3 Affected Environment

The Lost Trail National Wildlife Refuge lies in the west-central portion of Flathead County, Montana, approximately 25 air miles west of Kalispell (figure 1). To get to the refuge, visitors travel 20 miles on Highway 2, west to Marion, and northwest 20 miles through Haskell Pass.

The congressionally designated refuge boundary encompasses approximately 9,225 acres. Within the designated boundary, the Service manages approximately 7,885 acres (figure 4). Valley meadows and sloping uplands dominated by forest comprise the refuge. Located in an Intermountain drainage known locally as Pleasant Valley, the refuge has elevations ranging from 3,488 to 4,600 feet.

Tables 1 and 2 summarize the existing resources and conditions on the refuge, as well as the socioeconomic setting and administration. In-depth descriptions of the resources, conditions, and settings are found in this chapter. Further details can be found in appendix A.

Geographic Setting

Lost Trail National Wildlife Refuge is nestled in the Pleasant Valley, which was formed during the last glacial period in North America. Pleasant Valley sits atop a vast, relatively uniform expanse of the Belt Rock formation called the Purcell Alticline.

Pleasant Valley is located in the Salish Mountains among medium-elevation mountains such as Ashley Mountain (6,300 feet) to the north and Murr Peak (6,763 feet) to the south, near the confluence of the boundaries of the Flathead, Kootenai, and Lolo National Forests (figure 5).

The Whitefish Mountains lie northeast of the refuge, beyond which Glacier National Park and the Continental Divide are found. The Purcell Mountains are directly west, and Little Bitterroot and Flathead lakes lie southeast of the refuge. Further east are the breathtaking Mission and Swan mountain ranges. The Cabinet and Bitterroot mountains are west of the refuge.

The refuge is part of the ecosystem designated by the Service as the Missouri, Yellowstone, Columbia River (MOYOCO) ecosystem (figure 6). The Columbia River watershed primarily falls into the Service's Region 1, a different administrative area. The Improvement Act and planning policy requires CCPs to show how refuge management contributes to the Service's ecosystem goals.

The mission for the MOYOCO ecosystem is to maintain, restore, and enhance riparian and watershed functions for the benefit of trust resources, Service properties, and the American public. This includes preservation and restoration of grasslands, riparian areas, and wetland habitats and conservation of endangered, threatened, and other species of special concern. The habitat and wildlife goals and objectives for the refuge contribute to the MOYOCO ecosystem mission.

Lindy Garner/USFWS

A healthy cluster of the threatened Spalding's catchfly grows on the refuge.

Physical Resources

The soils, along with the water resources, provide the basis for the vegetation and conditions that create habitats for fish, wildlife, and plants.

Soils

Pleasant Valley was formed during the Pleistocene Epoch by glacial contraction, and expansion and sedimentation activity after glacial melt at the end of the last ice age. The glaciers pushed south out of Canada to smooth and shape the underlying Precambrian Belt rocks, a sedimentary formation deposited more than a billion years ago. This bedrock is visible on the higher hills along the north edge of the refuge and in some road cuts along the main road through the refuge.

Glacial deposits sit atop the older Belt Rock formation, which faulted over younger Paleozoic rocks (Alt and Hyndman 1986). Receding glaciers often leave behind enclosed basins, some of which now contain lakes. The Thompson and McGregor lakes and other popular lakes south of the refuge are examples of these pothole lakes. Dahl Lake, in the eastern part of the refuge, is another example.

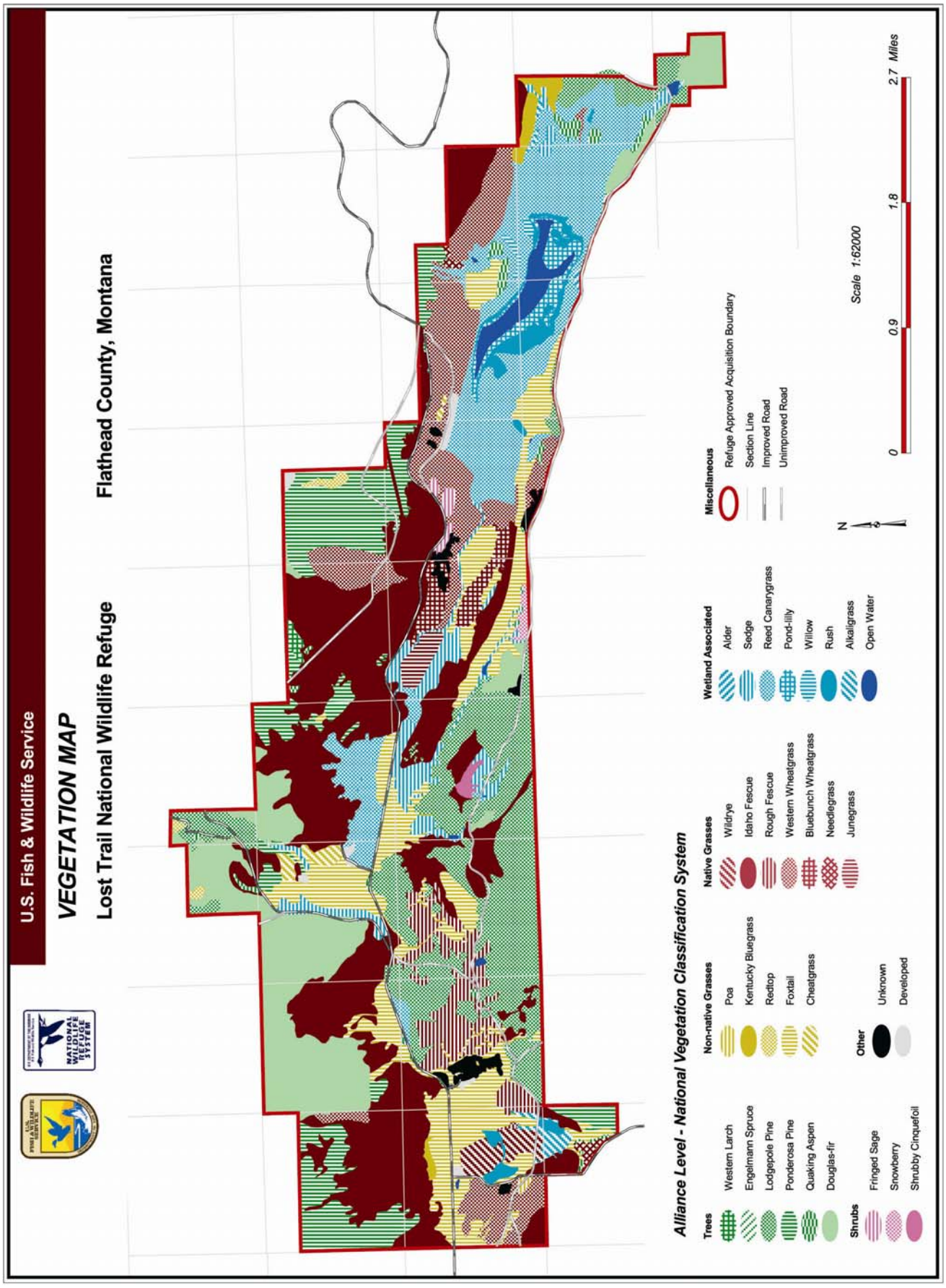

Figure 4. Vegetation of Lost Trail National Wildlife Refuge, Montana

Table 1. Summary of the natural resources of Lost Trail National Wildlife Refuge, Montana

Physical Resources	*Habitat*	*Wildlife*
— The refuge occurs in the glacially formed Pleasant Valley sheltered by the Salish Mountains. Soils contain significant amounts of silt and sand; organic soils occur around Dahl Lake and well-drained loamy soils are in the uplands. — Elbow Creek and several unnamed drainages fill the 216-acre Dahl Lake. Pleasant Valley Creek drains into the Fisher River watershed (part of the Columbia River headwaters). — The refuge is part of the MOYOCO ecosystem.	— Ponding and channeling of creeks provided irrigation and flood prevention. Pond habitat provides waterfowl habitat and breeding sites for boreal toads. Warm water temperature and increased siltation are the result of decreased stream depth, straightening of the channel to aid irrigation, and reduced vegetation. Creeks no longer support a large native fishery. — Riparian shrublands important to migratory birds such as the willow flycatcher are in good condition along the north end of Pleasant Valley Creek. — The Dahl Lake wetland complex and isolated wetlands cover more than 1,000 acres. Wet meadows have mostly introduced meadow grasses dominated by reed canarygrass and Garrison creeping foxtail. Wetland vegetation provides habitat for many waterfowl and water birds. — More than 1,000 acres of native, bunchgrass prairie provides wildlife cover and nesting habitat. Palouse prairie is a rare ecosystem. — Lodgepole and ponderosa pine, and Douglas-fir are common forest species. These forests provide habitat for wildlife such as woodpeckers, owls, deer, elk, bears, and mountain lions. — Spotted knapweed is a nonnative, invasive plant that is fairly dispersed. This and other invasive plants such as tansy ragwort, foxtail, and reed canarygrass have reduced native species diversity. — Historic fire return intervals are around 125 years in the area north of the refuge. Fires have converted dense forest to open conditions, increasing wildlife browse and forage. — No areas meet all criteria of the Wilderness Act for designation as wilderness.	— Common breeding waterfowl include mallard, lesser scaup, shoveler, and teal. Fall waterfowl populations are low. — Nesting water birds include red-necked and horned grebes, killdeer, black tern, and sandhill crane. — Neotropical migratory birds, including grassland species such as vesper, Savannah, and grasshopper sparrows, nest on the refuge. Many grassland species are experiencing population declines on a national level, likely due to habitat loss. — Populations of white-tailed and mule deer have been increasing steadily in the vicinity of the refuge. Approximately 300 elk winter on the refuge. Fencing poses a hazard to wildlife. The Rocky Mountain Elk Foundation (RMEF) has assisted refuge staff to remove more than 25 miles of fence remaining from ranching activities. Approximately 20 miles of unnecessary fence remain. — Small mammals include river otter, beaver, coyote, and wolverine. Ground squirrels are an important source of protein for predators, but can compete with other wildlife for forage and cause soil erosion. — Resident birds include black-capped chickadee, great horned ow1, hairy woodpecker, nuthatches, and golden eagle. Upland game birds include spruce grouse and turkey. — All fish found in Pleasant Valley Creek on the refuge show stunting (yellow perch, northern pike minnow, and pumpkinseed), except redside shiners and suckers. It is likely Pleasant Valley Creek historically supported redband and westslope cutthroat trout. — Species of concern that reproduce on the refuge include bald eagle, black tern, boreal toad, and Spalding's catchfly. Species of concern that use the refuge occasionally include grizzly bear and gray wolf. Canada lynx and trumpeter swan are species of concern that occur in Pleasant Valley. The refuge is in an important grizzly corridor.

Table 2. Summary of the cultural resources, and socioeconomic, administrative, and partnership setting for Lost Trail National Wildlife Refuge, Montana

Cultural Resources	*Socioeconomic Setting*	*Administration*	*Partnerships*
— Native people of the area were the Bitterroot Salish, Pend d'Oreille, and Kootenai, some of which are today members of the CSKT of the Flathead Indian Reservation. Teepee rings and other native occupation sites and use sites are documented. Native people hunted deer and elk, harvested huckleberries and camas bulbs, and traded furs with settlers. — Europeans settled in Pleasant Valley in the 1880s. The Jackson and Orr–Gardiner ranches are eligible for nomination to the National Register of Historic Places. The Doll Ranch has not been evaluated for eligibility. The Great Northern Railroad's main east-to-west line ran through Pleasant Valley from 1892 to 1904.	— The refuge is located in Flathead County—the fastest-growing county in Montana. The county population is 76,269 with 14.6 persons per square mile. Ranching and timber harvest are the main types of land use near the refuge. More than 3,250 businesses occur in the county, with 49,466 employees. Median household income is $34,466. Nonresident travel numbers increased 7.6–63 percent at state entry points. — Existing roads provide access for wildlife observation, hunting, and other public use. — Some areas of the refuge have been open to deer, elk, mountain grouse, and turkey hunting since 2002. Waterfowl hunting is not allowed due to low numbers of ducks and geese on the refuge in the fall. — Fishing is not allowed due to the lack of viable fisheries and ongoing wetland restoration. — A public use handout and signs provide limited interpretive materials. — Environmental education includes some in-school presentations and on-site habitat improvements, monitoring, and surveys.	— There are more than 1,400 acres of state lease lands within the refuge boundary; these may be transferred to the Service when renewed. Habitat protection efforts include conservation easements purchased by the NRCS. Four land inholdings within the refuge will be evaluated for acquisition or protection when available. Land acquisition outside the refuge boundary is not needed. Habitat protection via conservation easements will be evaluated. — Many facilities are not needed for refuge management and occupy areas that could be restored. The headquarters complex was remodeled from part of the horse arena. Wells, septic systems, storage, shops, and horse barns provide the infrastructure. Culverts and cattle guards occur on 27 miles of roads. Nearly 30 miles of barbwire boundary and interior fence exists. — Lost Trail is a satellite refuge of the National Bison Range complex. The refuge has one full-time employee, the refuge manager. Seasonal employees and one to five volunteers provide assistance during the summer.	— Partnerships have been essential in carrying out refuge programs. — Partnerships have been established with Montana Fish, Wildlife and Parks (MFWP) for support with refuge establishment and planning. — Flathead and Lincoln counties, Plum Creek Timber Company (PCTC), U.S. Department of Agriculture (USDA) Forest Service, McGinnis Meadows Guest Ranch, and Montana's Department of Natural Resources and Conservation (DNRC) provide support including road and fence maintenance, invasive plant management, and fire protection. — A partnership with NRCS exists to manage the wetland restoration program. The RMEF has funded wildlife habitat improvement projects. — Pleasant Valley School, Montana Academy, Flathead Audubon, and Montana Conservation Corps (MCC) are partners in providing educational activities.

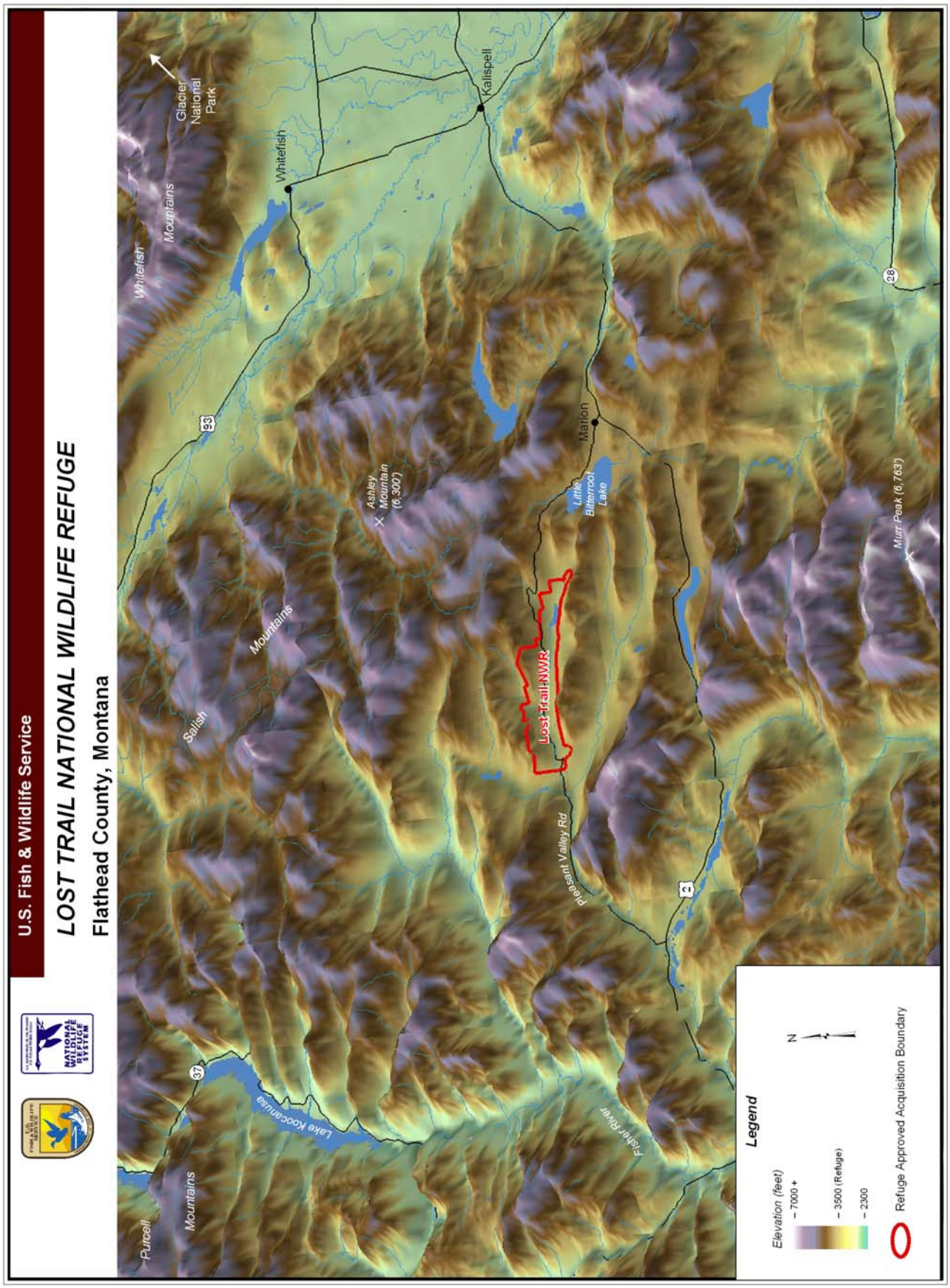

Figure 5. Geographic setting of Lost Trail National Wildlife Refuge, Montana

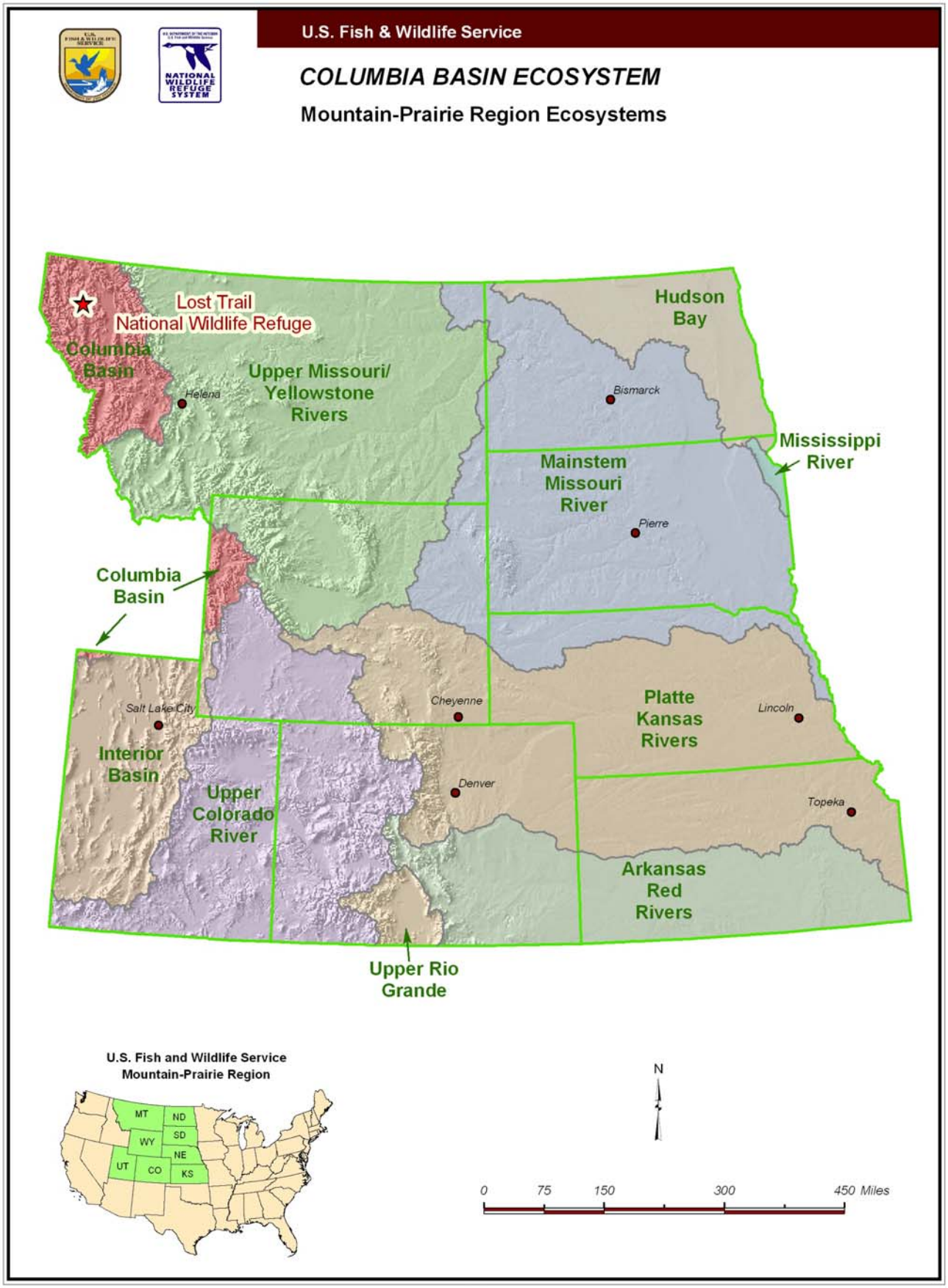

Figure 6. Columbia Basin ecosystem

Soils consist of loams—silt, sandy, gravelly, and clay loams. The soils formed in glacial deposits typically are loamy-textured with varying amounts and sizes of rock fragments. Most of these soils have a high component of volcanic ash in the surface layer. After the glaciers receded, a period of volcanic activity in the Northwestern United States deposited volcanic ash on much of the area. The eruption of Mount Mazama (now Crater Lake, Oregon) about 7,000 years ago is thought to have dropped up to 2 feet of volcanic ash in northwestern Montana. This pale brown ash is still visible in some forested areas under the forest litter.

Soil texture is determined by the relative amounts of sand, silt, and clay, along with rock fragments if present. When glaciers grind up Belt rocks, they create silt or very fine sand-sized particles. Volcanic ash is also mainly silt-sized particles. The soils in the refuge contain significant amounts of silt and very fine sand.

Bottomland Soils

A glacial lake covered much of the Pleasant Valley at the end of the last ice age. Although most of the valley is now drained, the stream gradients are so low that water accumulates in the flood plain during spring runoff. Dahl Lake is a remnant of this old glacial lake.

Organic soils are found around Dahl Lake. The very poorly drained Barzee soils are adjacent to the lake and have stratified muck more than 50 inches thick. The McLangor soils are also very poorly drained mucky peat, but have stratified silt loam layers below 16 inches.

The flood plains are dominantly Meadowpeak silt loam, a deep, poorly drained soil. The profiles are silt loam and very fine sandy loam. Buried, brown ash layers can be found in these soils. Small areas of Blacklake mucky peat are found in slightly lower, wetter areas. These very poorly drained soils are similar to Meadowpeak, except they have 8–16 inches of mucky peat over the silt loam and very fine sandy loam textures. Along the edges of the flood plain on slightly higher areas are Whitebear–Dahlake silt loams. These somewhat poorly drained soils also have deep silt loam and very fine sandy loam textures, but they are sodium-affected with pH values as high as 10.0.

Some stream and lake terraces and small alluvial fans are adjacent to the flood plain. Perma and Dominic soils on the stream terraces formed in alluvium and have loamy surfaces, but are very gravelly loams to extremely gravelly loamy sands underneath. The Tally soils have deep sandy loam profiles. These soils are well-drained or somewhat excessively drained. The lake terrace soils formed in glaciolacustrine deposits and dominantly silt loam profiles. Some soils are sodium-affected and are somewhat poorly drained. The soils on alluvial fans generally have deep silt loam profiles, but some have gravelly or very gravelly textures below about 2 feet. They are somewhat poorly drained or well drained.

Upland Soils

The upland soils generally formed in deep, glacial deposits. Rock fragments are varying in size from small pebbles to stones. Rangeland areas are dominantly Prospect and Finleypoint soils. These soils are well drained and have dark-colored, loamy surfaces. Prospect soils have less than 35 percent rock fragments in the profile and Finleypoint soils have 35–60 percent. Forested areas are dominantly Courville and Winfall soils—loamy textures with 35–60 percent rock fragments. The Courville soils have a pale brown ash-influenced surface layer.

The Belt formation bedrock outcrops occur in some areas where glacial deposits have eroded away or were thin deposits. These bedrock areas are generally along the north part of the refuge at higher elevations. Soils formed in this bedrock are the shallow Rockhill and Sharrott soils, and the deeper Winkler soils. Some of these areas have remnants of deep, glacial deposits.

Water Resources

Pleasant Valley is crossed and irrigated by Pleasant Valley Creek. The refuge is located in a long, narrow east–west valley in which Pleasant Valley Creek flows south out of the Salish Mountains and moves westward (figure 7).

The creek is joined by the Meadow Creek ditch, which partially drains from the west end of Dahl Lake. The lake is filled by Elbow Creek and several unnamed drainages that end before the lake and seep into the wetland. Pleasant Valley Creek starts north of the refuge headquarters and flows south to the county road before heading west to drain into the Pleasant Valley–Fisher River, a tributary of the Fisher River.

The Fisher River watershed complex is part of the headwaters of the Columbia River. The Fisher River is a tributary of the Kootenai River and leads to Lake Pend Oreille, which is drained by the Columbia River. The Fisher River corridor is part of a large watershed conservation effort for native fish. The corridor was established by MFWP with an easement on PCTC land (figure 7).

In the eastern part of the refuge lies Dahl Lake, which is 216 surface acres at 3,511 msl contour. There are six intermittent creeks within the drainage area of the lake—all of these creeks end as they enter the valley floor, and none of them have channels that connect to the lake. An explanation for this may be that the valley floor is like a large porous sponge, from a deposit of glacial till, that pulls surface water to join the groundwater rather than form stream channels (Pierce 2001).

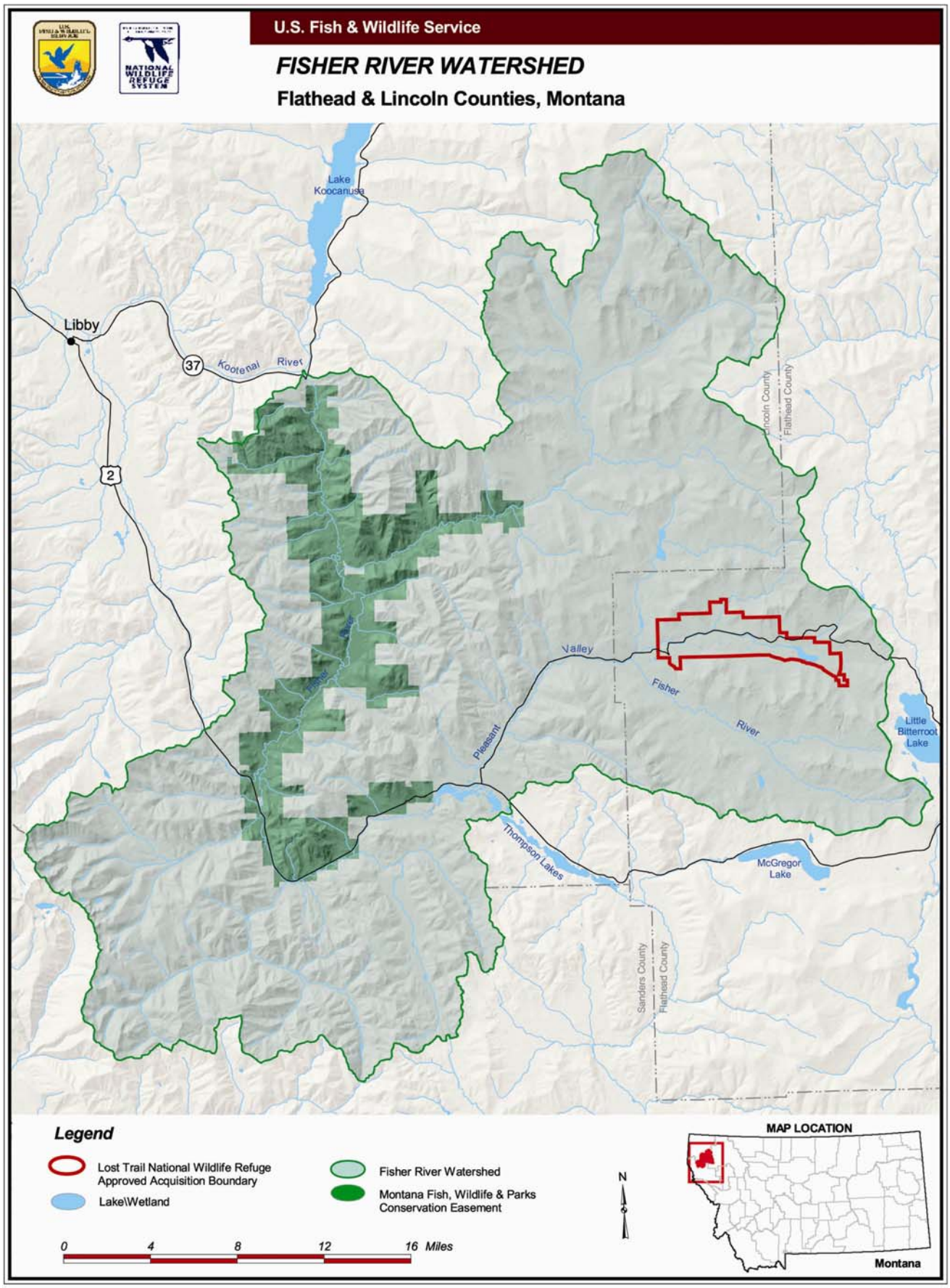

Figure 7. Fisher River watershed, Montana

Throughout the rest of the Pleasant Valley Creek drainage, eight other intermittent creeks exist—only two of their channels connect to the creek. This area was glaciated by the Cordilleral Ice Sheet, whose terminus was not too far south from Pleasant Valley.

Hydrology of Pleasant Valley

The drainage area for Pleasant Valley Creek, as it leaves the refuge, is 53.6 square miles. For management reasons, this area has been delineated into three drainages (figure 8).

- Basin 1—53.6 square miles; terminates downstream at the western edge of the refuge
- Basin 2—31.1 square miles; at the current earthen check dam on Pleasant Valley Creek for Dahl Lake
- Basin 3—29.4 square miles; at an abandoned check structure on Pleasant Valley Creek

Within the drainage area of Dahl Lake are six intermittent creeks. All six of these creeks terminate on entry to the valley floor; none of them has channels that connect to the lake. Throughout the rest of the Pleasant Valley Creek drainage, there are eight other intermittent creeks; only two of their channels connect to the creek.

This area was glaciated by the Cordilleral Ice Sheet, whose terminus was not too far south from Lost Trail Valley. There appears to be widespread lake sediments formed by glacial damming of the valley. These sediments would restrict water infiltration and groundwater flow. One possible explanation for the terminus of the streams is that the hillslopes are comprised of permeable fan gravels, yet the valley floor is less permeable (Pierce 2001).

Dahl Lake does not appear as though it had a natural outlet channel. The linear shape of the outlet channel suggests that it was constructed. Historically, this channel and a dam allowed irrigators to back up water into the meadow around the lake and time the release best to manage their fields. The NRCS has an easement on the property where the outlet structure is located; the purpose of which is to restore the system to its natural hydrology.

Runoff predictions are based on average annual runoff numbers developed by the NRCS. Research for this area shows 7.2 inches of surface runoff for mountainous elevations of 4,000 feet and 10 inches for the elevation of 5,200 feet (Ralph Bergentine, NRCS, personal communication).

Table 3 shows the results of the runoff-mapping analysis. The basins were divided into elevation bands. The area in acres was multiplied by inches of rain, divided by 12, and totaled to predict runoff in acre-feet.

Table 3. Runoff predictions for Lost Trail National Wildlife Refuge, Montana

	Basin 1 West Drainage		Basin 2 Middle Drainage		Basin 3 Dahl Lake	
Elevation (feet)	*Runoff (inches/acre-ft)*		*Runoff (inches/acre-ft)*		*Runoff (inches/acre-ft)*	
4,000	7	5,085	7	511	7	5,426
4,000–4,400	8	2,465	8	132	8	3,641
4,400–4,800	9	1,203	9	26	9	2,217
4,800	10	273	10	0	10	920
Basin Totals		9,026		669		12,204
Runoff Total = 21,899 acre-feet						

Water Rights

The refuge currently owns the necessary water rights to maintain existing wetlands in their present condition.

The earliest livestock water and irrigation claims for the refuge date back to 1890 and 1899, respectively. The amended irrigation claims describe 1,572 acres irrigated with 10,930 acre-feet per year.

The combined irrigation diversion rate at the western edge of the refuge is 20 cubic feet per second (cfs). This flow value does not include areas that are subirrigated by check structures with no flow rate claimed on the water right. It is important to note that the irrigated acreage figure does not include several natural wetlands. Filing on naturally subirrigated areas such as pasture and wetlands was not required under the statute establishing the adjudication.

The temporary preliminary decree for the Fisher River basin (76C) was issued in 1985. The basin was one of the first to be reviewed by the state through the water rights adjudication process. A complete list of water rights is in appendix A.

Some of the water rights were not accurately described in the preliminary decree. When the MPC negotiated transfer of the property to the Service, a water rights specialist was retained to review and amend the water rights. The validity of the water rights was documented, but some errors were found. Clerical errors were corrected, but the larger issues are still before the water court.

The largest irrigation claim is on Dahl Lake. Historically, the lake would back up and cause the small valley to flood, after which the water was released downstream in Pleasant Valley Creek. Although refuge stream flows and pond elevations have been monitored for several years to better understand available water, the effort has been hampered by extremely dry conditions.

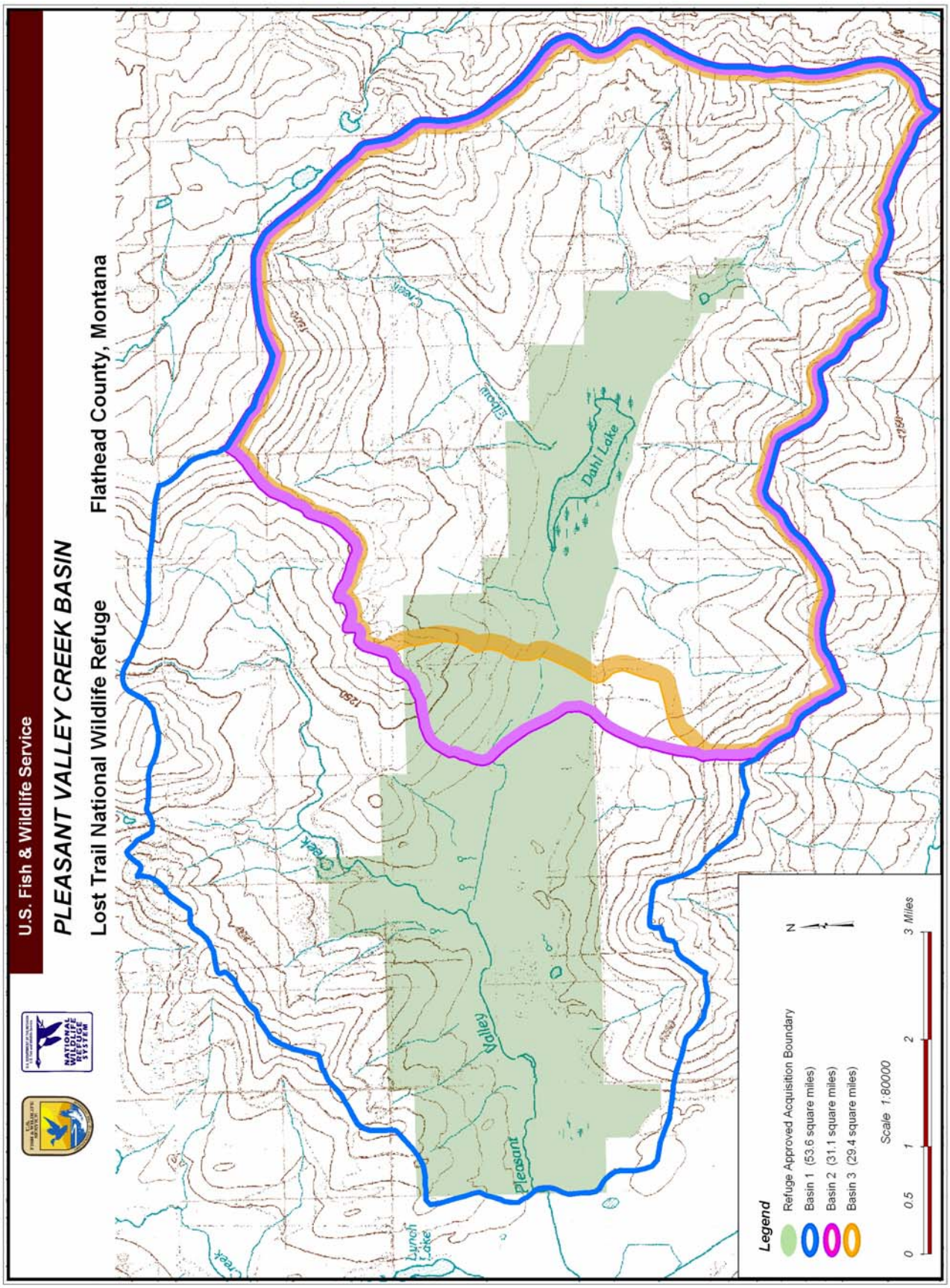

Figure 8. Pleasant Valley Creek basin, Montana

Recently the Montana State Legislature modified the statutes pertaining to adjudication—water users can present changes to the water court at any time and must no longer wait until the next decree stage. The MPC retained an attorney for this work at the refuge, which began this process in 1999. Money set aside in escrow is for the Service to defend water right changes that are currently before the Montana Water Court, if needed. This money will be available until the court process is complete and the judge issues a finding. If no legal costs are incurred, the money will be transferred to the seller, MPC.

John Westenberg of Land and Water Consulting, Inc. (Missoula, Montana) believes that the revised water rights currently reflect historic use of the water. The next step is to examine the reliability or availability of the water.

The water claims filed by the Lost Trail Ranch (before refuge establishment) received no objections from other users during the adjudication of the basin that occurred in the 1980s. This is an indication that the former ranch and general area experience few water conflicts.

Climatic Conditions

Precipitation is the most important criteria used to predict stream flow. At a nearby weather station called Pleasant Valley (southeast of the valley at 3,600 feet in elevation), the average annual precipitation for a 25-year period is 18.6 inches. A majority of the Lost Trail basin is 1,000 feet higher in elevation than this weather station, resulting in greater rainfall, therefore another annual precipitation value was used. It came from a map of the entire state of Montana (made by Oregon State University and funded by the NRCS). This work more accurately predicts 22 inches, as established by the 1961–1990 data set. The Service is currently in the process of using several different predictive equations to estimate water supply.

Climatological data for 1931–1960 was supplied by the U.S. Department of Commerce, Environmental Data Service published in June 1968. This data set, while rather dated, summarizes the most comprehensive elements to climate that could be located. Table 4 displays this data, which is likely a compilation of sites; a nearby site might be more accurate, but none nearby collect evaporation or humidity.

Air Quality

Air quality in the area of the refuge is considered good, with no nearby manufacturing sites or major air pollution sources.

Particulate matter (PM_{10}) is a measure of tiny liquid or solid particles in the air that is respirable in the lungs. In the area of the refuge, carbon from automobiles and diesel engines; soot from slash burning, forest fires, fireplaces, and wood stoves; and dust associated with wind-blown sand and dirt from roadways, fields, and construction sites may all contribute to particulate matter.

Table 4. Climatological data for 1931–1960 near Lost Trail National Wildlife Refuge, Montana

Climatological Factor	*Time Period*	*Measurement*
Precipitation	Wettest month (June)—mean total precipitation	2.34 inches
	Driest month (August)—mean total precipitation	0.97 inches
	Mean annual total precipitation	19.00 inches
	Mean annual total snowfall	85.00 inches
Temperature	January—normal daily maximum temperature	30.0° F
	January—normal daily minimum temperature	10.0° F
	July—normal daily maximum temperature	80.0° F
	July—normal daily minimum temperature	43.0° F
	Average annual temperature (at Glacier National Park, ~10,000 feet in elevation)	42.1° F
	Annual heating degree days	approximately 10,000 days
Humidity	Mean annual relative humidity	70 percent
Wind	Mean annual wind speed (prevailing winds from the west)	6 mph
	July—annual fastest wind speed (wind from the northwest)	72 mph
Evaporation	Mean annual class A pan evaporation	35 inches

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. Montana has adopted additional standards under the Montana ambient air quality standards.

Air quality problems in Montana are usually related to urban areas and mountainous topography or river valleys that are sensitive to temperature inversions. Particulate matter and carbon monoxide are the air pollutants that have the greatest adverse impact on Montana's air quality.

The major sources of particulate matter are vehicles traveling on unpaved roads, sand and gravel from winter traction material, and residential wood burning. The major sources of carbon monoxide in Montana are motor vehicles and residential wood burning. The other criteria air pollutants under the NAAQS are lead, nitrogen dioxide, ozone, and sulfur dioxide.

The area around Kalispell was designated a nonattainment area and was not in compliance for PM_{10} in 1989. A monitoring study indicated that material from road dust, gravel roads, parking lots, and construction activities in Kalispell were the main sources of the area's particulate matter. Burning from wood stoves and open fires were secondary sources of PM_{10}. A technical committee developed control strategies that were applied to an area within 1 mile of the city limits. Attainment designation for the area will probably be achieved in the near future.

Between 1986 and 1995, national average concentrations of carbon monoxide decreased 37 percent and national emissions decreased 16 percent, despite the fact that there was a 31 percent increase in total vehicle miles traveled in the United States.

BIOLOGICAL RESOURCES

This section describes the existing and potential plant and animal communities for the refuge.

HABITAT

Habitat types consist of subirrigated wet meadows, grassy uplands, and coniferous forests (figure 4). The subirrigated wet meadows are composed primarily of introduced meadow grasses dominated by reed canarygrass and Garrison creeping foxtail, and basin wildrye, cattail, rush, and sedge. Table 5 lists and quantifies the vegetative resources.

Upland areas are composed of a mosaic of prairie grasslands consisting of the following:

- cool-season native grasses—rough fescue, Idaho fescue, bluebunch wheatgrass, Columbia and Richardson's needlegrass, and needle and thread
- nonnative grasses—smooth brome, timothy, redtop, and Kentucky bluegrass
- invasive plants—spotted knapweed and tansy ragwort
- a diversity of native forbs

Coniferous forests are dominated by lodgepole and ponderosa pine, and Douglas-fir. Other forest species include subalpine fir, grand fir, Engelmann spruce, and juniper. Small pockets of quaking aspen, birch, and cottonwood are located throughout the refuge.

Table 5. Vegetative communities[1] of Lost Trail National Wildlife Refuge, Montana

Riparian Area and Wetland (species / acres)		*Native Grassland* (species / acres)		*Nonnative Grassland* (species / acres)		*Shrubland* (species / acres)		*Forest and Woodland* (species / acres)		*Nonvegetated Area* (species / acres)	
Reed canarygrass	973	Idaho fescue	2,146	Foxtail	1,007	Fringed sage	24	Lodgepole pine	1,212	Open water	107
Sedge	275	Western wheatgrass	758	Kentucky Bluegrass	62	Snowberry	17	Douglas-fir	926	Unknown	63
Rush	126	Rough fescue	279	Cheatgrass	36	Shrubby cinquefoil	16	Ponderosa pine	779	Structures	28
Pond-lily	83	Bluebunch wheatgrass	101	Redtop	23			Quaking aspen	76	Gravel pit	10
Alkaligrass	37	Wildrye	75	Poa	6			Western larch	14		
Willow	13	Needlegrass	20					Engelmann spruce	6		
Alder	6	Junegrass	43								
Total	1,721	Total	3,422	Total	1,134	Total	57	Total	3,013	Total	101

Total Refuge Acres = 9,225[2,3]

[1] *Derived from the National Vegetation Classification System, alliance level*
[2] *The refuge acreage includes state land leases.*
[3] *Total acreage figures add up to 9,347 because of how open water and lake acreages are used, and depending on climatic conditions.*

Riparian Habitat

Much of the riparian habitat in the Western United States has been lost or degraded due to flood control, irrigation projects (Hendrickson and Kubly 1984), grazing (Bock 1993), logging, and housing development.

Riparian shrubs—alder and willow—occur along Pleasant Valley Creek (USFWS 1982). Meadow Creek is a constructed ditch that flows out of the west end of Dahl Lake, across an open meadow, and into Pleasant Valley Creek at the horse ranch. From there, the stream flows through cottonwoods, willows, and a water control structure at refuge headquarters, before leaving the refuge. Deciduous, riparian woodlands of aspen and cottonwood occur in small patches (USFWS 1982).

Fish Habitat

The past uses of the refuge, as well as of surrounding lands on the valley floor, have been primarily for raising beef cattle. Subsequently, the creeks and lakes have been modified to provide for irrigation of grass and hayfields and no longer support a large native fishery. Historically, the streams in this area had a meandering pattern, profile, and dimensions prior to irrigation, flood prevention, and hayfield needs.

Pleasant Valley Creek is a tributary of the Fisher River (figure 7), which is an important focus area for native fish restoration for MFWP. Pleasant Valley Creek currently contributes to the system as a non-fish-bearing tributary.

Pleasant Valley Creek could possibly function as a native-fish-bearing tributary after restoration efforts. Historically, it supported Columbia redband and westslope cutthroat trout. Pleasant Valley Creek drains into the Fisher River where bull trout (federally listed as threatened) are being restored.

Water temperature is a critical component of habitat selection for these native, cold-water trout species. Ponding and channeling have decreased the stream depth, and large sections of stream bank are denuded of native vegetation, all of which lead to increased water temperature and siltation. Pleasant Valley Creek's control structures also limit fish movement.

Current water temperature is too high and there has been too much siltation to support redband trout. Loss of habitat is the main problem for the westslope cutthroat trout, due to loss of stream water to irrigation and barriers created by dams and road culverts (Gardner 2001).

Riparian Shrublands

Riparian shrublands consist of tall shrubs such as alder, willow, birch, and dogwood. This habitat is important foraging and nesting habitat for a diverse set of migratory birds, including many priority species [as designated by Montana Partners In Flight (MPIF)] such as the willow flycatcher, gray catbird, warbling vireo, MacGillivray's warbler, and lazuli bunting. As the Montana Bird Conservation Plan points out, this habitat is also used by common species such as song sparrows, which should respond quickly to restoration efforts, in line with the concept of "keeping common birds common" (Casey 2000).

The north end of Pleasant Valley Creek has been mostly undisturbed for approximately 10 years and is in relatively good condition. Prior to that, some selective logging occurred. Preliminary bird surveys suggest use by passerines such as song sparrows, and ruby-crowned and golden-crowned kinglets.

The willow flycatcher is a priority 2 species for riparian shrub habitat (designated by MPIF), and occurs in the Pleasant Valley Creek corridor. These birds breed in riparian habitat with a midstory of 6- to 7-foot alders or willows interspersed with openings (Casey 2000).

Conservation

Plans are in draft form to improve the stream channel of Pleasant Valley Creek to create or enhance fish habitat by restoring sinuosity on the south end where it was channelized and straightened. The NRCS is in the process of formalizing restoration plans for Pleasant Valley Creek (figure 3).

The plan calls for restoration of stream sinuosity and streambank vegetation. Lower Moose Pond is an artificial impoundment that was developed when the refuge was a working cattle ranch. This pond provides waterfowl habitat and is one of the two largest reproductive sites for boreal toads in the Rocky Mountains.

Wetland Habitat

Wetland habitat consists of the Dahl Lake wetland complex along with isolated wetlands that are seasonal, temporary, permanent, and semipermanent (figure 3). The wetland habitat on the refuge has tremendous biological potential.

The refuge has four permanently flooded wetlands or ponds:

- southeast pond surrounded by alders and lodgepole pine; species recorded include moose and olive-sided flycatcher
- wetland south of Pleasant Valley Road near the South 1019 intersection; species recorded include deer, elk, marten, Canada goose, mallard, wigeon, and common goldeneye
- upper wooded pond on Pleasant Valley Creek, excavated and diked, surrounded by tamarack, poplar, birch, aspen, and Douglas-fir; species

recorded include bufflehead, horned grebe, and hooded merganser

- lower pond on Pleasant Valley Creek, excavated and diked, surrounded by alders and grasses; species recorded include boreal toad, long-toed salamander, deer, elk, marten, Canada goose, mallard, wigeon, and common goldeneye

Dave Menke/USFWS

Wetlands are habitat for many species of waterfowl including the northern shoveler.

There is an unknown amount of fens on the refuge. Fens are wetlands dominated by emergent sedge vegetation. They occur in northern regions that have an underlying layer of peat covered with many species of mosses and aquatic macrophytes. A fen is similar to a bog, but is alkaline rather than acidic, with a much higher nutrient content. Fens gain nutrients found in precipitation, surface water, and groundwater, whereas bogs are fed by nutrients in precipitation only (Aerts 1999). Wet meadows are like fens, but are much more numerous across the country.

Most species use different types of wetlands to meet their life history requirements. For example, American bitterns nest in shallow water (less than 4 inches deep) with dense, robust emergent vegetation, while trumpeter swans will nest in water greater than 20 inches deep. Both black terns and trumpeter swans need abundant, floating, dead vegetation.

Species of concern (as designated by MPIF) that have been documented using refuge wetlands include the bald eagle (threatened) and several category 2 species (horned grebe, hooded merganser, black tern, and willow flycatcher).

Wetlands with diverse emergent vegetation, seed-producing annuals interspersed, and open water with submergent vegetation provide the habitat requirements of many waterfowl and water birds (Cowardin et al. 1979). Emergent vegetation such as cattail, rush, and bulrush is critical to successfully raising a brood, with a variety of uses from foraging habitat to escape cover. Submergent vegetation (e.g., pondweed, mint, and horsetail) provides seeds and the substrate necessary for invertebrate populations that are food for waterfowl.

Dahl Lake Complex

Dahl Lake is a natural lake that spills over to the west into the surrounding wetland complex in high-water years. This complex naturally fluctuated in water level seasonally and yearly, creating an array of temporary, seasonal, and semipermanent wetlands.

Around 1940, the natural spillway for Dahl Lake was channelized and directed through a ditch system named Meadow Creek. These actions, which reduced the lake's water level and dried up surrounding wet meadows, were done to increase hay pasture. The resulting reduction of surface water and loss of wetland vegetation has made these areas less conducive to use by waterfowl and other water birds.

Meadow Creek extends westward through the valley from the western end of Dahl Lake. Portions of the creek were more recently dredged to increase water flow efficiency for irrigation. Historical and current aerial photos show the area as a complex of temporary and seasonal wetlands, with seepage and overflow out the west end of the complex.

The National Wetland Inventory (NWI) data (1982) for the Dahl Lake complex identified the following wetland types:

- 182 acres (different than table acreage) of open water;
- 80 acres of semipermanent wetlands (water through spring and summer and frequently into fall and winter);
- 432 acres of seasonal wetlands (water in spring and early summer, but generally dry by late summer and early fall); and
- 376 acres of temporary wetlands (water for only a few weeks after snowmelt and few days after heavy rainstorms).

Dahl Lake has submergent vegetation such as mint and pondweed. It is used by black terns (candidate species, category 2), soras, waterfowl, and sandhill cranes. Lower Moose Pond and Dahl Lake host the largest populations of boreal toads in the Rocky Mountains.

Semipermanently flooded wetlands include areas surrounded by hardstem bulrush. Intermittently flooded wetlands include a few wet patches of alkaligrass mixed with bluegrass. Saturated wetlands cover 15 acres (USFWS 1982) of wet sedge areas.

Seasonally flooded wetlands consist of reed canarygrass with small, intermingled sedge patches. Historically, these areas probably included mainly

sedge, rush, cattail, and bulrush vegetation. Isolated seasonal wetlands are surrounded by bulrush. Seasonal wetlands provide abundant invertebrate foods and nesting cover for species that nest over water.

Temporarily flooded wetlands consist of subirrigated pastures with Garrison creeping foxtail. Alder and willow historically occurred along the ditches. Birds breeding in these wetlands include savannah sparrow, sandhill crane, and common snipe. Temporary wetlands are important for breeding waterfowl, especially early nesters such as mallards and teal, because they provide isolation and spacing and because their shallow waters warm rapidly to provide the first invertebrate foods in spring (Swanson et al. 1974, Baldassarre and Bolen 1994).

Conservation

Many of the refuge's wetlands have potential for restoration to basins that discharge and recharge on a seasonal basis, with either naturally occurring runoff or water control structures. A restored Dahl Lake complex would have the potential to provide habitat for trumpeter swans (candidate species, category 1).

The NRCS bought a permanent easement on 1,770 acres of refuge wetland (figure 3) for the WRP. The emphasis of the WRP is to protect, restore, and enhance the functions and values of wetland ecosystems to attain:

- first and foremost, habitat for migratory birds and wetland-dependent wildlife, including threatened and endangered species;
- protection and improvement of water quality;
- reduction of water flows due to flooding;
- recharge of groundwater;
- protection and enhancement of open space and aesthetic quality;
- protection of native plants and animals;
- contribution to education and scientific scholarship.

The WRP helps eligible landowners protect and restore the original hydrology, native vegetation, natural topography, and values of wetlands in the agricultural landscape. The national WRP goal is "no net loss of wetlands" (USDA NRCS 2000).

Grassland Habitat

A diverse set of grasses cover the majority of the refuge. The main grass types include tall and medium-tall bunchgrasses, and some planted areas of medium-tall sod. Basin wildrye occurs in the bottomlands of more moist sites (75 acres). More than 2,400 acres of uplands have fescue species intermixed, in some low areas, with 882 acres of wheatgrass and redtop-dominated areas. Planted areas of foxtail and Kentucky bluegrass cover more than 1,000 acres. The area south of the county road (includes the WRP easement) has a wide diversity of sedges, native grasses, and forest.

There are more than 1,000 acres of relict, native, bunchgrass prairie that provides wildlife cover and nesting habitat. Idaho fescue and western wheatgrass have very good to excellent palatability and are good in energy value as forage for deer and elk (Mueggler and Stewart 1980). These grasses also provide fair to good cover for nongame birds (Dittberner and Olson 1983, Tirmenstein 1999). Upland grasslands and one unit of bottomland grasslands (figure 2; mitigation units 11–14, 19) surround the Dahl Lake wetland complex, and have many areas important for waterfowl.

Prior to establishment, the refuge was a working cattle ranch. Some areas have been overgrazed, leading to weedy areas and sparse vegetation with low productivity. The impact of defoliation on plant vigor is depression of herbage and flower stalk production. Adequate plant vigor and productivity are essential to regain the climax grassland community, with native plants occurring in their natural, "correct" percent compositions.

Conservation

For vigor to recover in grassland species such as Idaho fescue, areas of extremely poor vigor may need 6–7 years of rest, while bluebunch wheatgrass can take up to 10 years (Mueggler 1975). In areas of intermediate vigor, Idaho fescue may be able to recover after 3 years of protection (Mueggler 1975). Once vegetation targets are met, some disturbance is required to maintain vigor unless native herbivores are concentrating in these areas.

Conservation is essential for Palouse prairie, which is listed as a rare ecosystem exhibiting a 98 percent decline (Noss et al. 1995). Native bunchgrass prairie is an important habitat coverage that is limited in the Northwestern United States. These upland grasslands overlay rolling topography that grades into forest habitat and encompass approximately 1,500 acres. Most of these upland grassland areas are comprised of native grasses (figure 4).

Birds key into vegetation structure and litter for nest site selection rather than plant species composition (Cody 1968, Wiens 1969, Kantrud and Higgins 1992). Tame grasses can provide suitable habitat for ground-nesting birds; however, it is important to maintain and restore native plant communities, where feasible, to meet Refuge System goals and further initiatives such as "bring back the natives."

FOREST HABITAT

Forest habitat is composed of coniferous and deciduous forest occupying approximately 3,000 acres of the surrounding slopes of the valley. Dominant tree species include lodgepole pine, Douglas-fir, ponderosa pine, and quaking aspen. Other species found include western larch, Engelmann spruce, subalpine fir, grand fir, spruce, juniper, black cottonwood, and white birch (figure 4).

Stands of large ponderosa pine historically dominated most dry forest sites in western Montana. These dry forests are also composed of a mix of ponderosa pine and Douglas-fir. Logging and fire suppression have resulted in an alteration of tree age-class structure, physical structure, density, and species composition (Barrett 1979, Schubert 1974, Shepperd et al. 1983). Large, old-growth trees in open settings have been replaced with dense stands of younger trees.

Although forest habitat types have been initially classified (figure 4), a more thorough evaluation is needed to determine the amount of open areas, and provide species-specific coverage types. Initial efforts grouped the largest area possible for dominant tree species; other available habitat types may be inclusions within large forest areas.

Aspen groves are important components of the diverse habitats on the refuge. These areas provide food and nesting habitat for a variety of wildlife. Aspens are important for stabilizing soil and watersheds. Healthy stands of trees, with shrub and herbaceous understories and tree litter, provide nearly 100 percent vegetative cover. Soil cover and the intermixture of herbaceous and woody roots protect soil, except during very intense rains (DeByle 1985a).

Associated Wildlife

Many priority bird species are closely associated with old forest stages and snags, such as the Lewis's woodpecker, pileated woodpecker, olive-sided flycatcher, flammulated owl, white-breasted nuthatch, and Williamson's sapsucker, all of which have been documented on the refuge. Regional populations have decreased due to the reduction of old forest stages.

Olive-sided flycatchers, flammulated owls, and black-backed woodpeckers (priority 1 species for the MPIF program) are found, respectively, in open-canopy woodlands, open-canopy ponderosa pine, and closed-canopy lodgepole pine.

Golden eagles are nesting in Douglas-fir on the refuge. Yellow-billed cuckoos are a federal candidate species that could be using the cottonwood–aspen woodland associations.

Dave Menke/USFWS

Lewis's Woodpecker

While the refuge does not have enough forest habitat to provide all life requirements for the grizzly bear, gray wolf, and Canada lynx, with the large, surrounding, land tracts owned by the USDA Forest Service and PCTC, refuge lands could provide an important linkage area for these species. Grizzly bears and gray wolves are known to occur in the surrounding forested area, and Canada lynx could potentially be using the refuge as a corridor or foraging area.

The refuge harbors large wintering deer and elk populations. They use the dry forest areas of ponderosa pine and Douglas-fir. Elk live in high elevations in semi-open forests and mountain meadows during the summer. In the winter, elk migrate to lower sheltered valleys, windswept meadows and lower wooded slopes. Tree lichen is an important forage for deer and elk during winter (Baty et al. 1996), with their typical diet consisting of mainly grasses, sedges, and forbs.

Wild Merriam's turkeys were transplanted to Pleasant Valley in 1999. Although, turkeys are not indigenous to Montana and are not a priority species for management, they are a popular game species and are considered for habitat management to better serve the public. Turkey hunting is open in fall and spring on the refuge, except in the bottomlands between south of the county road and north of South Pleasant Valley Road.

Merriam's turkeys are associated with the edges of ponderosa pine, lodgepole pine, and Douglas-fir forests, where there are open areas for foraging and mating (MacDonald and Jantzen 1967). Turkeys use forested areas as cover from predators and for tree-roosting at night. Open areas provide a greater abundance of insects for young poults and females. This varied habitat of both open and covered areas is essential for wild turkey survival. Most turkey sightings have occurred in the refuge's mixed-conifer and hardwood areas and meadows surrounding the Dahl Lake complex.

A bald eagle has nested in the aspens on the north side of Dahl Lake for several years. Many migratory songbirds and woodpeckers use aspen for foraging and nesting habitat, especially moist aspen sites where bird species diversity tends to be higher than stands on dry sites (DeByle 1985b). Ruffed grouse use aspen communities extensively for an abundant and nutritious food source, as well as for courting, breeding, and nesting (DeByle 1985b).

Young aspen provide browse for deer and elk, especially valuable during fall and winter when protein levels are high relative to other browse species (Tew 1970). Aspen also provide thermal cover for deer and elk, which is important for summer shade and winter warmth. Moose use aspen in summer and winter (DeByle 1985b).

Invasive Plants

Invasive plants have undergone extensive range expansion. They often create dense stands that turn native plant communities into weed wastelands. The presence of invasive plants can alter the functioning of ecosystems by loss of wildlife habitat, displacement of native species, change in carrying capacity from reduced forage production, lower plant diversity, and increased soil erosion and sedimentation.

The refuge has not yet been inundated with a large number of invasive plant species. Spotted knapweed and tansy ragwort are the two most common and noticeable invasive plants. Kentucky bluegrass has invaded some areas of the refuge. Sulfur cinquefoil exists on the refuge, intermingled with the native cinquefoil, and the extent of this problem has yet to be defined. Foxtail species and reed canarygrass are other invasive plants that are impacting native species diversity and wildlife habitats.

Control of invasive plants is costly in time and money, and requires careful planning, implementation, and monitoring as defined by a plan to be successful. Native plant restoration is planned for the WRP easement, and will be conducted through the partnership with the NRCS.

Spotted Knapweed

Spotted knapweed is fairly dispersed over the refuge and is likely to become dominant without control efforts. Spotted knapweed aggressively invades grassland and early successional forest sites (Rice et al. 1997a). As spotted knapweed increases on a site, other species decline and there may be up to a 60–90 percent decrease in graminoid production (Harris and Cranston 1979, Bucher 1984, Morris and Bedunah 1984).

Tansy Ragwort

Tansy ragwort is a new, encroaching plant that occurs in many isolated pockets on the refuge; eradication may be possible if heavy effort is put into its control early.

The refuge participates in a working group that coordinates control of tansy ragwort within the area. In 2000 and 2001, ragwort locations were mapped and treated with hand pulling and herbicide. Chemical and biological controls are the two most common methods used for these invasive plants. Evaluation of biological control agents is essential prior to release to ensure they do not alter or disrupt the native insect community, especially pollinators.

Foxtail

More than 1,000 acres of foxtail occur on the refuge. Foxtail plants are palatable, but are a poor nutrition forage grass for deer and elk. Foxtail can provide some nesting cover for waterfowl (Hitchcock 1971). Foxtail species are often seeded along with timothy; the result is reduced plant diversity from vigorous spreading and domination of the area occupied.

For effective control, elimination methods are used with simultaneous introduction of a desirable competitor (Weaver et al. 1990).

Reed Canarygrass

Dahl Lake water levels have been stabilized at a lower level for multiple years to promote drying of the upper portions of the meadow for hay pasture. A consequence of these stabilized water levels is increased cattail and reed canarygrass, which has likely reduced the area's attractiveness to waterfowl (Smith and Kadlec 1986). In the past, cattle grazing kept the reed canarygrass in check to some degree.

Reed canarygrass has taken over the majority of the Dahl Lake complex at 780 acres (most occurs in units 14 and 19; figure 2). In unit 14, the largest section of canarygrass is still interspersed with native sedges and, therefore, has a greater chance for restoration to native species. Control efforts are needed to stop the canarygrass from taking over the entire wetland complex.

Although some waterfowl species use reed canarygrass as nesting substrate, it is not a native plant species. Reed canarygrass often grows into a monoculture, reducing species diversity. A return to native plant diversity would include species such as cattail and bulrush, along with a variety of wetland plants such as sedge, mint, and pondweed. These native plants would increase food resources and nesting substrates for a greater diversity of wildlife.

Fire Regime

Limited historical fire regime information is available. Wildland fires range from smoldering duff to stand-replacing crown fires. Fire ignitions are classified as natural or human caused. Lightning is a natural, random weather event. Human-caused fire is accidental, negligent, or deliberate arson. An ignition from either source developing into a spreading wildland fire is dependent on many

variables, primarily weather, topography, and available forest fuels.

Fire has a demonstrable effect on wildlife habitat through its effects on food plants. The combination of opening up stands by killing overstory trees, reducing competition by removing understories, and rejuvenating sprouting plants through the top-kill can significantly increase the availability of palatable browse and forage.

Information presented here was obtained from the USDA Forest Service, Canoe Gulch Ranger Station in Libby, Montana. The Pleasant Valley area has been designated a "fire group six habitat" by the USDA Forest Service:

- Douglas-fir is both the indicated climax species and a vigorous member of seral communities usually occurring at elevations of 3,000–6,500 feet. It is not uncommon for Douglas-fir to dominate all stages of succession.
- Ponderosa pine, western larch, and lodgepole pine are components within this habitat group.
- Whitebark pine can be found at the upper elevation sites.
- Subalpine fir and spruce are essentially absent, although there is a tiny bit of Engelmann spruce on the south side of the refuge.
- Various shrubs and moist site forbs such as kinnikinnick dominate the undergrowth, along with pinegrass and elk shrub.

Fire history studies conducted in southwestern Montana (sites similar to forest immediately north of the refuge) indicate fire was an important agent in controlling density and species composition. Low- to moderate-severity fires converted dense stands of pole-sized or larger trees to more open conditions. Subsequent light burning maintained stands in a parklike state. Frequent low- to moderate-severity fires favored larch and ponderosa pine over Douglas-fir in stands where these species occurred. Severe fires probably occurred on dense, fuel-heavy sites and resulted in stand replacement that favored lodgepole pine.

Fire's role as a seedbed-preparing agent for Douglas-fir shows this species establishing itself on a variety of seedbeds and that it is not dependent on mineral soil conditions for successful regeneration. Fire's role as a stand-replacement agent is more pronounced when the natural, fire-free interval is increased.

Fire occurrence and intensity is dependent on the area's wet and drier habitat types. Fire occurrence is indicated within the Grubb Mountain area (immediately north of the refuge) by the recorded fire suppression actions—12 lightning-caused and 0 human-caused fires since 1908 when records were initiated. Human activity such as piling slash from timber harvest, piling poles from thinning, and filter strip rows from road construction contribute to and influence fire behavior. Naturally occurring, dead, forest fuels occur from insect disease, snow breakages, and windthrow throughout the drainage. The highest hazard fuel loading occurs in remaining thickets of lodgepole pine that sustained mortality from mountain pine beetles.

There is little, if any, evidence of pine beetle mortality within forested areas on the refuge. There is widespread, hazardous fuel loading in the mixed conifer, Douglas-fir, and western larch stands that have a lodgepole pine component.

Historical fire return intervals are around 125 years in the Grubb Mountain area. Fire scar recordings were conducted on burned larch in September 1995 on north-facing slopes of the Grubb Mountain area. Scar records on a larch tree showed a tree age of 325 years (felled in 1985), with three scars recording fires during the years of 1785, 1889, and 1939.

Fires in the Grubb Mountain area have been of mixed intensity, with more mortality and stand replacement occurring on drier sites. There have been eight recorded fires within 2 miles of the refuge boundary since 1908; two of these fires occurred on present refuge lands (township 28 north, range 27 west, sections 13 and 24).

The most recent wildland fire was the Little Wolf fire of August/September 1994. This fire had moderate–intense fire behavior and spread through Douglas-fir, larch, and ponderosa pine communities on previous ranch lands within sections 14 and 15, and PCTC lands in sections 3, 4, 10, and 11 north of the refuge boundary. Approximately 300 acres within the refuge were burned. This lightening-caused fire was as a stand-replacement fire. Ponderosa pine and larch seedlings were hand planted in 1995 within the burn area.

Wildland fire season in Montana officially begins May 1 and runs through early September. Seasonal weather patterns may extend or shorten the fire season, resulting in a seasonal-dependent fire risk.

WILDLIFE

A list of animal and plant species that occur on or near the refuge can be found in appendix E.

MIGRATORY BIRDS

Documentation of bird occurrence and use is not well developed for this new refuge. Two point-count surveys were initiated in 2000.

The first survey consists of 20 points along the South Pleasant Valley and the county roads. This survey encompasses various habitats including grassland, wetland, and forest. The second survey is a walking survey along Pleasant Valley Creek. It starts in

riparian forest on the north end of the refuge and ends in riparian grassland by the county road. These surveys were developed to determine species presence and use, to develop a species list for the refuge, and to monitor the effect that implementation of the NRCS restoration projects would have on birds.

The MPIF program uses a system that identifies species of conservation priority in each of its planning units, rather than writing planning information for all species. If conservation measures are focused on these species and their habitats, it is expected that other species in the area will benefit as well. MPIF has identified a pool of species that represents priorities for conservation action within the state. A species may be considered a priority for several different reasons, including global threats to the species, high concern for regional or local populations, and high state responsibility for conserving large or important populations of the species.

MPIF has also identified target habitats for conservation and study in the northern Rocky Mountains. The refuge contains three of these habitats—ponderosa pine forest, grassland, and marsh/wetland.

Water Birds

The Dahl Lake wetland complex is an Intermountain valley wetland system that provides habitat for many species. These types of wetlands support nesting populations of many common waterfowl, shorebird, and other water bird species, as well as some upland species.

The wetland complex has potential for nesting waterfowl and rails, along with the entire Intermountain valley, wetland-priority species and some prairie–pothole species, as defined by Partners in Flight Montana Bird Conservation Plan. These species include the following:

— common loon
— trumpeter swan
— black, common, and Forster's tern
— Clark's and horned grebe
— black-crowned night-heron
— black-necked stilt
— Wilson's phalarope
— yellow-headed blackbird
— American bittern
— Le Conte's sparrow

The complex can provide important migration habitat as well for transient shorebirds, waterfowl, and sandhill cranes.

The remoteness of the refuge, and the potential for less human disturbance and recreation, may encourage use by species that are most sensitive to disturbance. Freeze-up on Dahl Lake generally occurs by mid-November and ice remains until late March or April, limiting use of the area by late-season migrating and wintering wetland-dependent species.

Waterfowl

Fall populations of waterfowl on the refuge appear to be low compared to other areas in western Montana.

Wetland habitats support many species of waterfowl. Commonly observed species include: mallard, teal, common goldeneye, redhead, ring-neck, lesser scaup, common merganser, gadwall, wigeon, canvasback, hooded merganser, wood duck, northern pintail, northern shoveler, bufflehead, ruddy duck, and Canada goose. Pair-count data has indicated all of these species may nest on the refuge, with the most commonly observed pairs being mallard, lesser scaup, northern shoveler, cinnamon teal, and ruddy duck.

Duck pair counts have been conducted on Dahl Lake and other wetlands since the refuge's establishment. Pair-count data will only establish an estimate of how many pairs are nesting. Average brood size, hen success, and survival to fledging must also be calculated to determine production.

Duck production = *number of pairs*
x average brood size
x nest success
x constant of 0.7 survival to fledging

Nesting success of approximately 15–20 percent is suggested to maintain stable duck populations (Cowardin et al. 1985, Greenwood 1986, Klett 1988).

Current staffing levels and management obligations do not allow time for these calculations to be determined on site. Data on average brood size is calculated yearly by biologists from the National Bison Range complex, using surveys conducted on WPAs in the wetland management district (WMD), and on Ninepipe and Pablo national wildlife refuges. Hen success and survival are constants, as determined by literature and past nest dragging conducted by the Montana Cooperative Wildlife Research Unit.

The National Bison Range complex completes two aerial surveys for geese that include the refuge. These surveys are done with partners—the CSKT, MFWP, and Avista Utilities. The goose pair-count was not conducted for several years, but has been resumed; these data are important to evaluate population trends from year to year, and are used by MFWP for hunting regulations. The goose brood survey is used to calculate production.

Goose populations and production are high in northwestern Montana, therefore, geese are not a priority species. The goose nesting structures

existed prior to refuge establishment; since they are in good condition and there is not an overabundance of geese in the Pleasant Valley watershed, they will likely be retained.

Nest predation by mammals and, to a lesser extent, by birds is the major proximate cause of nest failure (Cowardin et al. 1985, Greenwood et al. 1987, Klett et al. 1988). Predation can be limited directly through predator trapping, and indirectly through habitat manipulation and expansion to increase nest security. Predator control is often expensive and time consuming.

Another limiting factor to duck production is forage. Aquatic invertebrates play a critical role in the diet of most female ducks during the breeding season. Ducklings feed on aquatic invertebrates until approximately 1-month-old, and then gradually increase consumption of seeds and vegetation. Primary foods of hens and broods of many waterfowl species shift from invertebrates in spring and early summer to seeds and vegetation by fall. While the high-protein foods are required for reproduction and growth, the high-energy foods more available later in the season are critical for migration.

Human disturbance can negatively affect waterfowl production by decreasing the number of breeding pairs, hatching success, and survival of the young. Disturbance during pair bonding, and nest building and initiation can cause waterfowl to nest elsewhere or not at all. Several studies have identified human disturbance as the cause of nest desertion, especially during early incubation (Korschgen and Dahlgren 1992). Flushing hens away from the nests, leaving eggs exposed to predators and the elements, can affect nest success. Human-created trails and markers may also lead to increased predation rates on hens and eggs. Disturbance during brood rearing may break up and scatter broods, leaving them vulnerable to predation, exposure, and starvation.

Shorebirds and Waders

Other wetland-dependent species are important to ecosystem health and many are listed as priority species under the Shorebird Conservation Plan and the MPIF initiative. These species are difficult to record with traditional monitoring and general observation. Monitoring such as taped calls may be needed to record their presence.

Water birds known to nest on the refuge include red-necked and horned grebes, killdeer, and a small colony of black terns. Two pair of sandhill cranes has inhabited the refuge during spring and summer for the last 4 years; colts have been observed, so nesting has occurred. Eared grebes are common on Dahl Lake, and pied-billed grebes were observed on the refuge. Eighteen Wilson's phalarope were observed during the 2002 duck pair counts. Other species migrating through or nesting include the great blue heron, spotted sandpiper, common snipe, American bittern, sora rail, gulls, and dowitchers. It is unknown to what extent shorebirds are using this wetland complex.

Young shorebirds are especially vulnerable to mortality from hay cutting. In Harney Basin, Oregon, it was estimated that one operator killed 400–600 shorebirds (primarily Wilson's phalarope) by mowing between July 1 and 13 (Oring et al. 2003).

Unlike ducks, shorebirds, and especially the Wilson's phalarope, tend to remain in hay meadows to feed after hatching. Consequently, even the early-nesting species are vulnerable to mowing.

Species of shorebirds known to breed in the northern Rocky Mountains that are listed as priority 3 (important) for conservation value include black-necked stilt, American avocet, greater yellowlegs, willet, spotted sandpiper, Wilson 's phalarope, and common snipe. The long-billed curlew is listed as priority 4 (very important). Snowy plover, killdeer, and upland sandpiper, may also occur in the area but are not listed as priority species. Twenty-three additional species occur annually as migrants, six in moderate numbers, and 17 in small numbers.

The American bittern is as a priority 3 species for the MPIF initiative. They are a secretive species, which makes them difficult to monitor and, therefore, it is hard to determine occurrence and abundance. The biological potential exists for bitterns at the refuge; surveys have not been conducted. Bitterns may nest in reed canarygrass (Dechant et al. 1999) and prefer relatively large wetlands (7.5 acres). Bitterns will not tolerate haying, mowing, or grazing during or immediately prior to nesting season.

One of the goals of the U.S. Shorebird Conservation Plan is to ensure that adequate quantity and quality of shorebird habitat is maintained at the local level. The plan addresses individual regional plans, with Lost Trail National Wildlife Refuge falling in the Intermountain West subregion. By monitoring and protecting shorebird habitat, the refuge can aid the Intermountain West in obtaining two of their regional goals. The habitat management goal is to maintain and enhance diverse landscapes that sustain thriving shorebird populations. The monitoring and assessment goal is to acquire information on shorebird distribution and abundance for shorebird conservation.

Other Migratory Birds

The MPIF Plan (2000) and the Service's office of migratory bird management (1995) have prepared lists of bird species of concern.

The Partners in Flight Draft Montana Bird Conservation Plan identifies priority, Neotropical, migratory bird species and associated habitats in Montana. Partners in Flight uses a system that

identifies species of conservation priority in each of its planning units rather than writing plans for all species. Focusing conservation measures on these species and their habitats should benefit other less imperiled species. Species may be considered a priority due to global threat to the species, high concern for regional or local populations, or high state responsibility for conserving large or important populations of these species.

Priority habitats that occur on the refuge include: Palouse prairie, montane shrublands, dry forest, burned forest, moist Douglas-fir and grand fir forest, quaking aspen, cottonwood and quaking aspen, riparian shrub, riparian coniferous forest, prairie potholes, and wetland (see table 6).

Grassland birds show the most consistent population declines of all groups of birds monitored by the breeding bird survey. Loss of habitat, as prairies and grasslands were converted to crop and hay lands, is the primary reason many grassland bird species are on the decline.

Other problems that have plagued the nesting success of grassland species, which could be minimized with refuge management practices, include grazing regimes, invasive plants, habitat fragmentation, and shrub and tree encroachment. The refuge has more than 3,400 acres of native prairie. Much of the converted cropland could also be restored to native grasses.

Two Neotropical migratory bird survey routes have been conducted annually on the refuge since 2000. The first of these routes follows the Pleasant Valley and South Pleasant Valley roads. The other survey is located on Pleasant Valley Creek, running from its inception on to the refuge to Pleasant Valley Road. Migratory bird surveys are conducted in daylight hours using bird songs as the primary method of detection. Neither of these surveys adequately covers upland habitats.

Relatively little is known about the abundance and population trends of most species of nocturnal owls in North America. In the last few decades, there has been increasing concern over the status of both diurnal and nocturnal raptors. Birds of prey are high on the food chain and are highly susceptible to changes in the environment, making them good indicator species.

Most species of owls are poorly monitored by existing Neotropical migratory bird surveys. Broadcast surveys are one of the most widely used techniques to locate and survey owls. Broadcasting recordings of owl vocalization can increase calling rates. In September 1999, standardized owl monitoring surveys were developed—Guidelines for Nocturnal Owl Monitoring in North America (Takats 2001).

Table 6–List of priority, Neotropical migratory birds for habitats on Lost Trail National Wildlife Refuge, Montana

Habitat Type	*Priority Species*
Palouse Prairie	Burrowing owl Columbian sharp-tailed grouse Grasshopper sparrow Long-billed curlew Northern harrier Short-eared owl
Montane Shrubland	Calliope hummingbird Clay-colored sparrow MacGillivray's warbler Nashville warbler
Dry Forest	Blue grouse Cassin's finch Chipping sparrow Flammulated owl Lewis's woodpecker Red crossbill
Burned Forest	Black-backed woodpecker Olive-sided flycatcher Three-toed woodpecker Townsend's solitaire
Moist Douglas-fir and Grand Fir	Pileated woodpecker Plumbeous/Cassin's vireo Sharp-shinned hawk Townsend's warbler Williamson's sapsucker
Quaking Aspen	Red-naped sapsucker Ruffed grouse
Cottonwood and Aspen	American redstart Downy woodpecker Killdeer Least flycatcher Red-eyed vireo Veery Western screech-owl
Riparian Shrubland	Gray catbird Rufus hummingbird Song sparrow Warbling vireo Willow flycatcher
Riparian Coniferous Forest	Hammond's flycatcher
Prairie Potholes	Black tern Black-necked stilt Clark's grebe Forster's tern Horned grebe Wilson's phalarope
Wetland	American bittern Common loon Common tern Yellow-headed blackbird Trumpeter swan

Western and mountain bluebirds are found in the Pleasant Valley. Populations of mountain bluebirds have declined about 6 percent annually across

western North America, according to the national breeding bird survey. There has been a significant decrease in natural nesting cavities for bluebirds throughout the country; increased urbanization has led to a corresponding decrease in the number of dead trees. In addition, wooden fence posts are being replaced with metal posts.

Compounding the problem of habitat loss has been the introduction of two imported species, the house sparrow and European starling, which are cavity nesters that aggressively compete with bluebirds for cavities. Bluebird populations have rebounded since the box program became popular in the 1980s.

A bluebird box trail was established along the refuge road system in spring 2001. The Pleasant Valley School monitors and maintains the boxes. Although bluebirds are not currently a priority species for Montana, the maintenance of this bluebird trail is useful as an educational tool, to interest students and the public in Neotropical migratory birds and their conservation.

John and Karen Hollingsworth/USFWS

Mountain Bluebird

Some 85 species of North American birds excavate nesting holes, use cavities resulting from decay (natural cavities), or use holes created by other species in dead or deteriorating trees. The absence of suitable nest sites is usually considered the limiting factor for cavity-nesting species (Thomas et al. 1979). The Partners in Flight Montana Bird Conservation Plan specifies the retention of all large snags and broken-top trees. The plan has a critical objective of management for adequate numbers over the landscape to maintain viable populations of Lewis's woodpecker and flammulated owl.

Other cavity-nesting priority species in Montana that would benefit from the retention of snags include black-backed woodpecker, three-toed woodpecker, Williamson's sapsucker, pileated woodpecker, downy woodpecker, red-naped sapsucker, pygmy nuthatch, red-breasted nuthatch, white-breasted nuthatch, hairy woodpecker, and western screech-owl.

Other Wildlife

This section describes the mammals, resident birds, fish, amphibians, and reptiles of the area.

Large Mammals

MFWP uses aerial surveys, ground surveys, and harvest data to monitor population trends and composition of mule deer, white-tailed deer, elk, moose, black bear, and mountain lion populations in northwestern Montana. This data is used to determine the population health of individual species, project population estimates, and set hunting seasons. Hunting is the primary tool used by MFWP to manage ungulate populations (Canfield et al. 1999).

The refuge is important winter habitat for a herd of approximately 300 elk. Moose are primarily spring, summer, and fall residents. Fluctuations in population sizes are natural and may occur for many reasons.

White-tailed deer are year-round residents of the refuge and mule deer primarily use the refuge (uplands) in fall and winter. Their populations have been steadily increasing in the past 4 years. MFWP monitors both species to facilitate adaptive management through harvest regulations.

Elk were not plentiful in the Pleasant Valley and Fisher River watershed until MFWP made transplants of 27 and 29 elk into the Wolf Creek drainage in 1927 and 1928, and 105 elk into the Fisher River watershed in 1929. These elk thrived and multiplied into the healthy, self-sustaining herd present today. Refuge lands are primarily elk winter range.

The refuge is in the state's Salish elk management unit (northwestern Montana from Eureka to the Flathead Indian Reservation northern boundary; figure 9). The refuge is part of hunt district 103. Elk populations within the hunting district are consistently above MFWP objective levels. Data from aerial surveys conducted each spring by MFWP show the population goals for herd numbers are being met for this unit at approximately 2,000–3000 animals. The winter bull-to-cow ratio is 10 per 100 and the population maintains a minimum winter calf-to-cow ratio of 30 per 100.

Moose are generally observed in wetter areas on the refuge, including Pleasant Valley Creek and at Moose and other ponds, during May and June. Calving may occur on the refuge, but has not been documented. Moose use wetlands for feeding, loafing, and resting. Cow moose are more readily observed in June with their calves.

Some MFWP surveys show trends on a regional or area-wide scale. These surveys are still valuable, as the refuge is only a small part of the local ecosystem upon which these species depend. Anything that

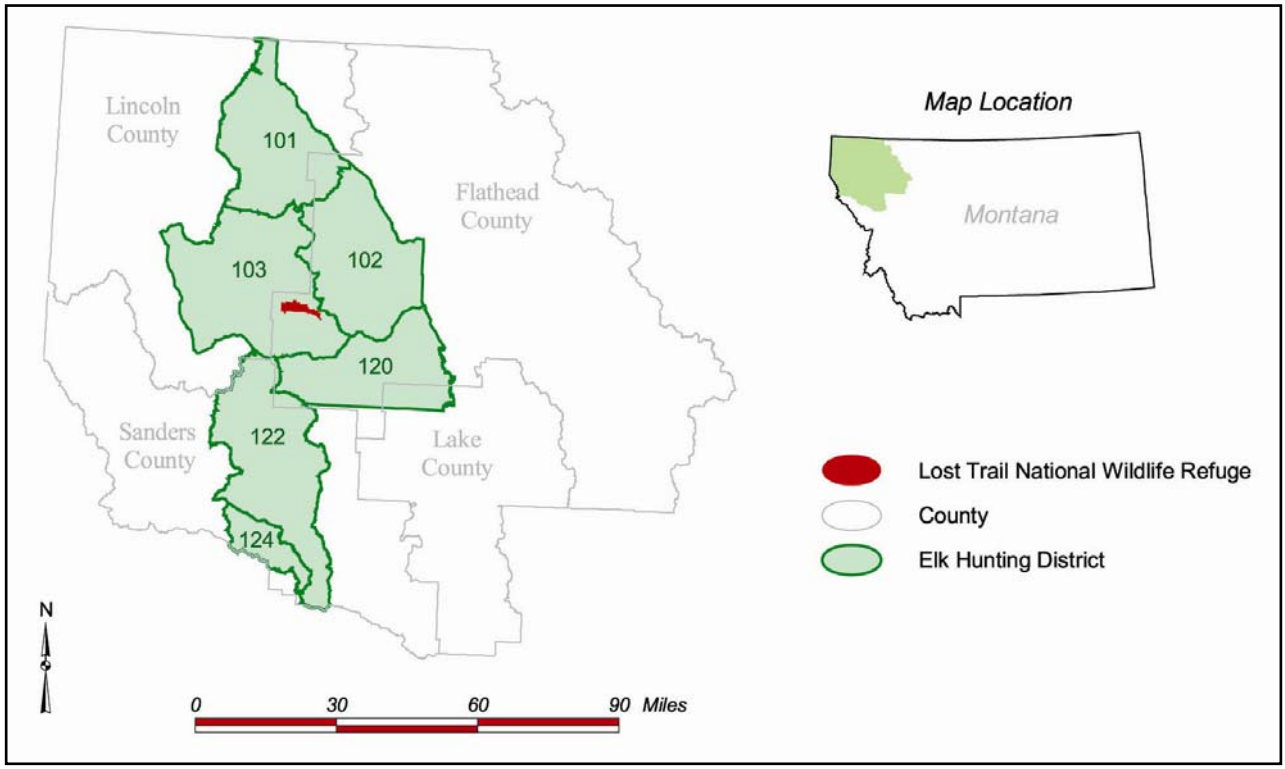

Figure 9. Elk management units, Montana

affects populations outside the refuge will project onto those individuals using the refuge. Refuge staff does not conduct formal surveys; however, they do record general observations that are valuable in monitoring herd health on the refuge (i.e., wintering elk numbers and individual moose numbers).

Winter is a critical time for ungulate survival. Animals that may have occupied thousands of acres of summer/fall range can be seasonally confined to relatively restricted geographic areas. These wintering areas have limited forage and extreme environmental conditions, which can cause physiological stress. Almost 40 percent more food is required in winter to generate energy for daily metabolic and activity requirements. Mackie et al. (1998) observed that, "Deer survive primarily by supplementing energy resources accumulated prior to winter with energy intake from submaintenance winter diets." This requires behavior that emphasizes energy conservation. Inactivity provides an energetic advantage for animals exposed to cold; forced activity caused by human disturbance exacts an energetic disadvantage.

The refuge contains approximately 30 miles of interior fence, 10 miles of fence along the county road, and 20 miles of exterior boundary fence. These fences were important for livestock grazing management prior to refuge establishment; however, they are not necessary for refuge management and can be harmful to wildlife. Wildlife can become entangled in fences, which can cause serious injury or death to an animal. At least five animals (four elk and one moose calf) have been found caught in refuge fences in the last 2 years.

Fences can also pose a hazard to ungulates by blocking escape routes, allowing predators to more easily catch and kill animals. This is especially true of young animals that cannot follow adults over a fence. Young animals are also separated from their mothers by fences when the adult jumps the fence and the young cannot follow. This results in a young animal stranded, often running a fence line until it becomes caught in the fence or is killed by a predator. The refuge receives up to 3 feet of snow in the winter. High snow levels may impede movement of ungulates by blocking access under fences.

Chronic-wasting disease is a transmissible spongiform encephalopathy of deer and elk. Although the exact causative agent is unknown, the disease is related to infectious proteins that are resistant to normal, metabolic breakdown processes and abnormally accumulates in the brain and brain stem. Consequentially, neurons die, which results in brain impairment. Eventually, diminishment of body condition and death occur.

An increased distribution of chronic-wasting disease within and among states, although not Montana, combined with high prevalence reported in some states, has resulted in national and international attention to this disease. The scope of this wildlife disease, combined with Service responsibilities for wildlife that span jurisdictions, make it essential that the Service cooperate with other agencies in addressing chronic-wasting disease.

Small Mammals

Since Lost Trail has only been managed as a national wildlife refuge starting in 1999, little is known about small mammal species and demographics on the refuge. Several species were identified during amphibian trapping conducted in 2000. Small mammals that are expected to reside on the refuge are listed in appendix E (data obtained from the Flathead National Forest).

Mammals that are known to occur in the area include the fisher, river otter, marten, Canada lynx, wolverine, and bobcat. These species are elusive, but probably inhabit refuge lands occasionally. A wolverine was seen on the refuge in 2000 and a river otter in 2002. Beaver and muskrat appear in the refuge's wetlands and ditches. Columbian ground squirrels, coyotes, and badgers are common.

Erwin and Peggy Bauer/USFWS

Marten

Ground squirrels are an important source of protein for most predators in northwestern Montana including birds of prey, weasels, canids, felids, and bears. Columbian ground squirrels can cause extensive habitat damage and compete with other wildlife for forage. Ground squirrel digging may accelerate soil erosion. Lambeth et al. (1982) found that, up to a point, ground squirrel populations increased with plant retrogression. Other research has indicated that ground squirrels may move out of stands of heavy vegetation to more open grass habitat.

Resident Birds

Resident (nonmigratory) birds on the refuge include common species such as the black-capped chickadee, great horned owl, hairy woodpecker, and red-breasted and white-breasted nuthatches. Less common residents include the pygmy nuthatch, brown creeper, and great gray owl. Resident upland game birds found on the refuge include spruce grouse and wild turkey.

Turkey was transplanted to the Pleasant Valley area in 1999 to increase hunting opportunities. This nonnative species is not a priority for refuge management.

Grouse are a native component of the Pleasant Valley ecosystem and provide public use opportunities on the refuge. They are not, however, a priority species for which the refuge was established. MFWP region 1 data suggests that grouse populations are stable region-wide. Nearly 50 percent Montana's mountain grouse harvest comes from this region, in which the refuge is included, indicating a consistently high population in the area of the refuge and the ability to tolerate hunting pressure.

Another resident species, the golden eagle, has nested 100 feet south of the refuge for many years. The golden eagle is protected under the Bald Eagle Protection Act of 1940, as amended in 1962. Montana's population of golden eagles may be declining due to low productivity (Canfield et al. 1999).

Some resident species may not be detected using Neotropical migratory bird surveys. Examples include species such as owls that are vocal predominantly in the evening, woodpeckers whose species-specific drumming patterns are hard to distinguish, and marsh birds.

Fish

The MFWP provided historical information from fish-stocking records, fish-planting reports, and creel surveys. Rainbow trout, cutthroat trout, and brook trout were stocked in the Pleasant Valley Fisher River between 1938 and 1952, likely between Loon Lake and Silver Butte Fisher River (figure 7). Game wardens conducted creel surveys in the 1950s and 1970s that showed angler success was excellent for brook trout and cutthroat trout up to 12 inches. Neighbors in the Pleasant Valley remember strong numbers of trout as far as just west of the refuge.

Unfortunately, no in-depth information exists from historical fish surveys. Very little recruitment to trout populations was accomplished since the upper Pleasant Valley–Fisher River drainage was heavily affected by agricultural practices, logging, and road building for the last 100 years (Hensler 2001).

The MFWP conducted fish surveys in the Pleasant Valley Fisher River drainage between 1993 and 2000, and collaborated with the University of Montana Wild Trout Genetics Lab. Brook trout and redside shiners were the only species sampled in the area of the refuge. Below the refuge (below Big Meadows dam) species captured were brook trout, mountain whitefish, redside shiner, large scale sucker, northern pike minnow, longnose dace, and torrent sculpin. No cutthroat species in tributaries above Deer Creek were captured. Below Deer Creek, redband trout and westslope cutthroat trout were present and various levels of hybridization existed.

Pleasant Valley Creek affects these fisheries by introducing water that warms the mainstem of Fisher River since Pleasant Valley Creek has temperatures that range from 32–77° F and areas with very high levels of fine (silt) substrate (Hensler 2001).

The MPC surveyed Dahl Lake and Meadow Creek in 1996 to determine fisheries potential. The MFWP surveyed Pleasant Valley Creek in 2000. The only fish sampled were downstream of Forest Service road 1019 and included the redside shiner, yellow perch, northern pike minnow, pumpkinseed, and suckers. Stunting characteristics were observed in all fish populations except redside shiners and suckers (Mabbott 1996). The dissolved oxygen in Pleasant Valley Creek is sufficient to support a cold-water fishery.

Pleasant Valley Creek does not currently support redband, westslope cutthroat, or bull trout (Hensler 2001, Mabbot 1996). The creek drains into the Fisher River where bull trout (species of concern) are being restored. The MPC report recommends introducing redband and westslope cutthroat trout.

Columbia River redband trout, a subspecies of rainbow trout, is native to the Columbia River drainage. The U.S. Fish and Wildlife Service, American Fisheries Society, and all states throughout its historic range (Idaho, Oregon, Washington, Nevada, California, and Montana) consider it a species of special concern. The USDA Forest Service and the Bureau of Land Management classify the redband trout as a sensitive species. In 1994, the Biodiversity Legal Fund of Colorado and a private individual from Kalispell formally petitioned the Service to consider the Kootenai River population of redband trout as an endangered species; the petition was dismissed due to lack of information (Muhlfield 2001).

It is probable that redband trout historically occurred in Pleasant Valley Creek, but current water temperature is too high and there has been too much siltation to support redband trout. Redband trout are found downstream in the Fisher River. Adult redband trout use deep microhabitats (greater than 1.5 feet), with low to moderate velocities (less than 1.5 feet per second). Young select slow water (less than 0.4 feet per second) and shallow depths (less than 0.7 feet) (Muhlfeld 2001).

Westslope cutthroat trout is native to Montana. Its spawning and rearing streams tend to be cold, nutrient-poor, pool habitat, and have more cover than uniform, simple habitat (Gardner 2001). Adults need slow-moving pools, which do not fill with ice, to survive the winter (Brown and Mackay 1995). Loss of habitat is the main problem due to loss of stream water to irrigation and barriers created by dams and road culverts (Gardner 2001).

Amphibians and Reptiles

A researcher from the U.S. Geological Survey (USGS) searched 24 sites on the refuge for reptiles and amphibians in 2001 and 2002. The long-tailed salamander, Pacific tree frog, and Columbia spotted frog, and boreal toad (species of concern) were all found to breed on the refuge. Also documented were common and terrestrial garter snakes and the painted turtle.

Reptiles and amphibians are important components of the biological integrity and functioning of an ecosystem. There are known and suspected declines of amphibians throughout North America, with a significant proportion of amphibians native to western United States (Corn 2000).

Hossack (2003) explains, "In response to documented and suspected declines in the United States, a national effort identified as the 'Amphibian Research and Monitoring Initiative' was launched in 2000 to determine the status and trends of amphibian populations on Department of Interior lands nationally and to provide information useful in determining causes of declines." To determine the cause of amphibian and reptile declines as well as the scope of a decline, it is essential to first determine a baseline for comparison.

Bullfrogs are not native to Montana. This species has been widely introduced across the United States and now exists along the Bitterroot, Flathead, and Clark Fork rivers. Amphibian surveys have failed to located this species at or near the refuge. Bullfrogs can affect amphibian and reptile populations directly through predation and indirectly through the avoidance of sites where bullfrogs are present. Bullfrogs have been implicated in the declines of several amphibian and reptile species. They also prey on ducklings.

Species of Concern

The ESA requires federal agencies to carry out conservation (recovery) programs for listed species and to ensure that agency actions are not likely to jeopardize the continued existence of listed species or adversely modify or destroy their critical habitat. Section 7(a) of the ESA requires federal agencies to

evaluate their actions with respect to any species that is listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Federal agencies are to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of any species listed as endangered or threatened, or to destroy or adversely modify its critical habitat.

Species of concern for the refuge are listed in Table 7. They include federally endangered, threatened, proposed, and candidate species in Flathead County, Montana, that have the potential to occur on the refuge include the grizzly bear, gray wolf, Canada lynx, bald eagle, bull trout, and Spalding's catchfly.

Table 7. Species of concern in proximity to Lost Trail National Wildlife Refuge, Montana

Common Name	*Classification*	*Sighted on Refuge*
Grizzly bear	Federally threatened	
Gray wolf	Federally threatened	✓
Canada lynx	Federally threatened	✓
Bald eagle	Federally threatened	✓
Trumpeter swan	Montana species of concern, priority 1*	
Black tern	Montana species of concern, priority 2*	✓
Bull trout	Federally threatened	
Boreal toad	Montana species of concern category S3	✓
Spalding's catchfly	Federally threatened	✓

**Classification of the MPIF Bird Conservation Plan*

The trumpeter swan and black tern are also addressed as species of concern. The MPIF considers the trumpeter swan a threatened species. The Service has listed the black tern as a nongame bird of management concern.

Grizzly Bear

Where grizzly bear habitat was once continuous in the Rocky Mountain ecosystem, habitat fragmentation from human settlement and development has created isolated populations of grizzly bears. It is important to the survival of the species that bears from one localized population come in contact with individuals from other populations to maintain genetic variation. Potential linkage areas across Highway 2 remain between the towns of Marion and Libby, Montana. Grizzly bear recovery biologists believe that securing the future of the grizzly bear is dependant on maintaining opportunities for linkage of wildlife populations across areas of human development (Serveen et al. 2001).

The refuge is in an area classified as a management situation II under the Interagency Grizzly Bear Guidelines (USDA Forest Service 1986). Although grizzly bears occasionally inhabit the area, lack of highly suitable habitat and security precludes extensive use.

For the grizzly bear, preserving the linkage between populations is as critical to long-term conservation of the species as managing individual populations. The refuge is part of an important linkage corridor for grizzly bears—between the northern Continental Divide ecosystem (NCDE) and the Cabinet/Yaak ecosystem (CYE).

Studies have shown that ground squirrels may be important as a source of protein to grizzly bears, and show that restricted availability of animal protein may limit grizzly populations (Nagy et al. 1983, Hechtel 1985, Hamer et al. 1978, Stelmock 1981).

In the NCDE, livestock depredation was the most common offense for which a bear was relocated (Thier and Sizemore 1981). These relocations were much less successful than relocations for other offenses (success being no return and no further conflict). Knight et al. (1985) reported that depredations (livestock and property) by grizzlies were the leading cause of nonhunting mortality in the NCDE from 1975 to 1984.

It is crucial to the recovery effort that the public understands reasons for recovery actions, generating tolerant or positive attitudes toward grizzlies. The interagency grizzly bear coordination team has appointed an information and education subcommittee to develop education programs and disseminate information. Private conservation organizations interested in the recovery of grizzly bears have also provided valuable assistance when they include appropriate information in their publications and news releases.

Gray Wolf

Because wolves and other large carnivores have large home ranges, attention needs to be focused on the habitat values of both public and private lands. Private lands, in particular, have substantial value to wildlife because they frequently occur at low elevations that have moderated extreme weather conditions such as deep snow.

John and Karen Hollingsworth/USFWS

Lost Trail is one of the first national wildlife refuges in the Intermountain West to support the gray wolf. Wolves have attempted to colonize the Pleasant Valley twice in the last decade. In both instances, the wolves started to prey on livestock and were subsequently killed.

One of the major limiting factors to wolf survival is an adequate prey base. The refuge is an important winter range for elk in the Pleasant Valley (Ray Washtak, refuge manager, personal communication, 2004).

Canada Lynx

Canada lynx occur in northwestern Montana, but have not yet been documented on the refuge. Canada lynx habitat consists of a mosaic of forest habitats including early successional forests that support high densities of snowshoe hare and late-successional forests that contain cover for kittens and for denning. Wildfire, wind-throw, and disease are all natural processes that create these forest conditions (Bailey et al. 1986, Fox 1978, Keith and Surrendi 1971, Koehler 1990, Koehler and Brittell 1990).

Early successional forests where snowshoe hare are plentiful are favored by lynx for hunting. Such forest is created from fires (Bailey et al. 1986; Fox 1978; Keith and Surrendi 1971; Koehler 1990, 1991), timber harvesting (Conroy et al. 1979; Koehler 1990, 1991; Litvaitis et al. 1985), and wind-throw and disease (Koehler and Brittell 1990). Hares are more likely to use regenerating forest with dense understory, than uncut or even-aged stands with little understory (Monthey 1986; Thompson 1988; Koehler 1990, 1999).

Although early successional forests are common on surrounding PCTC lands, these stands may not be managed to support the dense understory that is required for high snowshoe hare populations. For example, precommercial thinning is detrimental to snowshoe hare habitat, but is a common management tool on productive timberlands.

Although disease and insect attacks may increase fuel loads and the risk of large, high-intensity fires, they also provide dead and downed trees used for denning and cover. Late-successional, mature forest that contains large, woody debris such as fallen trees or upturned stumps are required habitat for Canada lynx denning (Berrie 1973, Koehler 1990, Koehler and Brittel 1990, Kesterton 1988, Murie 1963). Small-sized parcels (2.5–5 acres) of late-successional forest appear to be adequate for den sites, but they must be connected by corridors of cover to permit females to move kittens to alternate den sites that provide suitable access to prey.

Bald Eagle

A bald eagle has nested in the aspens on the north side of Dahl Lake for the last several years.

Guidelines developed by the Bald Eagle Recovery Team (USFWS 1986) recommend a goal of at least one fledged per year on average per nesting pair and an average nest success rate of not less than 65 percent over a 5-year period.

Trumpeter Swan

Historic accounts indicate that the Flathead Valley is one of three areas where suitable habitat existed and trumpeter swans were once a common breeding species in the United States (Banko 1960). When swans were eliminated from much of their range, they not only lost a major segment of their population but perhaps of greater importance, they lost flyway traditions.

In recent times, there have been sporadic reports of swans wintering in northwestern Montana along the Flathead and Clark Fork river drainages. Trumpeter swans are occasionally observed on Island and Flathead lakes, and other locations in northwestern Montana. The swans have also been observed during migration. The majority of trumpeter swans in the Rocky Mountain population concentrate on a small number of wintering grounds. Severe losses could occur from disease outbreaks, severe winter weather, and lack of forage.

Trumpeter swan habitat exists around Dahl Lake. A pair of trumpeters was documented in the Pleasant Valley area one summer, but breeding was not recorded.

Black Tern

Black terns have shown continent-wide population declines since 1960 and are currently listed as threatened or endangered in six states.

The black tern is listed as a species of concern in 18 other states and provinces (Casey 2000). In Montana, the black tern is listed as a species of special concern with a ranking of "vulnerable" under the Natural Heritage Program classification system (Shuford 1999), but has not been consistently monitored.

The Service has listed the black tern as a nongame bird of management concern (USFWS 1995b, 2002). Loss of potential nesting and foraging habitat for black terns is greatest in northeastern and northwestern Montana.

Black terns have been documented to nest around Dahl Lake. Black tern production on the refuge was documented by the MFWP in 1999. Refuge staff observed terns in 2000 and 2001.

Bull Trout

Bull trout are native to Montana and are federally listed as threatened. This species requires very cold, clean water (less than 64° F). Bull Trout Interim Conservation Guidance (USFWS 1998a) includes an objective for maintaining or restoring cold-water

temperature contributions of non-fish-bearing tributaries.

Boreal Toad

Boreal toads have experienced drastic declines in the southern Rocky Mountains (Corn et al. 1989), and recent surveys in western Montana found it to be less common than expected (Hossack et al. 2001). The boreal toad is a candidate species in Colorado and Wyoming, but is not yet listed in Montana. It was once recorded much more frequently in Montana than in the previously mentioned states.

The refuge is a survey site as part of the national amphibian research and monitoring initiative launched by the USGS. The refuge has documented one of the largest known populations of boreal toads reproducing in the northwestern Rocky Mountains, based on the number of larvae observed (USGS 2001, 2002). The USGS found upwards of 40 breeding females at Lower Moose Pond, and more than 200 breeding females on the south side of Dahl Lake.

The extent of boreal toad populations in Montana is unknown due to limited monitoring efforts. The USGS completed surveys in Montana during the last few years in more than 3,000 wetlands (Hossack, USGS biologist, personal communication). Boreal toads were found reproducing at only 3 percent of these sites (a maximum of 10 females at any one site). Hossack et al. (2001, 2002) found evidence of boreal toads breeding on 5 of 20 sites surveyed in 2001 and 15 of 28 sites in 2002. Boreal toads were located at less than 5 percent of other forested sites surveyed in Montana since 1999.

Evidence from the refuge and Glacier National Park show that breeding sites are often clustered in a small area, hence, are at risk to environmental changes and subsequent local extinction.

Spalding's Catchfly

Spalding's catchfly is a native forb of the carnation family that occurs in mesic slopes, flats, or depressions of open grasslands. It is associated with Idaho fescue, rough fescue, and bluebunch wheatgrass, occasionally interspersed with conifers. Twenty catchfly populations have been documented in northwestern Montana in Flathead (6), Lake (2), Lincoln (6), and Sanders (6) counties.

A new population of Spalding's catchfly was discovered on the refuge (figure 10) in 2002. This population is one of the largest documented sites in Montana, containing a minimum of 300 plants, within about 9.5 acres. Part of this population exists on state land [Montana Department of Natural Resources and Conservation (DNRC)] within the refuge boundary.

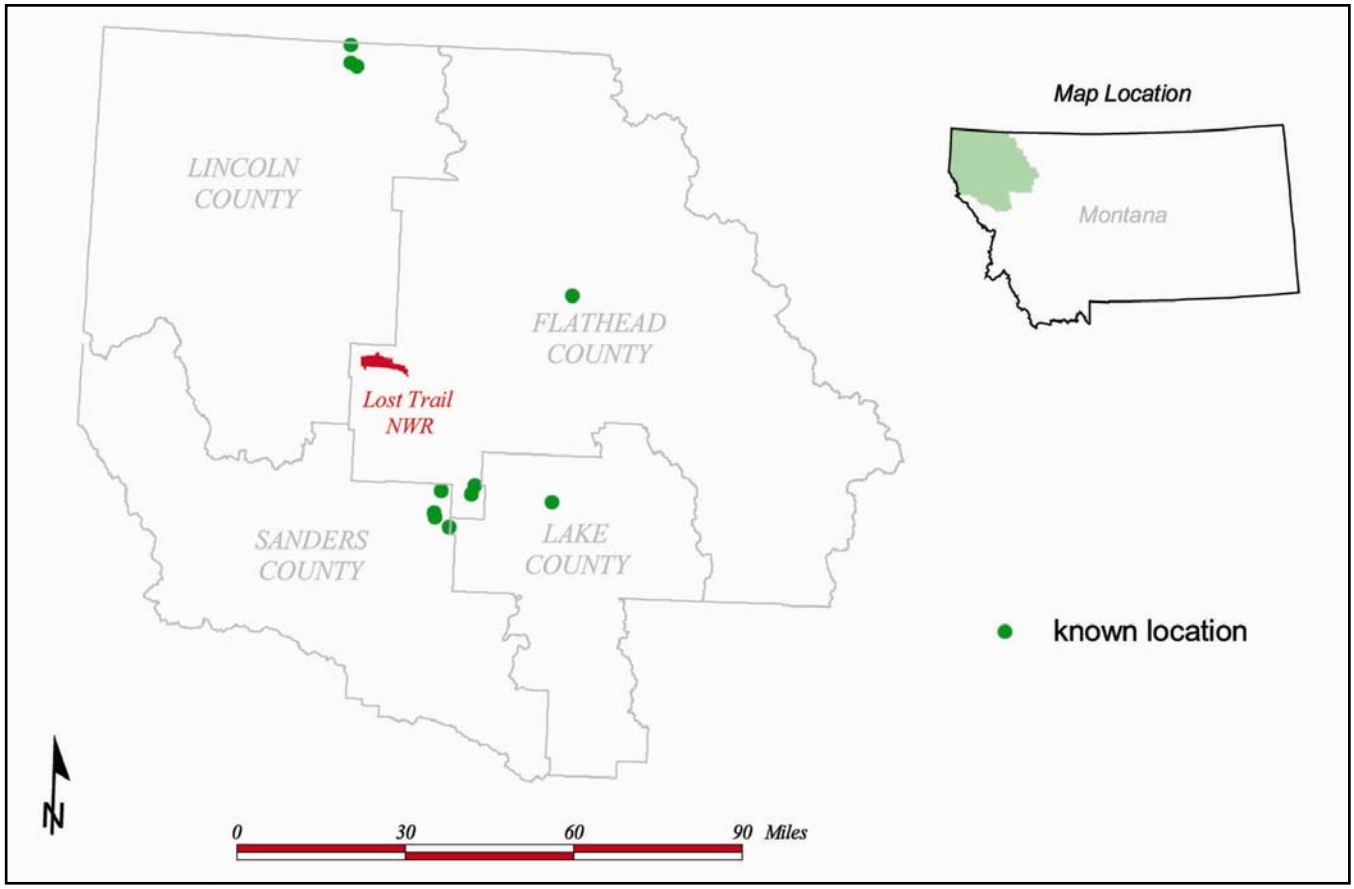

Figure 10. Distribution of Spalding's catchfly in Montana

The refuge has nearly 2,500 acres of Idaho and rough fescue-dominant habitat that could support Spalding's catchfly (figure 4). It is expected that more plants will be discovered as inventory efforts continue.

Stacy Hoehn/USFWS

The refuge biologist records observations about the catchfly plant before her.

Since there are only 53 known populations of Spalding's catchfly in fragmented populations across the northwestern United States, the relatively large population located on the refuge and any new populations that may be discovered are significant to the plant's survival.

Many catchfly plants on the refuge are at risk of being displaced by nearby populations of invasive plants, especially spotted knapweed and sulfur cinquefoil. Invasive plants displace the catchfly and compete with it for water, nutrients, light, and pollinators (Lesica and Heidel 1996, Montana Natural Heritage Program 1998).

Wilderness Review

To be designated a wilderness area, lands must meet certain criteria as outlined in the Wilderness Act of 1964:

- Generally appears to have been affected primarily by the forces of nature, with the imprint of human work substantially unnoticeable.
- Has 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 also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

The refuge meets the size and scientific, scenic, and historical value criteria, but is impacted by roads, fences, and extensive human effects from grazing and draining wetlands, which restrict it from being designated a wilderness area.

Cultural Resources

From thriving Native American tribal life to extensive European settlement, the archaeological and historical resources of the Pleasant Valley and the refuge provide insight to the people who lived there, and the prosperity and desirability of the area.

Native Americans

As documented through oral traditions and archaeological remains, Native Americans have long used western Montana and were first written about by Lewis and Clark during their journey through the area almost 200 years ago. According to the cultural resource overview prepared for the Service by the Confederated Salish and Kootenai Tribal Historical Preservation Office (THPO), the native people of the area were the Bitterroot Salish, Pend d'Oreille, and Kootenai. Today, all three tribes make up the CSKT of the Flathead Indian Reservation (CSKT 2000).

Physical evidence of Native Americans in the Kootenai River Valley comes from the Libby Dam cultural resources project in 1977, which found occupation sites and campsites located on terraces above the active flood plain. Included in the finds were fire-broken rocks, possibly from hearths or baking ovens. During 5,000 years of prehistory in the Kootenai River Valley, people wintered in the valley bottoms and moved to higher elevations to hunt and gather foods (CSKT 2000).

The area around the refuge, including Pleasant and Lost Prairie valleys, was within the immediate home range for the Kootenai people. Even though they were trading partners with the Salish and Pend d'Oreille tribes, the Kootenai spoke a different language. The Kootenai place name for Pleasant Valley is "yaqakmu'inki" and it was a major travel corridor from the Little Bitterroot River and Flathead Lake to the Upper Fisher River and Kootenai River Valley (CSKT 2000).

Flatheads and Kootenai traveled to Wolf Creek to hunt deer and elk in the fall, and went to huckleberry grounds in the summer (Wakefield 1998). Native Americans harvested camas bulbs along the shores of Dahl Lake and in low wetlands during early spring. The Kootenai people at Wolf and Fisher rivers traded furs with settlers in the early 1800s (CSKT 2000).

The granddaughter of settler Ed Jackson (Jackson Ranch), Jean Jackson Wakefield (1998), mentions finding teepee rings by Pleasant Valley Creek when she was young, as well as Native American graves behind the Jackson Ranch (now part of the refuge, north of headquarters). A petroglyph site on the refuge has been documented by the Service.

European Settlement

Some of the earliest Europeans to use Pleasant Valley were those from Plains (Wild Horse Plains), Montana. They brought cattle in from the west along Fisher Creek to summer range in the valley. About 1886, Charlie Lynch took up a homestead just south of Lynch Lake. Others soon followed, most being cattlemen moving from Plains to the valley.

Bill Orr and Frank Gardiner settled in Pleasant Valley in 1888. Orr homesteaded where the present-day refuge shop buildings are located, with Gardiner setting up just east of his partner. Bill Orr built his ranch house in 1914; it also served as the Pleasant Valley post office from 1916 to 1933. The building still stands today and provides housing for refuge staff.

Jack Nowlan homesteaded in Pleasant Valley in 1888, near the refuge's current headquarters. Nowlan and Edwin Vesey claimed the original water rights on Pleasant Valley Creek, just west of the ranch. In 1910, Ed Jackson purchased the Nowlan homestead, which became the Jackson Ranch. Over the next 27 years, he built a variety of structures, including a house, horse barn, cow barn, and log garage. The structures are still standing and in use, with the exception of the cow barn, which burned down.

George and Frank Doll were among the early homesteaders that set up within the present-day boundary of the refuge. Frank and his wife, Josephine, homesteaded along the east side of Medicine Lake (now known as Dahl Lake) in 1900, with his brother settling northwest of him. The Dolls and a partner from Spokane organized the Pleasant Valley Ranch Company in 1912. They bought and leased other homesteads in the valley, and sold the company in 1927. Frank and Josephine's house was torn down in the 1990s.

Ray Washtak/USFWS

Several structures remain from the Lost Trail Ranch.

The Great Northern Railroad's main east-to-west line ran through Pleasant Valley from 1892 to 1904. The railroad grade reached 1.5 percent at locations on its climb from Bitterroot Lake to Pleasant Valley. This steepness, and the large number of curves along the route, led the Great Northern to build a different track west from Whitefish, to connect with the railroad at Rexford, Idaho.

During the Great Northern Railroad's operation, a railroad stop and section house were built just east of the current refuge headquarters. A construction camp and railroad gravel pit existed just north of this area. The Pleasant Valley railroad line closed in October 1904. Two outside ovens for baking were built and were still present in the area in 1994.

The first Pleasant Valley School opened in 1903 in an old railroad cabin; it is located near the gravel pit behind the Jackson Ranch (now on an inholding within the refuge boundary). After 2 years, the school was moved approximately 2 miles east, and was located there until 1914. From 1914–1960, the Pleasant Valley School was situated near the junction of Lost Prairie Road and the old railroad grade. Today, the K–8 Pleasant Valley School is located south of the refuge on Lost Prairie Road.

The Pleasant Valley Road opened in 1917 and followed the railroad grade. Although residents made rail fences from the old railroad ties, old railroad spikes can still occasionally be found coming out of the roadbed.

In 1971, an absentee owner from San Francisco purchased the Pleasant Valley Ranch and renamed it Lost Trail Ranch. The ranch was resold in 1981 to absentee partners who extended the boundaries through purchases of the Jackson and Orr–Gardiner ranches. In 1996, the MPC purchased the Lost Trail Ranch as potential mitigation for wetland loss on the Flathead WPA. In 1999, MPC conveyed approximately 3,100 acres of the ranch to the Service, which purchased the remaining acreage from MPC.

The Jackson and Orr–Gardiner ranches are eligible for nomination to the National Register of Historic Places. The Doll Ranch has not been evaluated for eligibility for nomination to the register.

Socioeconomic Setting

Lost Trail is a remote refuge, located in one of the fastest growing counties in Montana. The refuge is located in southwestern Flathead County, Montana. Flathead County is 5,098 square miles in size.

Flathead County has been classified by the U.S. Census Bureau as nonmetropolitan, where a metropolitan area is described as having "a large population nucleus, together with adjacent communities having a high degree of social and economic integration with that core. Metropolitan areas comprise one or more entire counties…."

POPULATION

According to the most current published statistics (for 1990–2001) by the U.S. Census Bureau, the population of Flathead County is 76,269, representing a 25.8 percent increase in population from 1990. There are 14.6 persons per square mile in the county, and homeownership at that time is reported at 73.3 percent.

Flathead County experienced a 22.9 percent growth between 1991 and 1999, while the state as a whole increased only 10.5 percent (U.S. Department of Commerce 2001). The city of Kalispell (30 miles southeast) experienced a 20 percent growth in population during these years. More telling, the population of the greater Kalispell area (including the communities of Evergreen, Columbia Falls, and Whitefish) increased 25 percent (Montana Department of Commerce 2001).

Resident populations located west of the refuge are small, with Libby having about 2,226 people and Eureka having about 1,105 people (Montana Department of Commerce 2001).

The area of the refuge cannot be classified as either predominated by minority populations (96.3 percent of the population is classified as white by the U.S. Census Bureau in 2000), nor a predominantly low-income population (homeownership is reported at 73.3 percent; median household income and per capita income for 1999 are reported at $34,466 and $18,112 respectively). The percentage of persons living below poverty in 1999 is reported by the same federal agency at 13 percent, which does not represent a sizeable amount in the total population of Flathead County. Furthermore, while the refuge is located near Native American tribal lands, the refuge is not within the boundaries of any Indian reservation.

ECONOMIC SITUATION

The development trend in the area has increased considerably in the last 20 years—Flathead is one of the fastest growing counties in Montana. "Ranchettes" of 2–20 acres have increased as the region's natural amenities attract new residents, vacation homebuyers, and businesses.

Oil drilling on adjacent lands is unlikely. A test well drilled in 1983 hit Precambrian Rock, which is not known for good oil production; the well was plugged. It is unlikely that this area will be explored for oil production again (Jim Halvorson, petroleum geologist, personal communication).

The refuge is surrounded by two types of land use—agriculture (mainly cattle ranching) and industry (timber harvest and extraction). The past uses of the refuge, as well as of surrounding lands on the valley floor, have been primarily for raising beef cattle. Most lands managed by the timber industry, surrounding the refuge, allow various recreational uses.

The U.S. Census Bureau's "Montana: 2001, County Business Patterns" report identifies a total of 3,279 business establishments in Flathead County (table 8).

Table 8. Most numerous business in Flathead County, Montana, 2001

Business Type	*# of Businesses*
Retail trade	511
Construction	482
Accommodation and food services	311
Other services (repair, maintenance, religious organizations, etc.)	288
Health care and social assistance	273
Professional, scientific, and technical services	265
Finance and insurance	161
Manufacturing (includes wood products)	140
Transportation and warehousing	117
Wholesale trade	105
Arts, entertainment, and recreation	84
Forestry, fishing, hunting, and agriculture support	73
Information	49
Unclassified	43
Mining	11

The Federal Bureau of Economic Analysis reports the following data for Flathead County in the "Total Full-time and Part-time Employment by Industry" report (regional economic accounts) for 2000 in table 9.

The median household income and per capita income in Flathead County for 1999 are reported at $34,466 and $18,112 respectively. The percentage of persons living below poverty (in the same year) is reported at 13 percent.

There were more than 684,600 visitors to Montana in 1991 (Montana Department of Commerce 2001). The vehicle count on Highway 2 in 2000 recorded 4,085 vehicles per day between the western Kalispell city limits and Route 424; only 1,657 vehicles per day are recorded from there to Marion (Montana Department of Transportation 1999).

Table 9. Employment by industry for Flathead County, Montana, 2000

Total Full-time and Part-time Employment	49,466			
	Farm Employment	1,052		
	Nonfarm Employment	48,414		
		Private employment	43,728	
			Services	15,754
			Retail trade	9,929
			Manufacturing	5,111
			Construction	4,206
			Finance, insurance, real estate	3,849
			Transportation, public utilities	2,228
			Agricultural services, forestry, fishing, other	1,228
			Wholesale trade	1,196
			Mining	227
		Government	4,686	
			Local	2,898
			Federal civilian	848
			State	551
			Military	389

Nonresident travel numbers grew during 1991–1999, with a 7.6 percent increase in use of the Kalispell airport and a 63 percent increase at the Canadian border port of Rooseville; the average of all Montana/Canada border ports was a 9.2 percent increase (Montana Department of Transportation 1999).

Public Use

Up until establishment of Lost Trail as a national wildlife refuge, access to the property was through permission of owners and lessees only. Since a county road bisects the refuge (Pleasant Valley Road), visitors traveling through the area could observe and photograph wildlife visible from the roadway. With the open nature of the valley bottom, these roads provide nice wildlife observation opportunities, especially in the winter when the elk are feeding in the bottoms. Also visible are moose and eagles. The North 1019 road provides access through the refuge and PCTC lands to USDA Forest Service lands, allowing entry to areas that are open to public use.

According to the acquisition decision document for Lost Trail, the refuge was closed to consumptive recreational uses (i.e., hunting and fishing) pending development of plans. Other public uses were permitted as specified in the decision document that serves as the interim CCP. This includes wildlife observation and photography, environmental education, and interpretation. After establishment of the refuge in 1999, areas away from the road became accessible to the public by foot, cross-country skis, and snowshoes. This has provided more wildlife observation and photographic opportunities.

Since homesteaders established themselves in the Pleasant Valley starting in the late 1880s, most of the valley bottoms have been in private ownership. Land use mainly includes cattle ranching and associated activities such as haying. Public recreational use is by landowner permission only. The majority of the valley, including the refuge, is in close proximity to lands owned by the PCTC, DNRC, and USDA Forest Service, all of which are open to the public.

The PCTC has a block management agreement with the MFWP. Within MFWP's region 1 (includes the refuge), 800,000 acres of private land are in the block management program, of which PCTC owns 99 percent (MFWP 2002). Under the agreement, the public has access to these lands for recreation. Most PCTC roads are closed to motorized use but are open for other means of travel such as cross-country skiing, mountain biking, hiking, and horseback riding. For safety reasons, restrictions exist around areas being logged, but the public can use other areas for wildlife observation, hunting, photography, and general outdoor recreation.

The DNRC lands are also open for public use, under state regulations. Users having a current State Lands permit in their possession may hunt, hike, cross-country ski, and watch wildlife on these lands. The closest USDA Forest Service lands, administered by the Flathead, Lolo, and Kootenai national forests, also allow extensive public use and access, including downhill skiing, camping, fishing, hunting, river floating, hiking, and wilderness recreation (USDA Forest Service 2002).

Future visitation is hard to predict for the refuge, especially since there is little public use trend data from the past. With a large and fast-growing area just an hour away, the refuge has potential to attract visitors who are looking for a quiet, remote area to enjoy wildlife.

Hunting

Lost Trail is a remote refuge, nestled in a beautiful Intermountain valley—providing uncrowded hunting conditions and potential for quality hunting experiences.

In 2001, the refuge provided some hunter access across refuge lands to reach PCTC lands, allowing hunting under the MFWP block management plan. This included foot access along Bleise and Orr roads in the northern section, and along the South Pleasant Valley and Lund roads in the southern part of the refuge (map in appendix F). The refuge was closed to hunting, awaiting the completion of an EA for hunting and a hunt plan (with a compatibility determination and associated documentation).

A draft hunt plan was developed for the refuge in 2001. One of the issues raised is the need to provide opportunities for waterfowl hunting on the refuge. Waterfowl hunting is not permitted at this time due to the low numbers of ducks and geese using the refuge during the hunting season. The EA for the hunt plan noted that waterfowl populations and habitats would be evaluated in the future to determine the potential for hunting opportunities.

On completion of the EA and final hunt plan in 2002, some areas of the refuge were opened to deer, elk, mountain grouse, and turkey hunting. In addition to offering opportunities on the refuge, this allowed increased access to PCTC and DNRC lands that directly border the refuge (map in appendix F). A guide to authorized public uses was developed to ensure the safe operation of a quality hunt program and to facilitate public access on the refuge for the remainder of the year.

The biggest restriction to providing a quality hunt is the limited number of refuge staff available. Much needs to be done to provide information to hunters, not the least being a clear and understandable handout with a map, rules, and regulations. Signing along the refuge boundaries and closed areas is also important for proper use of the area during hunting season and to impart messages of conservation and ethical behavior.

Table 10 gives an idea of use during fall 2002, the first year the refuge was open for hunting. The weather during the majority of the 2002 hunting season, while cold, was relatively snow-free. Animals taken on the refuge included two white-tailed deer bucks and three cow elk.

Table 10. Use of Lost Trail National Wildlife Refuge (Montana) during the first hunting season

Type of Hunting Opportunity	*Estimated Numbers for 2002*
Deer and elk—youth-only archery	2
Deer and elk—archery	25
Deer and elk—youth-only rifle	20
Deer and elk—rifle	100
Hunters with disabilities, special access	11

[33 information requests]

The MFWP reported that 12,000 hunters spent 60,000 hunter days on block management areas in region 1 in 2000 (MFWP 2002). The popularity of this region is shown in the number of people applying for special elk permits in hunting district 103 (which includes the refuge)—for the 50 permits allowed, 337 Montana residents listed this area as their first choice (MFWP 2002).

Use of the refuge by elk during hunting season depends greatly on weather conditions, with warm weather and low snow keeping them in high areas and cold temperatures and deep snow driving them to valley bottoms. With access available to reach nearby PCTC, DNRC, and USDA Forest Service lands, the public has a large hunting area even if the animals are not using the refuge at that time.

Hunting success and regulations are directly related to prey populations. One of the greatest concerns the public has with wolf reintroduction is the effect that wolves would have on deer, elk, and moose populations. The hunting public has made substantial financial investments and sacrifices to restore ungulate populations to Montana (Sime 2002).

Fishing

At this time, there are no viable sport fishing opportunities, due in large part to past land practices that changed the hydrology of Dahl Lake, Pleasant Valley Creek, and the watershed downstream. The lake and creeks on the refuge were modified to provide for irrigation of grass and hayfields and no longer support a large native fishery.

Fishing is not allowed on the refuge, due in part to the lack of a viable fishery and to an ongoing wetland restoration program. Fishing is enjoyed by the public in areas around Marion (Bitterroot Lake), Kalispell (Flathead River, Smith Lake), and near Libby (Lake Koocanusa, Thompson and Fisher rivers).

Wildlife Observation and Photography

Visitors to the refuge enjoy wildlife observation and photography experiences mainly during spring months, when deer, elk, and other wildlife are more readily observable and roads are open. Waterfowl enthusiasts observe and photograph waterfowl throughout spring, summer, and fall at the various wetlands and ponds. It is unknown how many visitors visit the refuge to enjoy these activities.

Interpretation

Interpretive materials and displays are extremely limited at this time—one public use handout (appendix F) and a few signs.

For many visitors, taking part in interpretive activities is their primary contact with refuge staff, and could be their first contact with the refuge, conservation, and wildlife.

Environmental Education

The idea behind environmental education is to change the way people behave in everyday life. The Environmental Protection Agency defines environmental education (EPA 1996) as:

- a learning process that increases people's knowledge and awareness about the environment and associated challenges
- develops the necessary skills and expertise to address these challenges
- fosters attitudes, motivations, and commitments to make informed decisions and take responsible actions

Due to its diversity of habitat and wildlife species, the refuge has the potential for providing quality outdoor experiences in environmental education. The refuge has, within its boundaries, a piece of the Intermontane ecosystem—the type usually used for farming, ranching, or home sites and that is fast disappearing. It offers a unique opportunity for students to learn about and interact with plants and animals that naturally occur in the area.

Even with limited facilities and staff, the refuge has conducted a number of environmental education activities, especially involving the local schools of Pleasant Valley, Marion, and the Montana Academy. Along with in-school programs, students have been involved with building and erecting bluebird and goose nest structures, water monitoring, and amphibian surveys.

In addition, programs involving volunteer groups are ongoing, including fence removal with the RMEF, bird surveys with the Flathead Chapter of the Audubon Society, and general projects with the MCC and Landmark Volunteers.

The Service has educational curriculum, videos, and distance-learning opportunities that can be available free to educators. The refuge currently is (and will continue) gathering information on natural and cultural resources specific to the refuge for management, which can be made available for educational purposes.

Research into the need for and use of an education program needs to be evaluated. There is no history to show that educational resources would be used. The refuge would need to avoid duplicating what is already being offered in the areas in and around Kalispell to attract participants to this remote area and not waste time and money.

Administrative Setting

The majority of the refuge is adjacent to forestlands owned by the PCTC. Private ranching tracts lie to the west and southwest.

State lease lands encompass approximately 1,440 acres within the refuge boundary (figure 11). Leases for these lands may be transferred to the Service as renewals arise.

Opportunity exists for coordinated resource management with PCTC and the DNRC—cooperation could provide for mutually beneficial management of resources, public access, and associated recreational use.

Habitat Protection

Farming and ranching in Montana maintains open space. That open space is also habitat for a diversity of wildlife species. Maintaining the land base for agriculture and wildlife habitat is an increasing challenge, given broader trends in resource and agricultural economics, human population demographics, and development of the "New West" (Sime 2002).

Pleasant Valley is located in a prime subdivision area with abundant wildlife, many lakes, and beautiful scenery and is within easy commuting distance of Kalispell, Montana.

Increasing settlement during the last century has significantly transformed the valley floors of northwest Montana. Large undeveloped tracts of agricultural lands and a complex of wildlands, wetlands, rivers, grassland, and forests are being converted to home sites.

Lack of planning and effective zoning has led to a highly fragmented residential development pattern. In 1999, 46 percent of new residential development in Flathead County occurred in rural areas.

Conservation efforts have been initiated in the area surrounding the refuge. The NRCS has purchased conservation easements from willing landowners in the Pleasant Valley area. The largest private landowner in the area, PCTC, signed a conservation

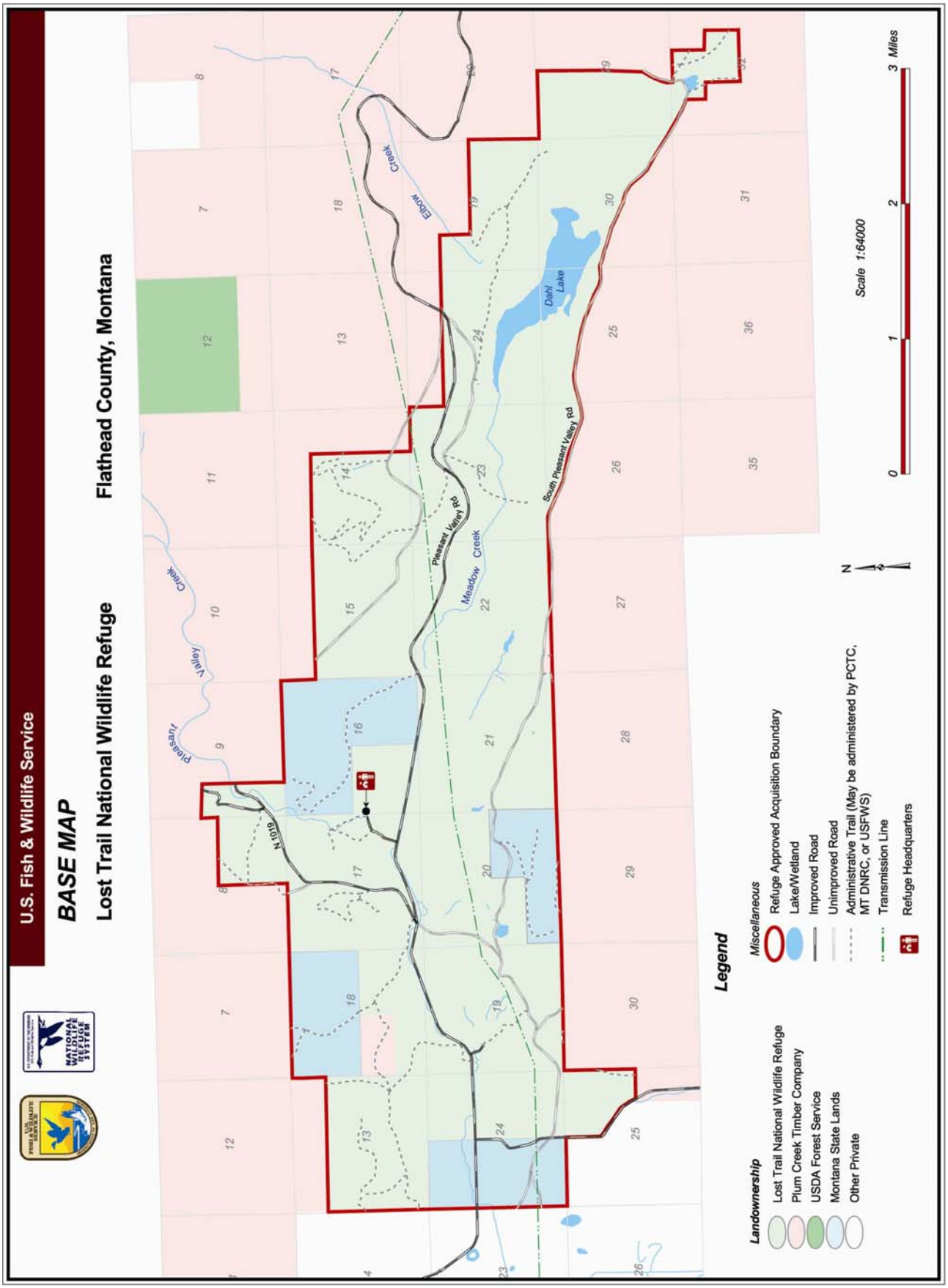

Figure 11. Base map, Lost Trail National Wildlife Refuge, Montana

easement with MFWP on 142,000 acres in the Fisher and Thompson river drainages. PCTC is currently selling land surrounding Island Lake (just west of the refuge).

The refuge is, with the exception of PCTC lands, the largest single, contiguous land parcel in the Pleasant Valley area. Much of the private land in the valley is under the ownership of large family-owned ranches. Two of the ranches neighboring the refuge have placed NRCS WRP easements on portions of their properties.

To achieve Service goals for fish, wildlife, and habitats, as well as allowing compatible public uses, the Service will pursue acquisition or protection of inholdings within the refuge boundary (figure 11) when land is available and as funding permits. The following areas are identified as inholdings (figure 11):

- Four state school trust land parcels totaling 1,440 acres. [State law requires the DNRC to manage these lands in a manner that produces revenue to help support the state's public schools. Management activities include grazing, haying, and timber harvest where applicable; one of the state parcels has been lease-transferred to the Service, two of the remaining three state parcels will be lease-transferred to the Service upon expiration of the present lease.]
- One forested inholding owned by PCTC of 80 acres.

Acquisition of additional habitat outside the executive boundary is not needed at this time. The Service recognizes that lands surrounding the refuge have the potential to provide increased, secure habitat for the protection of many wildlife species. Protection of these lands would maintain and promote the long-term viability of wildlife in the Pleasant Valley ecosystem as well as preserve the integrity of the refuge. For this reason, habitat protection measures via future conservation easements will be evaluated.

Facilities

Most structures and facilities obtained with the acquisition of the refuge were previously used in ranching activities (appendix G). Many of these facilities are in excess to Service needs and are occupying areas that potentially could be restored to grassland habitat. Some facilities are detrimental to the refuge because they:

- are wildlife hazards;
- harbor predators of ground-nesting birds;
- increase maintenance costs;
- increase fixed costs;
- detract from the natural appearance of the landscape.

Four residences exist on the refuge in addition to a large indoor arena that has a four-bedroom apartment. Two log buildings are used as office and storage space. An abandoned cattle station includes an office, numerous holding stalls and pens, small wooden corrals, and a calving barn.

In 2002, the office section of the horse arena was remodeled into a new headquarters complex (appendix F). The new headquarters provides office space for minimum staffing levels when positions are funded. It is also being made accessible and will provide restroom facilities during public hours. There are few nearby services to the refuge and no nearby public eating or restroom facilities.

The infrastructure for all these buildings includes three wells supplying potable water to the residences, five operational septic systems, three storage buildings, two shop areas (only one currently used), and two horse barns with stalls.

There are several culverts and cattle guards on 27 miles of interior and boundary roads (grass-covered and graveled). Pleasant Valley Road, a county-maintained road, traverses east-to-west through the refuge. The public roads accessing the refuge sometimes get blocked during winter storms. Approximately 30 miles of five-strand, barbwire boundary and interior fence exists.

Operations

Since its establishment in August of 1999, Lost Trail has been managed as a satellite refuge of the National Bison Range complex, located near Moiese, Montana. One full-time, permanent refuge manager (supervisory refuge operations specialist, grade GS-11) staffs the refuge.

Other staff includes a refuge manager trainee (grade GS-5) who was assigned to the refuge from May 2000 to June 2001. One seasonal biological technician (grade GS-4) worked on the refuge during the summers of 1999–2001. Two seasonal volunteers were stationed at the refuge during the summer of 2000. During the summer of 2001, one volunteer assisted with various ongoing refuge programs.

Visitors have limited opportunities to contact staff and receive information about public use opportunities. With limited staffing, the office is not usually available to the public 40 hours per week. There are public use handouts (i.e., tear sheets) at headquarters, as well as at kiosks located in the main parking areas (appendix F).

The negotiations between the CSKT Government and the Service concerning an annual funding agreement with the National Bison Range complex resulted in staffing changes at the complex and, consequently, at the refuge. As a result, two new

positions—one full-time permanent and one career-seasonal—were funded at the refuge. It is unknown what effects the agreement will have on the level of involvement and support that National Bison Range personnel will be able to provide to the refuge.

PARTNERSHIPS

Even though the refuge has been in existence a short time, several partnerships have been established.

- MFWP have provided firm support for refuge establishment, wildlife data (especially for big game animals), and hunting regulation enforcement. The MFWP is an active participant in the planning process.
- Flathead and Lincoln counties provide logistical support and funding for invasive plant management.
- Roads and utilities are maintained by a cooperative relationship with the county road and bridge department.
- A good working relationship exists with PCTC (figure 11) in the shared management of roads, fences, and invasive plants.
- A good-neighbor policy exists with McGinnis Meadows Guest Ranch to help maintain refuge fences for the benefit of wildlife and neighboring cattle.
- The USDA Forest Service and DNRC cooperate with the refuge for fire and invasive plant management.
- A close working relationship exists with NRCS to manage lands under the wetland restoration program.
- RMEF is generously providing funding for a variety of refuge projects to benefit wildlife, such as fence removal and invasive plant management.
- The refuge staff works closely with local schools (Pleasant Valley School and Montana Academy), Flathead Audubon, and MCC to provide educational activities that benefit the refuge resources by providing management information.

The refuge has had multiple entities requesting information about the restoration effort on Pleasant Valley Creek. Many of these potential partners have offered either to provide funding or expertise, as well as help to find additional funding sources. Restoration is always expensive. Refuge staff are working with these groups and coordinating with NRCS regarding funding needs to produce a restoration effort that will contribute a quality conservation effort of riparian habitat, migratory birds, and native fish.