquito-spraying activities to ensure that the refuge is not accidentally sprayed.

Contaminant Assessment for Mortenson Lake NWR

A baseline study of environmental contaminants, primarily trace elements, was performed at Mortenson Lake NWR in 1988 and 1989 (Ramirez 1992). Trace elements were not present in concentrations adverse to fish and wildlife. Aerial spraying for mosquito control is conducted on the private lands in the basin and on lands adjacent to the refuge. Bt is also applied on lands adjacent to the refuge and used within the refuge for mosquito control. Grazing is the main use of this land.

Contaminants assessment process information should be reviewed in 5 years. Managers should monitor mosquito-spraying activities to ensure that the refuge is not accidentally sprayed.

A recent investigation (Dickerson, Hooper, Huang, and Allen 2003) assessed pesticide aerial drift from mosquito control activities on lands adjacent to the refuge. Pesticide indicator strips and spray cards were used to determine the extent of malathion entering the refuge and potential reintroduction sites. Aquatic invertebrate abundance was not significantly different ($p < 0.05$) before and after spraying at any sites except the reference site and Meeboer Lake. No malathion residues were detected in the aquatic invertebrates. Results from this study indicated that, although some drift of malathion was occurring, the toads were not

exposed to concentrations great enough to reduce adult survival, affect predator avoidance behavior, or reduce their food source.

Recent study results (Little, Calfee, and Dickerson 2002) show that ammonia nitrate is not currently elevated to concentrations that would adversely affect the Wyoming toad. Increases in nitrogen input, such as what might occur with changes in land use, could increase the risk for adverse affects to the toad, particularly because ammonia nitrate concentrations may act synergistically with other environmental factors or may serve as a stressor for increasing the toads' susceptibility to disease. Periodical sampling of water from the refuge will ensure that nitrogen input does not increase to concentrations exceeding the tolerance level of Wyoming toads.

Threatened and Endangered Species

Mortenson Lake NWR was established in 1993 to protect the Wyoming toad's last known population. The Wyoming toad was listed as an endangered species in 1984; the population at Mortenson Lake was discovered in 1987.

At the present time, no known threatened or endangered species use Bamforth NWR or Hutton Lake NWR. Hutton Lake NWR has been a site for Wyoming toad releases in the past. Refuge staff would continue to facilitate the use of Hutton Lake NWR as a release site for the Wyoming toad, per Recovery Team recommendation.

Species of Concern

Table 4 indicates documented occurrences of vertebrate species of concern within the Laramie Plains refuges (Keinath, Heidel, and Beauvais 2003).

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View of Mortenson Lake.

Table 4. Documented occurrences of vertebrate species of concern within Laramie Plains refuges, Wyoming.

Bamforth NWR

Species	*Most Recent Observation*
American bittern	1911
American white pelican	unknown
Black tern	unknown
Black-crowned night-heron	unknown
Black-footed ferret	1977
Burrowing owl	1982
California gull	unknown
Caspian tern	unknown
Common loon	1933
Dwarf shrew	1987
Forster's tern	unknown
Herring gull	unknown
Iowa darter	unknown
Merlin	unknown
Mountain plover	1993
Northern leopard frog	1999
Preble's meadow jumping mouse	1968
Snowy egret	unknown
Swift fox	1988
White-faced ibis	1988
Wyoming toad	1963

Hutton Lake NWR

Species	*Most Recent Observation*
American avocet	2005
American bittern	1994
American dipper	1997
Bald eagle	2004
Black tern	unknown
Black-crowned night-heron	unknown
Black-footed ferret	1964
Black-rosy finch	1992
Brewer's sparrow	2005
Burrowing owl	1991
California gull	2005

Table 4. Documented occurrences of vertebrate species of concern within Laramie Plains refuges, Wyoming.

Hutton Lake NWR

Species	*Most Recent Observation*
Chestnut-collared longspur	2005
Common goldeneye	2002
Common loon	1998
Ferruginous hawk	2004
Forster's tern	unknown
Golden eagle	2004
Hammond's flycatcher	1911
Long-billed curlew	2004
McCown's longspur	2005
Merlin	2004
Mountain plover	2005
Preble's meadow jumping mouse	2005
Sage thrasher	2005
Short-eared owl	1995
Snowy egret	unknown
Swift fox	2002
Western scrub-jay	2002
White-faced ibis	1994
White-tailed prairie dog	2005
Wyoming toad	2000

Table 4. Documented occurrences of vertebrate species of concern within Laramie Plains refuges, Wyoming.

Mortenson Lake NWR

Species	*Most Recent Observation*
American avocet	2005
Black-footed ferret	1964
Brewer's sparrow	2005
California gull	2005
Chestnut-collared longspur	1982
Common loon	1990
Long-billed curlew	2004
McCown's longspur	2005
Mountain plover	2005
Ringtail	1993
Sage sparrow	1982
Sage thrasher	2005
Sandhill crane	2005
Swift fox	1965
Tiger salamander	1989
White-faced ibis	1998
White-tailed prairie dog	1978
Wyoming toad	2007

4.3 Cultural Resources

Prehistoric Resources

The available archaeological record of the Laramie Plains is fairly limited due to the presence of primarily private lands in the area. The only surveys conducted in Albany County have been on Hutton Lake NWR in conjunction with pipeline installations.

Larson and Letts (2003) propose that although the record is thin, the fact that prehistoric use of the area is indicated by the few sites inventoried points to significant use of the area by indigenous peoples. Sites that have been found during surveys include fire hearths, lithic scatters (cultural artifacts made primarily of stone), and quarry sites. The Arapaho, Cheyenne, and Sioux are presumed to have been the predominant tribes that used the area prior to European settlement (U.S. Department of Agriculture 1998).

Early Exploration

As is the case with much of the West, the early exploration of the Laramie Plains owes much of its beginnings to the fur-trapping trade. In 1820, Jacques LaRamie ignored the warnings of other trappers about hostile Native Americans and ran a trapline farther up the river that now bears his name. The Native Americans reportedly killed him and stuffed his body under the ice of a beaver pond. Although LaRamie met an untimely end, he became the namesake of a county, city, river, mountain range, and basin (Larson and Letts 2003).

Early Settlement

With the Overland Trail came the Overland Stage Company, owned by Ben Holladay, "the Stagecoach King." The company constructed stage stops at regular intervals along the route of the trail, which were some of the first Euro-American structures in the Laramie Basin. The first homestead in the basin was built in 1859 by Phil Mandel along the Little Laramie River. It also served as a stage station for the Overland Trail. Mandel sold replacement stock to travelers and later cut and sold hay to soldiers at Fort Sanders, south of present day Laramie.

Fort Sanders was constructed along the Overland Trail in 1866 to protect travelers on the Overland Stage Line and in preparation of the railroad. The decision to run the Union Pacific Railroad through the Laramie Basin stands as the most influential event in the shaping of the area's history. Several rail stations were constructed to service the line, and the city of Laramie became a primary supply source for railroad needs.

Ranching was also instrumental to the settlement of the area. In 1865, Tom Alsop was forced to abandon his oxen and wagon train in a snowstorm. He returned the following spring and was surprised to find all of the livestock alive and in good shape. Three years later, he and Charlie Hutton created the Hutton Ranch (also known as Hart Ranch), raising cattle and sheep in the basin. Although livestock can fare well during the Laramie winters, occasionally shepherds have lost entire flocks of sheep due to severe winter conditions (Larson and Letts 2003).

History of Development

Besides the homesteading tied to operation and services along the Overland Trail and the railroad, agriculture was also a key to settling the area and influencing the look of the land. Construction of houses, barns, and outbuildings were likely followed shortly by fences. Then, in the late-nineteenth and early-twentieth centuries, irrigation ditches were constructed in the basin, with the idea of crop production. Unfortunately, it was soon discovered that the short frost-free season made farming a less-than-profitable venture. Many of the old irrigation ditches and canals are still in use today, mostly for hay and some alfalfa production.

Some mining has occurred in Albany County, primarily in the mountains. Titanium, gold, silver, and copper mines have been developed in the Medicine Bow Mountains, and oil fields lie west of Laramie.

A recent economic activity has been energy generation through wind farms constructed in the northwest part of Albany County. The primary economic industries in the area today are the University of Wyoming, ranching, tourism, and the Monolith Cement Plant (Larson and Letts 2003).

4.4 Special Management Areas

This section describes the special management areas of the Laramie plains national wildlife refuges.

Wilderness

Due to the small size of the refuges and current and past land use patterns, the refuges do not appear to meet the criteria for wilderness. As outlined in the Wilderness Act of 1994, a wilderness area:

- generally appears to have been affected primarily by the forces of nature, with the human imprint substantially unnoticeable;
- offers outstanding opportunities for solitude or a primitive and unconfined type of recreation;

- has at least 5,000 acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition;
- may contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

Important Bird Area

The Laramie Plains refuges, particularly Hutton Lake NWR, are included in the Laramie Plains Lake Important Bird Area (IBA) recognized by the Audubon Society in partnership with Birdlife International. According to Alison Lyon Holloran (conservation coordinator, Audubon Wyoming; personal communication, 2006), this designation was given to the Laramie Plains refuges in 2003. The refuges meet four of five criteria for establishment of an IBA including:

- endangered/threatened species (Wyoming toad, Preble's meadow jumping mouse);
- other high conservation priority species (white-faced ibis, American white pelican);
- rare, unique, or representative habitat (high-prairie wetlands);
- significant concentration of waterfowl, gulls, and wading birds.

The only IBA criterion that is not currently met is long-term research.

4.5 Visitor Services

Refuge infrastructure (roads, fences, water control structures) and public use facilities (parking areas, walking trails) are shown on the following maps for Bamforth NWR (figure 12), Hutton Lake NWR (figure 11), and Mortenson Lake NWR (figure 13).

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Hunting opportunities exist in nearby areas.

Visitor Services at Bamforth NWR

No public use is allowed on Bamforth NWR. The refuge lands are separated into three parcels with private or state lands between them and have seen little active management in several decades. In addition, the soil types and moisture content in the area preclude adequate fence construction in some portions of the refuge. Consequently, much of the refuge boundary is unfenced and unsigned, creating potential trespass problems if visitation were allowed on the refuge.

One public road (Highway 12) traverses the southwest corner of the southwest parcel of the refuge, which offers distant views of area wetlands and other habitats on the refuge.

Visitor Services at Hutton Lake NWR

Opportunities for four of the six priority public uses identified in the Improvement Act are available at Hutton Lake NWR.

Hunting

Many hunting opportunities exist in nearby areas, and Hutton Lake NWR provides a place for members of the nonhunting public to experience safe, nonconsumptive wildlife-dependent recreation during hunting seasons.

Due to the small size of the refuge and existing hunting opportunities in the area, the refuge will remain closed to hunting.

Fishing

Fishing is not permitted on Hutton Lake NWR. Unreliable water supplies with diminishing water quality over time in refuge impoundments precludes establishment of a viable fishery.

Wildlife Observation and Wildlife Photography

There are no formal opportunities for these activities, but opportunistic means are available. Although there is not a designated auto tour route on the refuge, 2.75 miles of gravel road are currently open to public travel (see figure 11). These roads allow visitors to traverse all major habitat types on the refuge, including uplands with prairie dog towns, grasses and shrubs used by pronghorn and sage thrashers, and refuge impoundments hosting a variety of water dependent birds. Facilities that would aid the public in conducting wildlife observation and photography such as photo blinds, observation blinds, and interpretive panels do not exist at the refuge.

Figure 12. Infrastructure and public use areas at Bamforth NWR, Wyoming.

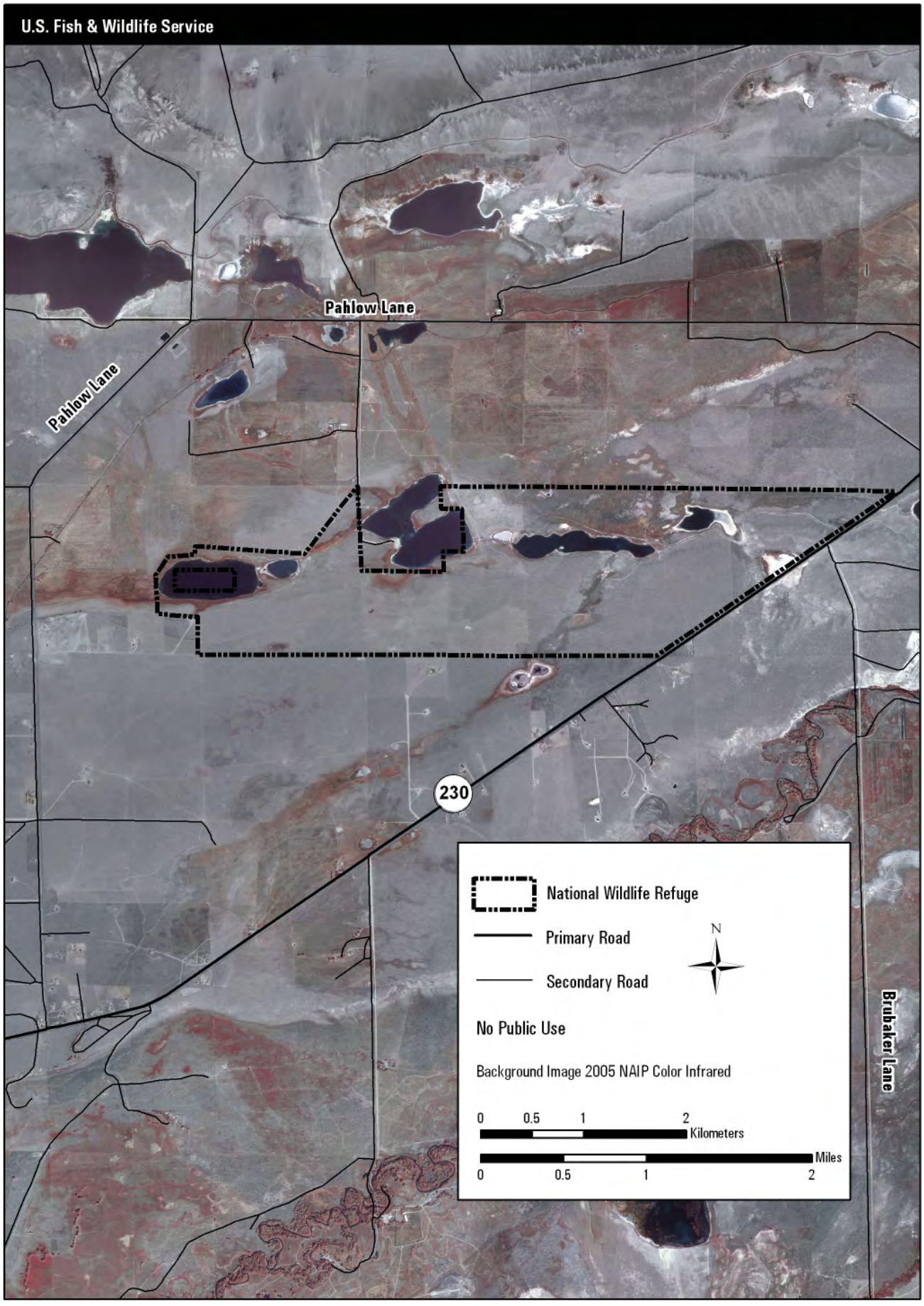

Figure 13. Infrastructure and public use areas at Mortenson Lake NWR, Wyoming.

Interpretation and Environmental Education

As previously mentioned, interpretive panels, tour routes, nature trails, or other interpretive facilities do not exist at the refuge. Staff are only occasionally on site, as there is not a visitor center on the refuge. An undated general information pamphlet and a 1972 bird list are available and sent to interested parties who contact the refuge staff located at Arapaho NWR with a request. Occasional requests for tours and talks from scout groups, schools, and nonprofit organizations are addressed on a case-by-case basis; the refuge biologist generally handles these requests.

Visitor Services at Mortenson Lake NWR

Because the refuge was acquired for the express purpose of preserving the endangered Wyoming toad, public use is currently not permitted on the refuge to prevent potential adverse impact on the toad. The refuge does not have any visitor services facilities such as interpretive panels, nature trails, and kiosks. Requests for refuge tours, studies, and other uses are addressed on a case-by-case basis.

4.6 Partnerships

Refuge staff work with the following partners to perform natural resource management at the Laramie Plains refuges:

- Wyoming Toad Recovery Team to achieve population recovery goals for the Wyoming toad;
- Albany County Weed and Pest to assist with management of invasive species on the refuges;
- Wyoming Audubon Society to develop nonconsumptive wildlife-dependent recreation opportunities at Hutton Lake NWR;
- Wyoming Audubon Society to conduct annual breeding bird surveys on Hutton Lake NWR.

4.7 Socioeconomic Environment

The local and regional demographics (statistical data about the population) are described below for the communities in the four-county study area pertaining to the Laramie Plains refuges.

Socioeconomic Conditions

The following section illustrates the current socioeconomic conditions found within the study area, which is comprised of Albany, Carbon, Platte, and Laramie counties. The Laramie Plains refuges are located within Albany County; however, the remaining three counties included in the study area are located in close proximity to the refuges and could be affected by refuge management decisions.

Background

The Laramie Plains refuges encompass a total of 4,860 acres of open water, wetland, grassland, and sagebrush, the largest of which is the Hutton Lake NWR at 1,968 acres. Mortenson Lake NWR and Bamforth NWR are closed to public access, but Hutton Lake NWR provides the public with opportunities for wildlife viewing, photography, and environmental education. If the refuges attract visitors to the area, some economic benefit to local communities may result. Food, gas, and lodging purchases, spurred by visitation to the refuges, would provide local businesses with supplemental income and increase the local tax base. Management decisions affecting the Laramie Plains refuges may influence visitation levels, which in turn affects visitor spending in the local economy.

Figure 14 shows the location of the Laramie Plains refuges in relation to nearby centers of economic influence. The refuges are located in southeastern Wyoming near the cities of Laramie and Cheyenne.

Population

The study area population has remained steady since 2000 and was approximately 140,000 in 2005. Over the same five-year period, the population of Wyoming decreased by 15,500 residents (figure 15). The study area contained 27 percent of Wyoming's population as of 2005. Two of Wyoming's largest cities (Cheyenne and Laramie) are located within the study area and provide an ample tourist base for the refuges.

Age

Figure 16 illustrates the aging population of the study area. In 2000, about 24 percent of study area population was under the age of 18; this age group is expected to constitute just 21 percent of the population by 2011. The median age of the study area is estimated at 36.02 years as of 2006.

Employment

The civilian workforce for the study area has increased by about 560 workers per year since 2000. As of 2006, the study area labor force is about 69,177 workers. The unemployment rate for 2006 is estimated at 3.19 percent, which is slightly lower than the state's 3.5 percent unemployment rate. Both the study area and the state have a lower unemployment rate than the nation, which was 4.4 percent as of October 2006 (U.S. Bureau of Labor

Statistics, Employment Situation Summary, October 2006).

Local Industry

Sales and office occupations are the largest employment sector at 30 percent (figure 17). Professional and related occupations employ 22 percent, while farming, fishing, and forestry occupations employ 1 percent of the labor force.

Refuge Activities

Bamforth NWR and Mortenson Lake NWR are closed to public access. Hutton Lake is open for nonconsumptive wildlife-dependent recreation, which includes wildlife observation, photography, environmental education, and interpretation. Hunting and fishing are not permitted.

Visitation and Visitor Spending

Laramie is the primary center for visitation and potential use for all three Laramie Plains refuges. The city was home to 27,204 residents in 2000. With the University of Wyoming based in Laramie, requests for field trips, and field activities for university classes on the refuges (mainly Hutton Lake) are common. This academic base and urban population show interest in natural resources in various forms. Audubon Wyoming and the local Audubon chapter are based in Laramie.

The U.S. Forest Service and Bureau of Land Management manage 674,479 acres of land in Albany County available for hunting, fishing, and camping, and several state wildlife areas also allow these public uses.

Hutton Lake NWR received only 2,000 visitors last year due to its small size and minimal marketing efforts. According to Ann Timberman (project leader, Arapaho NWR; personal communication, January 2007), the majority of these visitors likely reside in the local area . Without the addition of nonlocal visitors, increased economic activity in the area as a result of visitation to the Hutton Lake NWR is unlikely.

Employment Estimates

The presence of the University of Wyoming in Laramie strongly influences Albany County's occupational demographics. The county ranks the highest in the state in the percentage of residents claiming management, professional, and related occupations (includes education) at 40.4 percent, compared to a statewide figure of 30.0 percent. The rest of the occupational breakdown for the county is as follows, with state figures in parentheses: 23.2 (24.2) percent in sales and office; 18.9 (16.7) percent in service; 8.5 (12.8) percent in production, transportation, and material moving; 7.6 (14.8) percent in construction, extraction, and maintenance; and 1.4 (1.5) percent in farming, fishing, and forestry. Of these occupations, 31.2 percent are government jobs (local, state or federal), which includes university employees. This figure is again the highest in the state and well above the state average of 20.4 percent government workers.

According to the 2000 census (U.S. Census Bureau 2000), 91.3 percent of Albany County residents were white compared to 92.1 percent of Wyoming as a whole. Of the 32,104 residents in the county, 2,397 claimed Hispanic/Latino origin, putting this group at 7.5 percent of the county populace compared to 6.4 percent of the state populace. Other ethnicity information for the county includes 1.7 percent Asian, 1.1 percent Black or African American, 1.0 percent American Indian and Alaska Native, and 0.1 percent Native Hawaiian and other Pacific Islander; 2.6 percent claimed some other race, and 2.2 percent claimed two or more races.

Education

Albany County surpasses the state of Wyoming in the percentage of the population 25 or older that have graduated from high school (93.5 percent verses 87.9 percent), and in residents who have earned a bachelor's degree or higher (44.1 percent verses 21.9 percent).

USFWS

Northern pintail

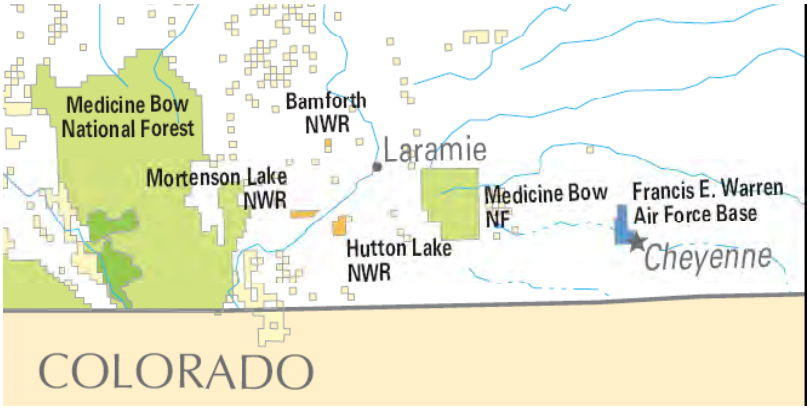

Figure 14. Laramie Plains NWRs in relation to nearby centers of economic influence.

Source: Nationalatlas.gov and BCC Research & Consulting

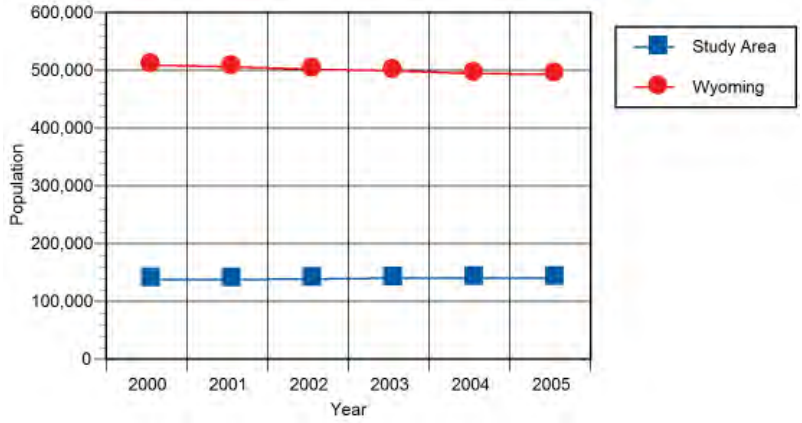

Figure 15. Wyoming and study area population.

Source: State of Wyoming, Economic Analysis Division.

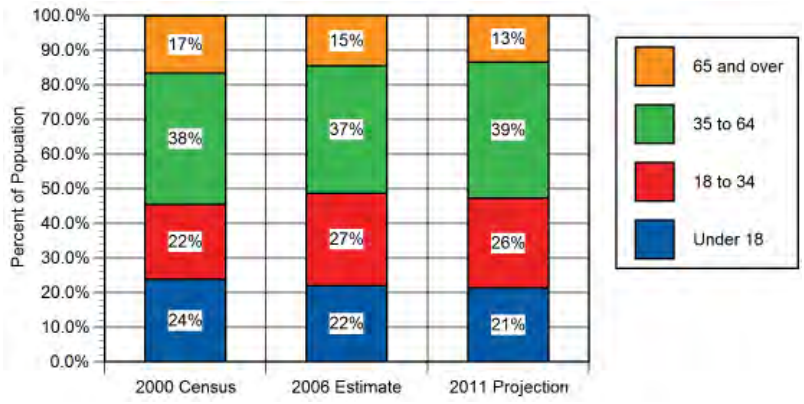

Figure 16. Study area age composition.

Source: U.S. Census Bureau, PCensus 2006.

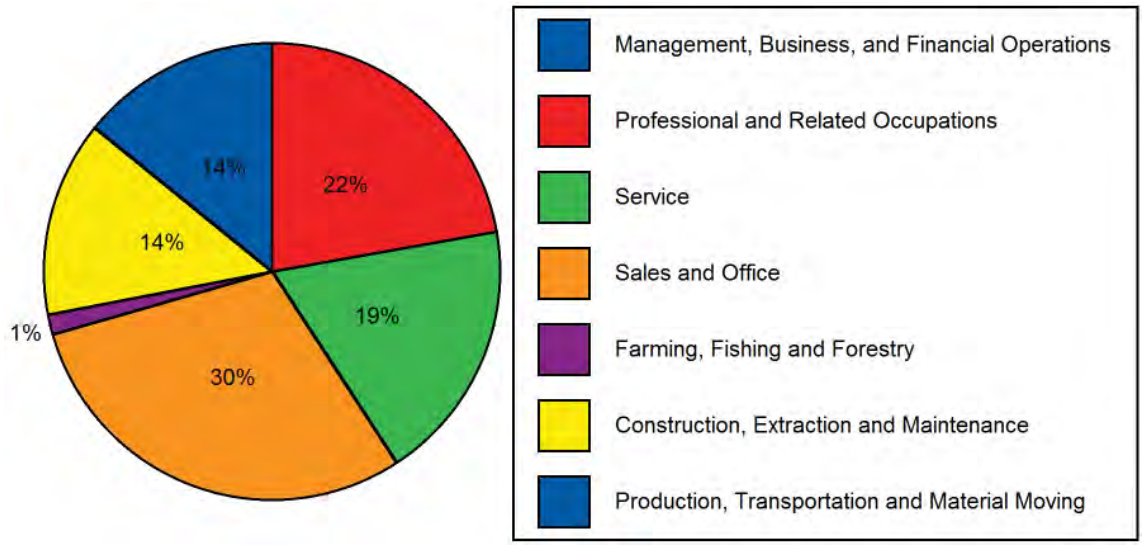

Figure 17. Study area employement distribution, 2006.

Source: PCensus 2006.

4.8 Refuge Operations

During the 1960s, the headquarters for the Laramie Plains refuges was located in the Wyoming Farm Bureau office in Laramie. The Arapaho NWR was established in 1967, and the headquarters for the Laramie Plains refuges was moved to Arapaho NWR near Walden, Colorado. Since that time, the Laramie Plains refuges have been managed as part of the Arapaho NWR Complex.

Staffing

The Laramie Plains refuges are managed by Service staff headquartered at the Arapaho NWR. Below is a list of the current staff for Arapaho NWR Complex.

Management	Project leader, GS-12
	Refuge operations specialist, GS-11
Biology	Wildlife biologist, GS-9
Administration	Administrative assistant, GS-8
Maintenance	Maintenance worker, WG-8

Facilities

Hutton Lake NWR facilities include a three-door equipment shed in a small enclosure and several other small storage buildings. Bamforth NWR and Mortenson Lake NWR do not have any facilities.

USFWS

Prairie dog.