BREEDING BIRD SURVEY
MUD LAKE OPEN SPACE

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SUMMARY

A one season breeding bird inventory was conducted on the 200 acre Mud Lake Open Space property from June 1 through July 31, 2000. The goals were to: survey the status and abundance of all breeding bird species; pay attention to the status of species of special concern and map their locations; and determine the locations of high quality habitats for avian species.

Fifty-one species were observed. Ten were confirmed as breeding, 33 were considered probable breeders, and another 7 species were possible breeders. One additional type of bird was seen on the property, but it is unlikely to breed.

Five Boulder County Avian Species of Special Concern were seen on the property: ring-necked duck, pygmy nuthatch, golden-crowned kinglet, MacGillivray's warbler and western tanager.

The results of the inventory indicate there are areas on the property that warrant special attention. The Sherwood Creek Riparian Area is probably the richest habitat for breeding birds on the property and was home to 2 species of special concern: golden-crowned kinglet and MacGillivray's warbler. The habitat is a mix of riparian forests and shrublands with good structural diversity and many large-diameter trees. A smaller riparian forest is found a little south of Mud Lake: it too has good structural diversity with many large-diameter trees and warrants attention.

Mud Lake is a small and shallow lake. A single pair of mallard successfully produced young on the property. A singe male ring-necked duck was observed, but there was no evidence of nesting. The lake is also used by migratory waterfowl. The lake will attract many open space visitors which could adversely affect the use of lake by waterfowl. Recommendations include prohibiting human use on or within the lake, and having at least 1 side (½ the perimeter) closed to human use.

Other management recommendations include: allowing for areas of habitat effectiveness by carefully planning trail locations and reducing fragmentation; and recognizing the importance of large-diameter trees, snags and deadfall.

STUDY AREA

The 200 acre Mud Lake Open Space is located in western Boulder County, Colorado, just north of the Town of Nederland and 13 miles west of the City of Boulder. Additionally, the

property is bordered by three roads: the Peak-to-Peak Scenic Byway on the east, Sherwood Gulch Road (County Road 126) on the north, and County Road 128W on the south.

The study area lies within the montane lifezone of the east flank of the Front Range of the Southern Rocky Mountains. Elevation ranges from approximately 8,200' in the northeast corner where Sherwood Creek exits the property, to 8,600' in the southwest corner.

Change in elevation and the degree of change have been influenced by the rise of the Rocky Mountains, and erosional processes. For the most part, the property gently increases in elevation from the northeast to the southwest. The property is flattest surrounding Mud Lake, a small circular pond of about 4 acres in size. The steepest part of the property is found on the north-facing aspect above Sherwood Creek, a small first order creek which flows from west to east near the property's northern boundary. The northwest corner of the property, which is north of Sherwood Creek, has a gradual south-facing aspect which increases in elevation toward the northwest.

Bedrock geology dates from the Precambrian Era. Most of the study area is underlain with biotite gneiss metasedimentary rock. This is mixed with small pockets of quartz monzonite and hornblende diorite.

Soils in the study area are influenced by geology and slope. Most of the property is dominated by soils comprised of weathered residuum from the underlying bedrock. They are generally stony or rubbly in texture. Finer-textured alluvial soils are found along Sherwood Creek and a smaller drainage which enters the study area a little south of Mud Lake.

Several plant communities and habitat types are found in the study area. The property is dominated by coniferous forests, particularly lodgepole pine, which average between 8" to 12" DBH. These forests are mixed with other conifer types and often the largest trees are ponderosa pine. Much of the lodgepole forest has been managed in past years through thinning and small patch-cuts. Ponderosa pine dominates the northwest corner of the study area, as well as several other small sites including the area just east of Mud Lake. The ponderosa in these stands, as well as those scattered throughout the lodgepole forests, range in size from 20" to 34" DBH. Several small stands of aspen, some mixed with meadow, are found on the property. Some of the developing aspen stands are in areas patch-cut during past forest management activity. A linear mixed-conifer forest, dominated by Colorado blue spruce, is found in the central part of the study area along a small drainage. Many large-diameter trees are found in this stand, ranging in size from 20" to 33" DBH. Along Sherwood Creek is a riparian plant community. Portions are forested and mixed with aspen, Engelmann spruce, Colorado blue spruce, subalpine fir, lodgepole pine, and Douglas-fir. This forested community ascends up the north-facing aspect along the creek and blends into the lodgepole pine forest. The riparian forest generally has a shrub understory. Portions of Sherwood Creek are dominated by a riparian shrubland which are comprised of willow and alder. Just north of Sherwood Creek is a small meadow of grasses and forbs mixed with scattered shrubs and trees. Mud Lake proper is a 4 acre, shallow body of water. Bulrush, sedge and rush plant communities exist around the lake's perimeter and near the shallow edges.

METHODS

A survey of breeding bird populations was conducted within the study area from June 1 to July 31, 2000. The goals were: 1) to survey the status and abundance of all breeding bird species; 2) pay special attention to the status of species of concern and map their sighting locations; and 3) determine the location of high quality habitats for avian species.

Walking surveys of the property were conducted on June 4, 6, 13 and 20, and July 7, 14 and 20. Each trip lasted 2 hours, starting at 6 A.M. and ending by 8 A.M.. Throughout the two month field season, all habitat types on the property were covered. Mark Pscheid and Eric Vozick assisted with the surveys.

The species of bird, their numbers, habitat in which they were observed, and their behavior were noted on each survey. Locations of species of concern were mapped. Breeding status was categorized using the following:

- Confirmed: Observed nest or fledged young.
- Probable: Singing males observed in suitable habitat, or pair observed.
- Possible: Observed on property in suitable habitat, though less evidence of nesting on property (not territorial, or only observed late in breeding season, or known to have very large nesting territories and no nest found on the property during this study).
- Potential: Not observed on the property, but suitable habitat appears to be present and should be watched for in future years.
- Visitor: Seen but not likely to nest on the property.

An estimate of breeding pair abundance was made based on the numbers observed and suitable habitat present. The categories were 1-2 pairs, 2-5 pairs, 5-10 pairs and 10+ pairs.

In determining high quality avian habitat, several factors were evaluated including: 1) presence of species of concern; 2) structural diversity of the habitat; and 2) what other studies have shown about the density and diversity of the avian community that regularly breeds in the habitat.

RESULTS

BREEDING SPECIES

A total of 51 species were seen within the study area during the 2000 breeding season (Table 1). Of this total, 10 were confirmed as breeding, 33 were considered probable breeders and another 7 were classified as possible breeders. Another 10 species not seen during this year's survey are considered potential breeders due to suitable habitat and may be seen in future years.

The most common (10+ breeding pairs) species found in the study area fall into two groups. The first are those which breed in coniferous forests, the most common habitat on the property. These birds are mountain chickadee, ruby-crowned kinglet, yellow-rumped warbler, and pine siskin. The second group of common breeding birds consist of habitat generalists who can utilize the resources of several types of habitat and have small nesting territories. This group

Table 1: Bird Species Observed and Other Potential Breeders at Mud Lake Open Space				
Species	**Observed**	**Status**	**Habitat**	**Abundance** (breeding pairs)
Mallard	X	Confirmed	L	1
Ring-necked Dusk	X	Possible	L	0 - 1
Osprey	X	Visitor	L	
Sharp-shinned Hawk	X	Confirmed	CF, A	1
Cooper's Hawk		Potential	CF, A	
Northern Goshawk		Visitor	CF	
Red-tailed Hawk	X	Possible	CF	0 - 1
Blue Grouse		Potential	CF	
Killdeer	X	Possible	L	1
Spotted Sandpiper	X	Possible	L	1
Mourning Dove		Potential	CF	
Great Horned Owl		Potential	CF, Rf	
Northern Pygmy-owl		Potential	CF, Rf	
Northern Saw-whet Owl		Potential	CF, Rf	
Common Nighthawk	X	Possible	CF	1
Broad-tailed Hummingbird	X	Probable	CF, A, R	10+
Williamson's Sapsucker	X	Confirmed	CF, A	2 - 5
Red-naped Sapsucker	X	Probable	A, Rf	2 - 5
Downy Woodpecker	X	Probable	A, Rf	1 - 2
Hairy Woodpecker	X	Probable	CF, A, Rf	5 - 10
Northern Flicker	X	Confirmed	A. CF, Rf	5 - 10
Olive-sided Flycatcher		Potential	CF	
Western Wood-Pewee	X	Probable	CF, A	2 - 5
Hammond's Flycatcher		Potential	CF, Rf	
Dusky Flycatcher	X	Probable	Rs	2 - 5
Cordilleran Flycatcher	X	Probable	Rf, CF	1 - 2
Warbling Vireo	X	Probable	A, Rs	5 - 10
Steller's Jay	X	Probable	CF	5 - 10

Table 1: Continued				
Species	**Observed**	**Status**	**Habitat**	**Abundance** (breeding pairs)
Clark's Nutcracker	X	Probable	CF	1 - 2
American Crow	X	Possible	CF	1
Common Raven	X	Possible	CF	1
Tree Swallow	X	Probable	A	2 - 5
Violet-green Swallow		Potential	CF, A	
Black-capped Chickadee	X	Probable	A, Rf	2 - 5
Mountain Chickadee	X	Confirmed	CF, A, Rf	10+
Red-breasted Nuthatch	X	Probable	CF, Rf, A	2 - 5
White-breasted Nuthatch	X	Probable	CFp, A	1 - 2
Pygmy Nuthatch	X	Probable	CFp	1 - 2
Brown Creeper	X	Probable	CF, Rf	1 - 2
House Wren	X	Confirmed	A, Rf, CF	2 - 5
Golden-crowned Kinglet	X	Probable	Rf	2 - 5
Ruby-crowned Kinglet	X	Probable	CF, Rf	10+
Mountain Bluebird	X	Probable	A	1 - 2
Townsend's Solitaire	X	Probable	CF	1 - 2
Swainson's Thrush		Potential	R	
Hermit Thrush	X	Probable	CF	5 - 10
American Robin	X	Confirmed	CF, A, R	10+
Yellow-rumped Warbler	X	Probable	CF, Rf	10+
MacGillivray's Warbler	X	Probable	Rs	2
Wilson's Warbler	X	Probable	Rs	2 - 5
Western Tanager	X	Probable	CFp	1 - 2
Chipping Sparrow	X	Probable	CFp	1 - 2
Song Sparrow	X	Probable	Rs	2 - 5
Lincoln's Sparrow	X	Probable	Rs	2 - 5
Gray-headed Junco	X	Confirmed	CF, A	10+
Black-headed Grosbeak	X	Probable	Rs	1 - 2

Table 1: Continued				
Species	**Observed**	**Status**	**Habitat**	**Abundance** (breeding pairs)
Red-winged Blackbird	X	Confirmed	L	2 - 5
Brown-headed Cowbird	X	Probable	CF, A, R	2 - 5
Cassin's Finch	X	Probable	CF	2 - 5
Red Crossbill	X	Confirmed	CF	2 - 5
Pine Siskin	X	Probable	CF	10+
Evening Grosbeak	X	Probable	CF	1 - 2
Habitat: CF - Coniferous Forest; Cfp - Ponderosa Pine Forest; A - Aspen Forest; R - Riparian; Rf - Riparian Forest; Rs - Riparian Shrubland; L - Lake				

includes broad-tailed hummingbird, American robin, and gray-headed junco. Other fairly common (5 - 10 breeding pairs) species include hairy woodpecker, northern flicker, warbling vireo, Steller's jay, and hermit thrush.

RICHNESS AND ABUNDANCE DIFFERENCES OF HABITAT TYPES

Many bird species are selective in their use of different vegetative communities, and not all habitat is of equal value. Hence, some habitats will have more species or individual birds than others. Detailed avian population studies of the different habitats on the property were not conducted as part of this study. However, much can be gleaned from other studies conducted nearby on similar habitat, as well as the observations of this study.

In the Rocky Mountains, avian species diversity is influenced by structural diversity, both vertical and horizontal, of the vegetation. Generally, the greater the structural diversity, the greater the species richness. A dense, even-aged forest of trees all similar in size will have less avian diversity than a forest comprised of a combination of large and small trees that is mixed with small openings or some shrubs in the understory. Older forests tend to have greater structural diversity. A meadow or wetland comprised of all grasses, sedges and forbs will have poor avian diversity compared to one with scattered trees or shrubs. Dense shrublands have very high vegetative structural diversity and high richness for breeding birds.

Lodgepole pine forests, which cover the majority of the property, are generally not considered to be rich avian habitat. They tend to be fairly homogenous in tree size and spacing, particularly middle-aged stands (50 - 150 years), which includes most lodgepole pine stands in western Boulder County. Most study plots of breeding bird species in lodgepole pine forests average 15 species, while breeding bird densities will average approximately 1 pair per acre (Snyder 1950, Hallock 1989). While no species are known to be restricted to lodgepole pine forests, some are restricted to coniferous forests, including Steller's jay, Clark's nutcracker, brown creeper, ruby-crowned kinglet, hermit thrush, yellow-rumped warbler, and pine siskin. Avian species diversity and density will slightly increase where there is some change in the structure of the forest, such as where relict large-diameter ponderosa pine trees are present, where aspen are mixed with the lodgepole, or where the death of several lodgepole pines has resulted in a small opening. However, some species, such as hermit thrush, require forest habitat that has a closed canopy and will drop out of the avian community as forest structure becomes more open.

Ponderosa pine forests and woodlands generally have greater species diversity than lodgepole pine, though this varies with age and structural diversity. A dense forest finds similar numbers to a lodgepole pine forest, approximately 15 species and 1 breeding pair per acre (Snyder 1950). However, as the forest becomes older and includes larger trees and more gaps in the forest structure, the number of species can approach 30 per plot, and densities of breeding pairs will range between 2 and 4 per acre (Stiles-Wainwright and Wainwright 1984, Lederer 1987). The study area contains a ponderosa pine forest in the northwest corner of the property, as well as several small patches of large-diameter trees scattered throughout the property. Pygmy nuthatch, western tanager and chipping sparrow favor ponderosa pine habitat, with pygmy nuthatch being restricted to this tree type. Williamson's sapsucker and Steller's jay tend to reach

their highest breeding densities in ponderosa pine habitat, though they will be found in other types of coniferous forest.

Aspen forests are considered rich avian habitat. They can average approximately 30 species per plot and 2 breeding pair per acre (Alles 1984). The study area contains several small patches of aspen. Aspen habitat is not well developed on the property at this point in time. The small size of the stands limits the number of aspen related birds on the property. Red-naped sapsucker and warbling vireo have the greatest ties to aspen for breeding habitat, though both are also found in riparian shrublands. Other mountain species which favor it include downy woodpecker, tree swallow and black-capped chickadee. Primary and secondary cavity nesting avian species will favor aspen, particularly if coniferous forest types are too young for the development of trees suitable for cavity development.

Montane riparian shrublands are considered rich habitat for breeding birds. Well developed riparian shrublands which are dominated by willows are sometimes called "willow carrs", and are especially rich habitat if mixed with beaver ponds. The number of breeding bird species found in this type of habitat will range between 20 and 25, while breeding bird densities will range between 5 and 8 pairs per acre (Figgs 1984, Hallock 1984). These are the highest densities of breeding birds found in any habitat in western Boulder County. Along Sherwood Creek a riparian shrubland is present. It is dominated by several species of willow and alder, and is best developed near the northeast corner of the property near the intersection of CR 126 and the Peak-to-Peak Highway. The avian species observed along this riparian shrubland are very characteristic of the habitat type, including dusky flycatcher, MacGillivray's warbler, Wilson's warbler, song sparrow, Lincoln's sparrow and black-headed grosbeak. For this property, this is the only habitat type suitable for these species. Other more common and widespread species found in the Sherwood Creek riparian shrubland include broad-tailed hummingbird, warbling vireo, and American robin. However, the fact that species such as Swainson's thrush, yellow warbler, and fox sparrow were not found, indicates this riparian shrubland is lacking in some components present in the highest quality sites; it is fairly narrow, and lacks the broadness and size needed to attract these other species. Still, it is the richest avian habitat in the study area.

A **montane riparian forest** is present along portions of Sherwood Creek. It consists of several coniferous forest types, including Engelmann spruce, Colorado blue spruce, subalpine fir, Douglas-fir, and lodgepole pine, as well as patches of aspen. The riparian forest, besides being along the creek, extends up on the north-facing aspect of the drainage. Being near the creek, there is more moisture than at most other locations on the property, and trees are well developed and large in size. Part of this forest has a shrub understory, adding to the structural diversity. No studies have focused on montane riparian forests, so comparative numbers of breeding species and overall breeding bird densities are not available. But the structural diversity, presence of large-diameter trees, along with the presence of aspen and shrubs lends itself to good breeding bird richness. Some interesting breeding birds included sharp-shinned hawk, cordilleran flycatcher and golden-crowned kinglet. Though no owl surveys were conducted, this is potential habitat for northern pygmy-owl and northern saw-whet owl. This habitat is intermixed with montane riparian shrublands; consideration of them as one ecological unit, both influenced by Sherwood Creek, is warranted.

A smaller riparian forest is found in a small drainage just south of Mud Lake. It is

dominated by Colorado blue spruce, but is mixed with other conifer types along with aspen. Many trees have large-diameters, again influenced by the greater availability of water. While not as rich in breeding birds as the Sherwood Creek site, it warrants recognition. Golden-crowned kinglets were present.

Mud Lake provides open water and emergent vegetation habitat. Those species that breed here are specialized towards lake and shoreline areas. Mallards successfully nested and produced fledged young. Red-winged blackbirds nested in the bulrushes. Male ring-necked ducks were present on the lake several times during the study period, but no females nor fledged young were observed. Swallows feed on insects present over the lake.

Several small **meadows** exist on the property, the largest found on the north side of Sherwood Creek. These meadows are used for breeding by only a few species, such as gray-headed junco. If mixed with scattered trees, chipping sparrow or Townsend's solitaire may be present. The meadows found in the study area are too small for true meadow nesters, such as vesper sparrows which are found in the larger meadows at nearby Caribou Ranch. However, meadows provide food resources (insects, earthworms, seeds, small mammals) and nesting materials (grass stems) that are utilized by birds which nest in surrounding habitat.

SPECIES OF SPECIAL CONCERN

Species of Special Concern are those with one or more of the following characteristics: endangered, threatened, rare, declining, isolated and restricted populations, or sensitive to habitat change. The Boulder County Nature Association maintains a list of Boulder County Species of Special Concern (Hallock and Jones 1999). The list is a compilation of species of concern lists from federal, state and local organizations and agencies including: U.S. Fish and Wildlife Service, Colorado Division of Wildlife, U.S. Forest Service, Colorado Natural Heritage Program, Partners in Flight, and Boulder County Nature Association.

There are two categories of concern on the list. The "primary concern species" are listed because of factors such as population decline, rareness, and/or habitat restrictions for uncommon species in Boulder County. "Watchlisted species" are those whose numbers in the county are fairly common to common, but due to concerns in the state or region (population decline or threats), or locally (habitat restrictions), or for which the west is an important area for their survival, or because they are good indicators of habitat change, they should be monitored.

A total of 5 species of special concern were seen within the study area during the 2000 breeding season (Table 2). All 5 are watchlisted species. Following are species accounts and habitat requirements.

Ring-necked Duck

Ring-necked duck is a watchlisted species. They are considered restricted breeders in the county by BCNA. They nest in the mountains in marshes adjacent to ponds. A single male was observed several times in Mud Lake (Figure 1). There was no direct evidence of breeding.

Of the nesting waterfowl in the mountains of Boulder County, ring-necks are the least common. Their habitat requirements appear the most specialized: shallow ponds, generally at

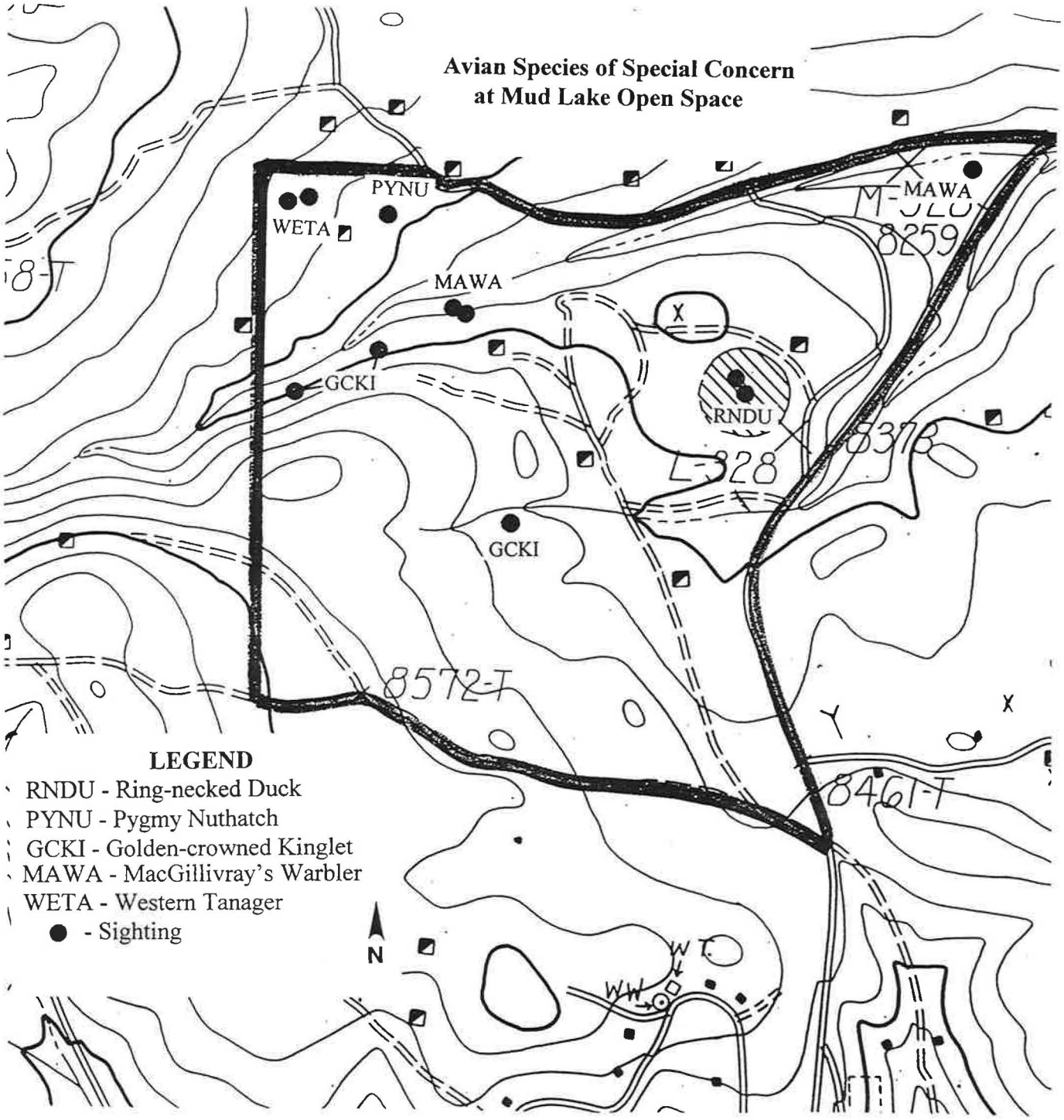
Table 2: Avian Species of Special Concern Seen on Mud Lake Open Space			
Species	**USFS**	**PIF**	**BCNA**
Ring-necked Duck			4
Pygmy Nuthatch	S, M		4
Golden-crowned Kinglet	S, M		4
MacGillivray's Warbler		1D	
Western Tanager		1D	

U. S. Forest Service (USFS)
Region 2 Threatened, Endangered and Sensitive Plants and Animals
Categories: S - Sensitive
Arapaho and Roosevelt National Forests Management Indicator Species
Categories: M - Management Indicator Species

Partners in Flight (PIF)
Methods for Setting Bird Conservation Priorities for State and Physiographic Areas of North America (Carter et al., 1998)
Categories: 1D - High area importance and high downward population trend

Boulder County Nature Association (BCNA)
Boulder County Nature Association Avian Species of Special Concern (Hallock and Jones 1999)
Categories: 4 - Isolated and Restricted Populations (Species that are found only at certain locations and/or have narrow habitat niche)

Figure 1 - Avian Species of Special Concern at Mud Lake Open Space



least an acre in size, with adjacent emergent vegetation where the nest is located. In contrast to other North American diving ducks, ring-necks readily take to ponds with shallow water and submerged vegetation. They normally feed in water less than 6 feet in depth (Bellrose 1976).

Pygmy Nuthatch

Pygmy nuthatches are listed as USFS Region 2 sensitive species, a management indicator species by Arapaho and Roosevelt National Forests, and a restricted breeder by BCNA. They were observed on the property in the ponderosa pine forest located in the northwest corner (Figure 1).

Pygmy nuthatches are considered excellent indicators of mature ponderosa pine forests. Because they usually drill their own cavities, they need mature ponderosa, with old and decayed wood. The ideal habitat consists of park-like, open forests of tall ponderosa where the pines have broken-off stubs of branches or tree-tops (Bent 1948).

Golden-crowned Kinglet

Golden-crowned kinglets are listed as USFS Region 2 sensitive species, a management indicator species by Arapaho and Roosevelt National Forests, and a restricted breeder by BCNA. They were observed on the property in the riparian forests along Sherwood Creek and along the small unnamed drainage southwest of Mud Lake (Figure 1).

They are birds of interior forests and tend to favor riparian coniferous forests with large-diameter trees (Kingery 1998). Engelmann spruce and subalpine fir are preferred tree types. They glean for insects at the outer tips of boughs in foliage.

MacGillivray's Warbler

MacGillivray's warblers are listed by Partners in Flight because of a possible population decline in the American West. They were observed in the riparian shrublands along Sherwood Creek (Figure 1).

Their habitat centers on shrublands in both wet and dry situations (Colorado Partners in Flight 1999). They generally favor tall shrubs for nesting and feeding, those over 6 feet in height.

Western Tanager

Western tanagers are listed by Partners in Flight because of a possible population decline in the American West. They were seen in the study area in the ponderosa pine forests located in the northwest corners of the property (Figure 1).

Though they breed in a variety of habitats, they prefer ponderosa pine and mixed-conifer woodlands (Kingery 1998). They typically place their nest on the branch of a conifer tree.

HABITAT OF SPECIAL INTEREST

The results of the study indicate there are areas on the property that warrant special attention relative to avian species. Habitats of Special Interest are those areas that are rich in breeding species diversity or density, have important habitat components such as high structural diversity or old-growth, or support several species of concern. The most significant area was the Sherwood Creek Riparian Area. Several other sites also warrant attention (Figure 2).

Sherwood Creek Riparian Area

Sherwood Creek contains habitat that is rich for breeding birds. The riparian habitat is a mix of forest and shrubland. The riparian forest is comprised of aspen, Colorado blue spruce, Engelmann spruce, subalpine fir, Douglas-fir and lodgepole pine. There is good structural diversity and large-diameter trees are present. Tall shrubs are found in the understory. The riparian forest extends up the adjacent north-facing hillside. The riparian shrublands are comprised of several types of willow and alder, and are best developed in the northeast corner of the property.

The avian habitat is rich and specialized. It is probable this site has the highest breeding bird density on the property. Two Avian Species of Special Concern were present: MacGillivray's warbler (at least two separate territories), and golden-crowned kinglet. Other species particular to this habitat include cordilleran flycatcher, dusky flycatcher, Wilson's warbler, song sparrow, Lincoln's sparrow and black-headed grosbeak. A sharp-shinned hawk nested in the hillside above the creek.

Other Sites of Interest:

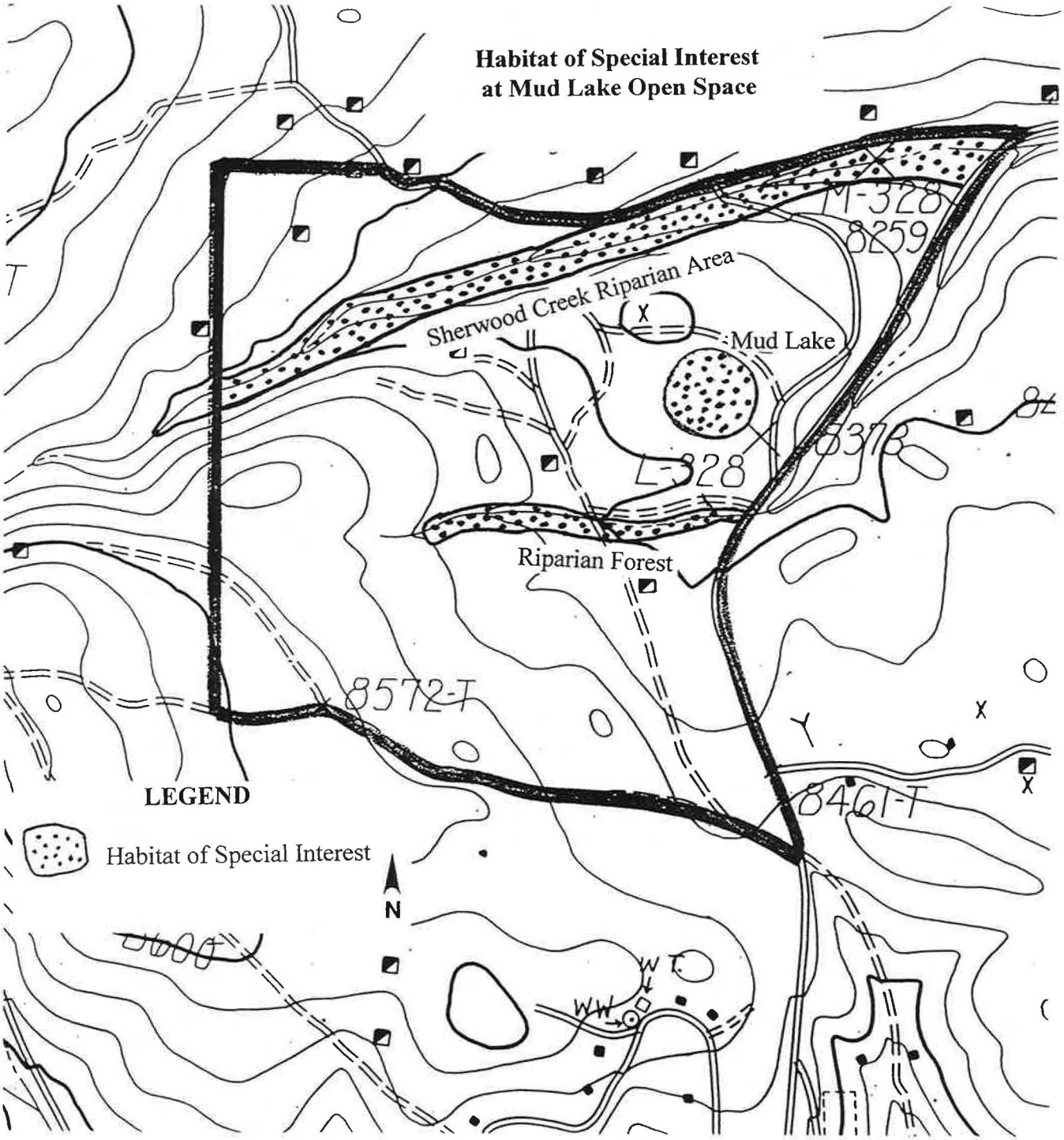
Mud Lake:

Mud Lake is a small (4 acre) and shallow body of water. Emergent vegetation is found around portions of the perimeter. During the study, at least 1 pair of mallards successfully nested at the lake and produced young. A single male ring-necked duck was observed several times at the lake, but there was no evidence of nesting. Red-winged blackbirds nested in the emergent plants on the east side of the lake. The lake is also used by migratory waterfowl in the spring and fall.

Because of the small size of the lake, its ability to provide nesting and migratory habitat for waterfowl will be dependent on the level and intensity of human use around and on the lake, as well as the degree of habituation by the waterfowl. The lake is approximately 450' in diameter. Waterfowl were observed moving to the opposite side from where people were present along the lake shore. Flight distance is the measurement from the source of a disturbance to the animal when the animal physically flees to a safer location; for several types of waterfowl it has been found to average approximately 300' (Miller 1994).

It is probable that due to the property becoming public open space and the presence of the nature center, use of the property, and specifically the area around the lake, will increase. The greatest impacts will come from uses on or within the lake, and uses on the perimeter especially if all sides have human presence. Prohibiting uses from occurring on and within the lake should

Figure 2 - Habitat of Special Interest at Mud Lake Open Space



be considered (with the exception of during the winter). Also, having at least 1 side (½ the perimeter) of the lakeshore closed to human use would be advantageous to nesting and migrating waterfowl.

Riparian Forest South of Mud Lake:

A small riparian forest is present in the drainage located south of Mud Lake. It is structurally dominated by large-diameter conifers, particularly Colorado blue spruce. Small patches of aspen are also present. It has good structurally diversity. Golden-crowned kinglets, who favor interior coniferous forests with large trees, were present.

OTHER MANAGEMENT RECOMMENDATIONS

The recognition of habitats of special interest does not imply a lesser value to the remainder of the property. Habitat for avian species is found throughout the property, whether ponderosa pine forest or lodgepole pine forest. The special interest habitats only highlight some of the unique elements of the property.

In addition, the landscape is very dynamic. What is old-growth today may become a young, regenerating forest 50 years from now. Where there is presently lodgepole pine forest may be a stand of aspen 100 years from today. Some vegetation types are more dynamic than others in terms of their rate of change due to disturbance. The locations of riparian areas, meadows, and lakes are highly influenced by geology, hydrology, and soils. The locations of dense mixed conifer forests (such as above Sherwood Creek) and small ponderosa pine woodlands are largely determined by topography and aspect. The changes in location, or even presence and absence, of lodgepole pine and aspen, represents a shifting mosaic which moves at a faster speed influenced by fire history.

Aspen is currently not well represented on the property, being found in small isolated patches. It is a rich habitat for breeding birds, particularly primary and secondary cavity-nesters. Is this a problem which needs hands-on management for resolution or just part of a long-term cycle? Which ever management path is chosen must be done while looking at a broader array of resource issues, and maybe even within a larger context than just this property.

Additional management recommendations for consideration are as follows:

- Allow for areas of habitat effectiveness by carefully planning the trail system and reducing fragmentation. This will benefit species with large territories, such as woodpeckers, as well as increase the likely nesting success of other birds who are wary of human presence.
- Large-diameter trees, snags, and deadfall should be recognized as important structural components which should be retained and perpetuated.

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