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Breeding Bird Survey, Caribou Ranch Op
OSMP Studies 4269

Study



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BREEDING BIRD SURVEY
CARIBOU RANCH OPEN SPACE

Dave Hallock
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Boulder County Parks and Open Space Department

October, 1999

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SUMMARY

A one season breeding bird inventory was conducted on the 2640 acre (1056 ha) Caribou Ranch Open Space from April through the end of August, 1999. The goals were to: determine the presence and relative abundance of all breeding species; map the locations of observed avian species of special concern; determine the location of significant habitat; and establish a system of transects and count stations where surveys can be repeated in future years to monitor changes in the avian community.

Eighty-eight potential breeding bird species were seen within the study area. This is considered high species richness for a parcel this size in Colorado and represents 75% of the breeding species found in western Boulder County. The avian community is dominated by neo-tropical migrants who are insectivores or omnivores, feed in the foliage of trees or shrubs, gather their food by gleaning or foraging, and nest in a tree.

Montane willow carrs and mixed-conifer woodlands are the richest habitats and have the greatest abundance of birds. Other studies of these habitats have shown high species richness and abundance. Meadow/forest edge and ponderosa pine forests have slightly lower richness and abundance values, while lodgepole pine, spruce-fir and mixed-conifer forests are lowest.

Eleven Boulder County Avian Species of Special Concern were seen on the property: ring-necked duck, northern goshawk, three-toed woodpecker, olive-sided flycatcher, pygmy nuthatch, golden-crowned kinglet, veery, MacGillivray's warbler, western tanager, savannah sparrow and fox sparrow. Montane willow carr and mixed-conifer forest are habitat for the highest number of species of concern.

The results of the study indicate there are areas on the property that warrant special attention. Two habitat types covering six geographic areas stand out as Habitats of Special Interest: mixed-conifer woodlands and the Delonde willow carr. These habitats have high species richness and abundance, and are significant sites for a high number of species of concern. Important features of mixed-conifer woodlands are their open canopy along with large-diameter trees, snags and deadfall, and clusters of shrubs in the understory. These woodlands occupy steep south to southeast facing slopes. Montane willow carrs are mosaics of dense tall shrubs mixed with wet meadows, beaver ponds and stream channels. They are found on the flat, alluvial floodplain of Delonde Creek where two colonies of beaver reside.

Another Habitat of Special Interest is the nesting and post-fledging family area for a breeding pair of northern goshawks. The nest site is just off the property on National Forest land. General recommendations for nesting goshawks include minimal human presence during the nesting season (March through September). Increased recreational activity near the nest or post-fledging family area will likely result in abandonment of this site.

Additional management recommendations include: allowing for areas of high habitat effectiveness by providing sizeable blocks of land where recreational use is discouraged and fragmentation is minimal; recognizing the importance of large-diameter trees, snags and deadfall; maintaining and, where appropriate, enhancing the wildlife values of riparian areas and wetlands; retaining and perpetuating meadows which are important hunting and foraging areas; and continued research and monitoring of species of concern as well as changes in the avian community that may result from recreation and other land use changes on the property.

STUDY AREA

The 2,640 acre (1056 ha) Caribou Ranch Open Space is located in western Boulder County, Colorado, 1 mile north of the Town of Nederland, 4 miles south of the Town of Ward and 13 miles west of the City of Boulder (Figure 1). Additionally, the property is west of the Peak-to-Peak Scenic Byway, primarily south of the Rainbow Lakes Road (County Road 116), north of Sherwood Gulch Road (County Road 126), and east of the old Caribou Townsite and Caribou Park.

The study area lies within the montane and subalpine lifezones of the east flank of the Front Range of the Southern Rocky Mountains. Elevation ranges from approximately 8,310' (2533 m) where Delonde and North Boulder creeks leave the property on the east to 10,130' (3088 m) along the western edge (Figure 2).

Changes in elevation and the degree of change have been influenced by the rise of the Rocky Mountains, glaciers and streams. The property is flattest on its east and southeast side, an area that abuts land which was the terminus of Pleistocene glaciers as they flowed down North Boulder Creek. Grade increases moving east to west. The increase is first gradual being influenced by glacial till. The southern part of the western portion of the property then sees a dramatic increase in elevation as granite is encountered. This area is heavily influenced by stream cutting action from Delonde Creek. The landscape is very linear and V-shaped. The western part of the northern portion of the property encounters less severe grade increases, though still a general increase, as the parent material is glacial in origin. Here the landscape is influenced by North Boulder Creek: the landscape changes pattern as the stream curves through the glacial till and topography is mixed with flat areas and steep grades. Some of the flat areas are where glacial kettle ponds exist. Parent material in the northeast portion of the property is a mix of glacial material and bedrock. It also has a linear and broad V-shaped appearance with Como Creek running through its center. Other features include flat areas of deposited sediment, such as where Delonde Creek exits its steep valley.

Soils in the study area are influenced by geology and slope. On the metamorphic and igneous rocks found in the southwestern and northeastern quadrants of the property, soils are comprised of weathered residuum and are either stony or rubbly. Soils on glacial material, which dominate the northwest and east-central portions of the property following the path of the glaciers which flowed down North Boulder Creek, are comprised of glacial till and are bouldery. Soils are better developed on flat or slightly sloped surfaces, such as the floodplains of Delonde and Como creeks. Soils influence vegetation: areas with fine-grained soils, such as alluvium, favor grasslands and wetlands, while coarser soils favor coniferous forests.

Several types of vegetation communities and habitat types are found in the study area. These were mapped by the Colorado Natural Heritage Program (Figure 3) (Pineda *et al.* 1999). The property is dominated by coniferous forests, particularly lodgepole pine. Ponderosa pine and ponderosa pine-Douglas fir forests are present at lower elevations while Engelmann spruce-subalpine fir forests are present at higher elevations in the western part of the property as well as along riparian areas. Found in the alluvial floodplains along Delonde and Como creeks are meadows, wetlands and riparian habitat. Delonde Creek contains two active beaver colonies whose dams, ponds and raised water table have resulted in the development of a willow carr.

FIGURE 1 - LOCATION

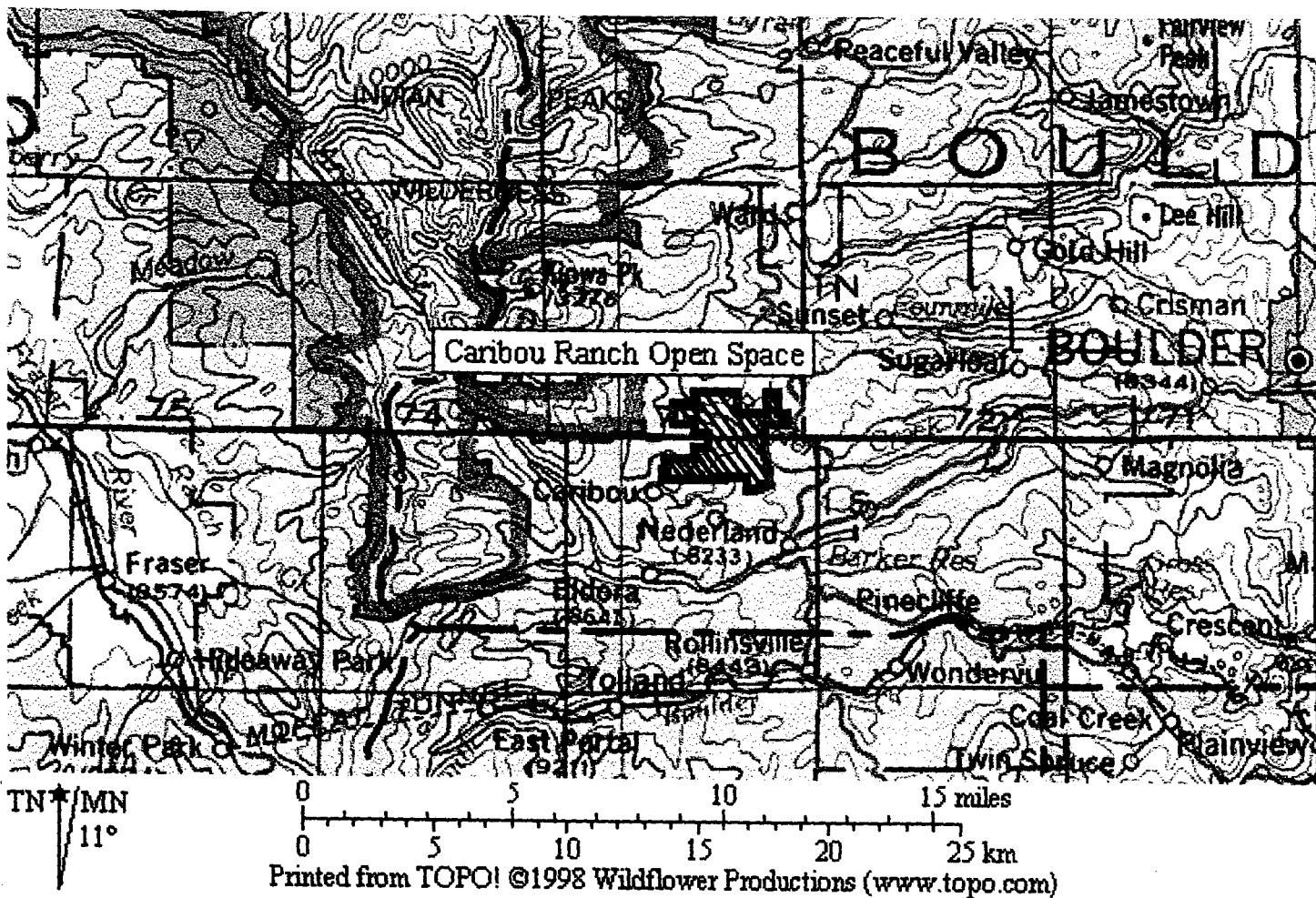
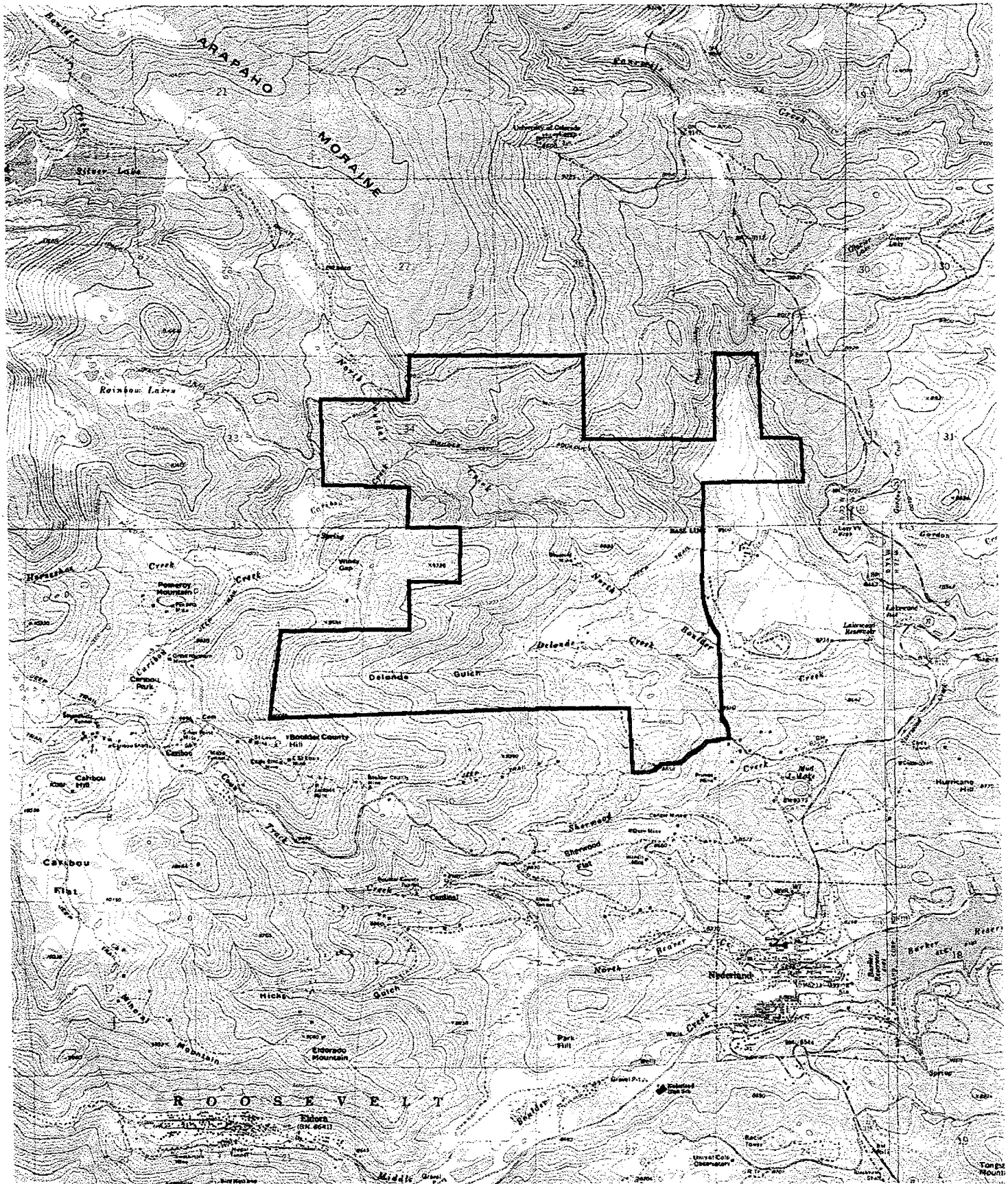
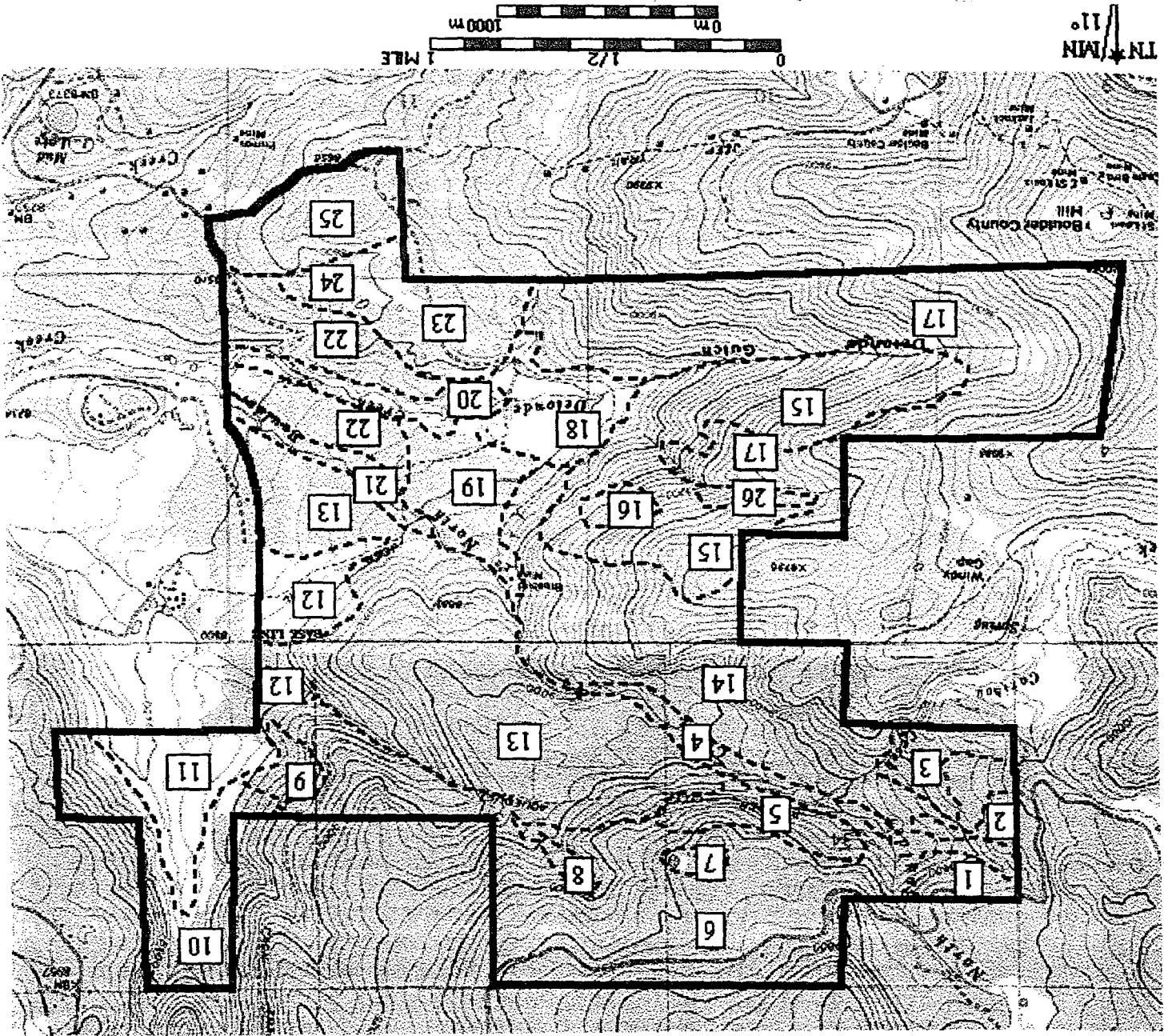


FIGURE 2 - STUDY AREA



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11°

FIGURE 3 - VEGETATION



- Legend**
- Riparian and Wetlands**
 Montane Riparian Forest (4)
 Montane Riparian Shrubland (8,21)
 Montane Willow Carr (20)
 Kettle Pond (7)
- Grasslands**
 Sagebrush Shrubland (16)
 Grassland (11,12,18)
- Forests**
 Subalpine Forest (3,17)
 Seral Lodgepole Pine Forest (2,6,14,22,23)
 Persistent Lodgepole Pine Forest (13)
 Montane Forests (10,19,25)
 Woodlands
 Limber Pine Woodland (1,5)
 Ponderosaae Mixed Conifer Woodland (9,15,25,26)
 Aspen Forests
 Aspen Forest (24)

Located on steep south and southeast aspects are mixed-conifer woodlands dominated by ponderosa pine and Douglas fir, mixed with sagebrush shrublands. These woodlands contain large diameter trees and snags. Also present are small, scattered patches of aspen, a few areas dominated by limber pine and several kettle pond wetlands.

Historic land uses of the study area included homesteading, ranching, mining, timber cutting and the presence of a railroad. There appear to be two primary impacts from these uses. First, most of the forests appear to have been cut or burned in the settlement era (1860 - 1920), hence they are dominated by lodgepole pine trees of similar age and size. Second, the meadows are dominated by European pasture grasses which are irrigated. Other changes appear to be: a probable increase in tree density of ponderosa pine and Douglas fir due to the cessation of fires after the settlement period; and the presence of noxious weeds including musk thistle, Canada thistle, ox-eye daisy and yellow toadflax.

METHODS

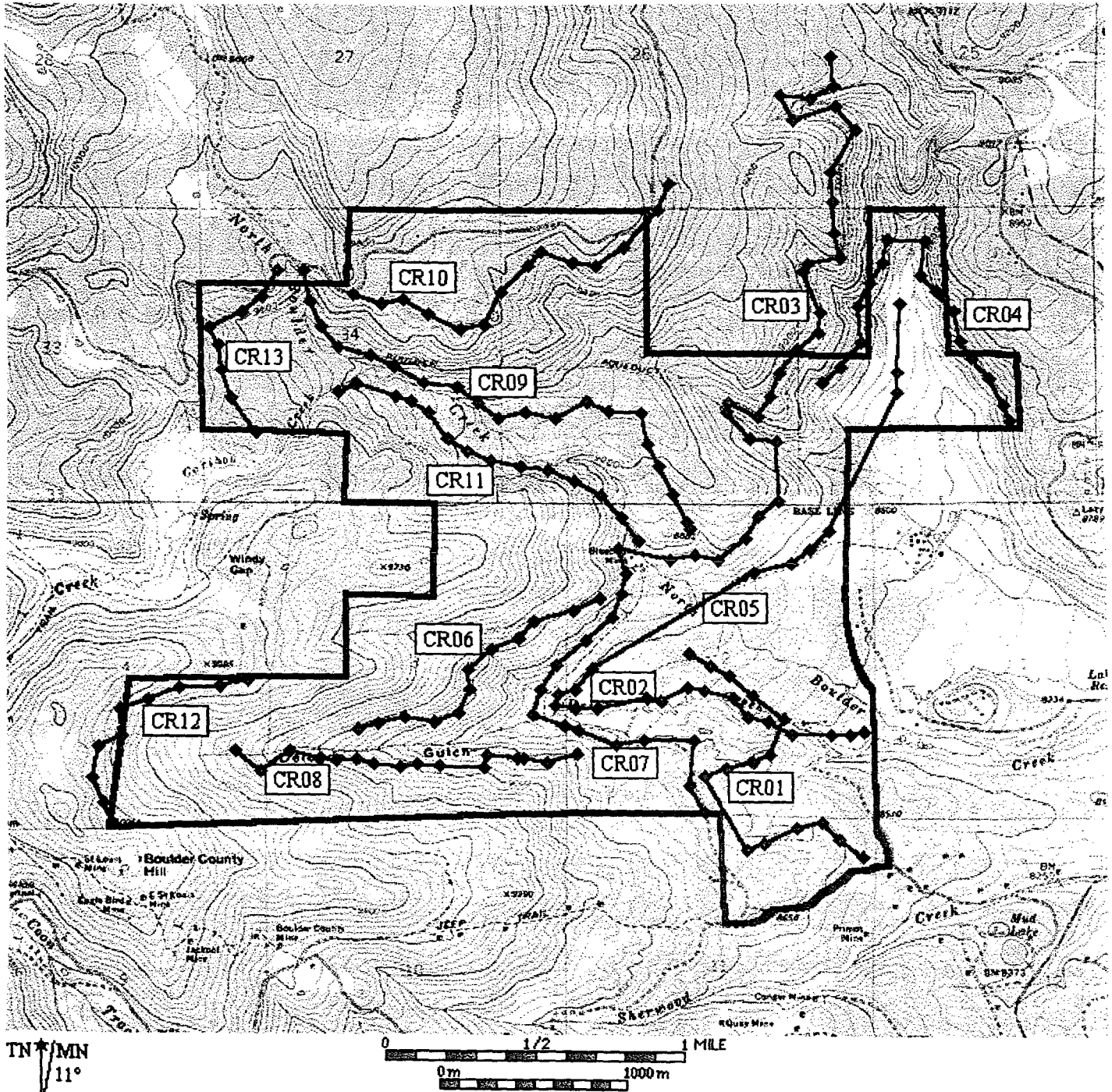
A survey of breeding bird populations was conducted within the study area from April 20th to August 31, 1999. The goals were:

- to determine the presence and relative abundance of all breeding bird species;
- to map the locations of observed avian species of special concern;
- to determine the location of significant habitats for avian species; and
- to establish a system of transects and count stations where surveys can be repeated in future years to monitor changes in the avian community.

Several survey methods were employed. These were:

- Point Counts: Point counts along 13 transects were established (Figure 4). Eleven transects were located within a single vegetation type based on CNHP mapping (see Figure 3). Two transects were placed along the Switzerland Trail and traversed several vegetation communities. Most transects followed a compass bearing, but adjustments were made to stay within the appropriate vegetation; several routes followed roads/trails. Along each transect, point counts were located at 492' (150 m) intervals. Between 10 and 20 point counts per transect were established as determined by size of the vegetation community. The count period at each station was 5 minutes. All birds seen or heard within 246' (75 m) of the point count were recorded. Counts were conducted from 6/3 until 6/29, and between 6 and 10 A.M. Each transect was conducted once. Observed species of concern were mapped. A GPS reading was taken at the location of each point count.
- General Surveys: This method was less structured than the point counts, allowing for searches to other parts of the study area as well as multiple visits to the same area where there was high interest in species and/or habitat. The number of birds, habitat they were found in and their behavior were noted on each survey. Locations of species of concern were mapped. A general assessment of habitat quality for avian species was conducted with special interest in:
 - Structural Diversity - Increasing amounts of vertical structural diversity

FIGURE 4 - TRANSECT AND POINT COUNT LOCATIONS



<u>Transect</u>	<u>Habitat</u>
CR01	Ponderosa Pine Forest
CR02	Willow Carr/Riparian
CR03	Switzerland Trail - Multiple Habitat
CR04a	Mixed Conifer Forest
CR04b	Mixed Conifer Woodland
CR05	Meadow/Forest Edge
CR06	Mixed Conifer Woodland

Legend

<u>Transect</u>	<u>Habitat</u>
CR07	Switzerland Trail - Multiple Habitat
CR08	Lodgepole/Spruce-Fir Forest
CR09	Lodgepole Pine Forest
CR10	Lodgepole Pine Forest
CR11	Lodgepole Pine Forest
CR12	Spruce-Fir Forest
CR13	Lodgepole/Spruce-Fir Forest

within a habitat has a positive correlation with species richness. High quality riparian areas, shrublands, woodlands with a shrub understory and old-growth forests are generally considered to have good structural diversity.

- Old-Growth Characteristics - Large-diameter trees (over 20" [50 cm] DBH), snags and deadfall are important forest components that late-successional avian species depend upon for finding food and nesting sites.
- Unique Landscape Features - Uncommon landscape features can present nesting or feeding opportunities for restricted species. Examples of such features are wetlands, ponds, cliffs and waterfalls.
- Owl Surveys: Evening surveys were conducted in search of owls. Portions of the property were surveyed on 20 and 27 April, and 25 and 27 May, with surveys beginning .5 hour before sunset and lasting until midnight.
- Northern Goshawk Surveys: A survey was made for locations of northern goshawks using broadcast tapes of goshawk alarm and wailing calls to elicit a response. A modified version of the U.S. Forest Service Southwestern Region Goshawk Inventory Protocol (Kennedy and Stahlecker 1991) was utilized. All suitable goshawk habitat was covered (forests and woodlands). Transects were walked with a general distance between transects of 984' (300 m). Transect locations were sometimes modified to follow ridgelines. Tapes were broadcast at stations along the transect which were also spaced at 984' (300 m). Alarm calls were broadcast during June and wail calls in July and August. One calling sequence per station was used (total time at station was 1.5 minutes). Where northern goshawks were observed, subsequent surveys were conducted to search for evidence of nesting.

RESULTS

SPECIES RICHNESS

A total of 88 potential breeding bird species were seen within the study area during the 1999 breeding season (Table 1). Another 5 bird species were seen in the study area during the breeding season, but are not considered likely breeders. It is possible that several additional species, such as flammulated owl, boreal owl and common yellowthroat, may be found breeding on the property from time to time but were not detected this season. Other species which breed in the vicinity, such as golden eagle, may be seen utilizing the property.

The 88 observed potential breeding species are considered high species richness for Colorado. When compared to the study blocks of the Colorado Breeding Bird Atlas, for which there were 1760 blocks each being almost 2.5 times larger than Caribou Ranch, fewer than 1% of the blocks produced more than 90 potential breeding species (Kingery 1998). The mean number of species in atlas blocks completed in Boulder County was approximately 62.

The Indian Peaks Four-Season Bird Counts also provide a perspective about the species richness of the study area. The counts have been conducted in the upper montane, subalpine and alpine lifezones of western Boulder County since 1982 and cover a geographic area of almost 100,000 acres. The average number of breeding species seen per year on these counts is 98; there are generally thought to be approximately 118 species which regularly breed within the count area (Hallock 1998). Caribou Ranch, which is located within the Indian Peaks Bird Count area, contains 75% of the breeding species found in the western half of Boulder County.

SPECIES FREQUENCY

Frequency is expressed in terms of total number of individual birds observed for each species (expressed in terms of percentage of all birds observed) as well as the percentage of point counts in which a bird species occurred. Information on species frequency is found in Table 1. The 10 most frequently seen species are shown in Table 2. Snyder (1950), in his study of breeding birds near the University of Colorado's Mountain Research Station during the 1940s, felt that the western forest bird community should be called *Parus-Spinus* due to the abundance of mountain chickadee and pine siskin. They were two of the most frequently seen species on Caribou Ranch. The ten most frequently seen species comprised 62% of all birds seen on the point count transects.

Table 2: Top Ten Frequently Seen Breeding Bird Species on Caribou Ranch Open Space

Species	% of Total #	% of Points	Species	% of Total #	% of Points
Brd-tailed Hummingbird	10.3%	60%	Ruby-crowned Kinglet	6.7%	42%
Pine Siskin	9.1%	50%	American Robin	4.3%	28%
Dark-eyed Junco	8.6%	40%	Warbling Vireo	3.8%	23%
Yellow-rumped Warbler	7.7%	48%	Steller's Jay	2.7%	18%
Mountain Chickadee	7.2%	40%	Red Crossbill	2.1%	6%

Table 1: Bird Species Observed on Caribou Ranch Open Space, Breeding Season 1999

SUMMARY	Point Count Data				Other Species Observed	Potential Breeder	Probable Migrant or Visitor
	Number Observed	% of Total	# of Points Observed	% of Total			
	Number		Points	Points			
Great Blue Heron					X		X
Turkey Vulture					X	X	
Mallard	6	0.5%	3	2%		X	
Green-winged Teal	1	0.1%	1	1%		X	
Ring-necked Duck					X	X	
Osprey					X		X
Sharp-shinned Hawk					X	X	
Cooper's Hawk					X	X	
Northern Goshawk					X	X	
Red-tailed Hawk	3	0.2%	3	2%		X	
Blue Grouse	2	0.2%	2	1%		X	
Sora					X	X	
Killdeer					X	X	
Spotted Sandpiper					X	X	
Common Snipe	1	0.1%	1	1%		X	
Band-tailed Pigeon					X	X	
Mourning Dove	6	0.5%	5	3%		X	
Great Horned Owl					X	X	
Northern Pygmy-Owl					X	X	
Northern Saw-Whet Owl					X	X	
Common Nighthawk					X	X	
Broad-tailed Hummingbird	136	10.3%	113	60%		X	
Belted Kingfisher					X	X	
Williamson's Sapsucker	7	0.5%	7	4%		X	
Red-naped Sapsucker	4	0.3%	4	2%		X	
Downy Woodpecker	1	0.1%	1	1%		X	
Hairy Woodpecker	12	0.9%	11	6%		X	
Three-toed Woodpecker					X	X	
Northern Flicker	23	1.7%	23	12%		X	
Olive-sided Flycatcher	5	0.4%	5	3%		X	
Western Wood-Pewee	13	1.0%	10	5%		X	
Hammond's Flycatcher	13	1.0%	13	7%		X	
Dusky Flycatcher	16	1.2%	16	8%		X	
Cordilleran Flycatcher	24	1.8%	24	13%		X	
Warbling Vireo	50	3.8%	44	23%		X	
Gray Jay	2	0.2%	1	1%		X	
Steller's Jay	36	2.7%	34	18%		X	
Clark's Nutcracker	11	0.8%	7	4%		X	
Black-billed Magpie	5	0.4%	4	2%		X	
American Crow					X	X	
Common Raven	6	0.5%	4	2%		X	
Tree Swallow	20	1.5%	16	8%		X	
Violet-green Swallow	6	0.5%	3	2%		X	
N. Rough-winged Swallow					X	X	
Barn Swallow	4	0.3%	1	1%		X	
Black-capped Chickadee	4	0.3%	4	2%		X	
Mountain Chickadee	95	7.2%	76	40%		X	
Red-breasted Nuthatch	19	1.4%	17	9%		X	
White-breasted Nuthatch	4	0.3%	4	2%		X	
Pygmy Nuthatch	19	1.4%	11	6%		X	
Brown Creeper	16	1.2%	14	7%		X	
Rock Wren					X	X	
House Wren	27	2.0%	24	13%		X	
American Dipper					X	X	
Golden-crowned Kinglet	14	1.1%	8	4%		X	
Ruby Crowned Kinglet	88	6.7%	80	42%		X	

Table 1: Bird Species Observed on Caribou Ranch Open Space, Breeding Season 1999

SUMMARY	Point Count Data				Other Species Observed	Potential Breeder	Probable Migrant or Visitor
	Number	% of Total	# of Points	% of Total			
	Observed	Number	Observed	Points			
Ruby Crowned Kinglet	88	6.7%	80	42%		X	
Mountain Bluebird	7	0.5%	6	3%		X	
Townsend's Solitaire	25	1.9%	23	12%		X	
Veery					X	X	
Swainson's Thrush					X	X	
Hermit Thrush	25	1.9%	24	13%		X	
American Robin	57	4.3%	52	28%		X	
Orange-crowned Warbler	1	0.1%	1	1%		X	
Virginia's Warbler	3	0.2%	3	2%		X	
Yellow Warbler					X	X	
Yellow-rumped Warbler	102	7.7%	91	48%		X	
MacGillivray's Warbler	7	0.5%	7	4%		X	
Wilson's Warbler	15	1.1%	11	6%		X	
Western Tanager	7	0.5%	7	4%		X	
Green-tailed Towhee	25	1.9%	23	12%		X	
Chipping Sparrow	12	0.9%	12	6%		X	
Brewer's Sparrow					X		X
Vesper Sparrow	6	0.5%	4	2%		X	
Savannah Sparrow					X	X	
Fox Sparrow	3	0.2%	3	2%		X	
Song Sparrow	6	0.5%	5	3%		X	
Lincoln's Sparrow	10	0.8%	10	5%		X	
White-crowned Sparrow	1	0.1%	1	1%		X	
Dark-eyed Junco	114	8.6%	93	49%		X	
Black-headed Grosbeak	3	0.2%	3	2%		X	
Red-winged Blackbird	13	1.0%	6	3%		X	
Western Meadowlark					X		X
Brewer's Blackbird					X	X	
Common Grackle					X	X	
Brown-headed Cowbird	12	0.9%	10	5%		X	
Pine Grosbeak					X	X	
Cassin's Finch	10	0.8%	10	5%		X	
Red Crossbill	28	2.1%	11	6%		X	
Pine Siskin	120	9.1%	95	50%		X	
Lesser Goldfinch					X		X
American Goldfinch	3	0.2%	3	2%		X	
Evening Grosbeak	5	0.4%	3	2%		X	
TOTALS	1319		189				
TOTAL SPECIES	93					88	5

Several other species of note include those with low total numbers but good distribution throughout the property as evidenced by being present at over 10% of the point count stations. These are northern flicker, Cordilleran flycatcher, house wren, hermit thrush, Townsend's solitaire and green-tailed towhee. Additionally, 18 species had total counts of five or less. A single individual was recorded for six of the species.

COMMUNITY COMPOSITION

Birds can be characterized by how they use the environment (food and shelter) as well as their migratory status (e.g., resident, neo-tropical migrant). Species can be grouped in terms of how they exploit environmental resources (e.g., cavity nesters, ground foragers, insect gleaners); these groupings are often called guilds.

Table 3 provides information for each species about habitat, migratory status, feeding guilds and nesting guilds for the bird species found on Caribou Ranch during the breeding season study. The average breeding bird is a neo-tropical migrant (long-distance migrant that winters in Central or South America) who eats by gleaning insects from the foliage of trees or shrubs and nests in a tree.

The migratory status of breeding birds in the study area is dominated by those which come from their winter grounds in the Southwest, Mexico, Central America and South America (Table 4). Migratory status is based on information from the Colorado Bird Observatory and the Colorado Division of Wildlife (1995) and modified to reflect localized seasonal migrations.

Migratory Status	% of Species	% of Individuals
A - Long-Distance	31%	29%
B - Short-Distance	37%	50%
V - Vertical	8%	1%
R - Resident	24%	21%

Most of the birds which breed on the property migrate several hundred to a thousand miles to their winter grounds. Long-distance migrants include most flycatchers and warblers who winter in Central and South America. Short-distance migrants, including most sparrows, American robins and mountain bluebirds, generally winter in Arizona, New Mexico and Mexico. Some short-distance species, such as robins and juncos, may be present in the winter as individuals that breed farther north spend the winter in Colorado. Vertical migrants, such as mallards and American dippers, are those which head down in elevation to find more suitable winter habitat and generally stay in the foothills or on the plains of Colorado. Resident species comprise just over 1/5 of the breeding population and are dominated by mountain chickadees, nuthatches, Steller's jays and hairy woodpeckers.

Table 3: Habitat, Migratory Status, Feeding and Nesting Information

Species	Habitat	Migratory Status	Food Type	Food Substrate	Feeding Method	Nesting Location
Great Blue Heron	L	B	P	W	A	T
Turkey Vulture	ECF	B	C	G	S	R
Mallard	LW	V	G	W	G	G
Green-winged Teal	LW	V	G	W	D	G
Ring-necked Duck	LW	V	O	W	F	G
Osprey	LF	B	P	W	Pf	T
Sharp-shinned Hawk	AC	B	C	AG	H	T
Cooper's Hawk	AC	B	C	AG	H	T
Northern Goshawk	CA	B	C	AG	H	T
Red-tailed Hawk	CM	B	C	G	H	T
American Kestrel	MCw	B	I	A	H	Co
Blue Grouse	CAM	R	O	G	F	G
Sora	W	V	O	W	F	G
Killdeer	WLM	B	I	G	G	G
Spotted Sandpiper	WLM	B	I	W	G	G
Common Snipe	WL	V	V	G	Pr	G
Band-tailed Pigeon	C	A	F	F	G	T
Mourning Dove	MC	B	G	G	G	T
Great Horned Owl	CR	R	C	G	H	T
Northern Pygmy-Owl	ACR	R	C	G	H	Co
Northern Saw-Whet Owl	ACR	R	C	G	H	Co
Common Nighthawk	CDM	A	I	AG	Sc	G
Broad-tailed Hummingbird	CAMWR	A	O	F	Hg	S
Belted Kingfisher	LRW	B	P	W	Pr	G
Williamson's Sapsucker	CA	B	O	B	E	Cs
Red-naped Sapsucker	ARWC	B	O	B	E	Cs
Downy Woodpecker	ACRW	R	I	B	G	Cs
Hairy Woodpecker	CRA	R	I	B	G	Cs
Three-toed Woodpecker	CsC	R	I	B	Sr	Cs
Northern Flicker	CRAM	B	I	G	G	Cs
Olive-sided Flycatcher	CwC	A	I	A	Sa	T
Western Wood-Pewee	CwCAR	A	I	A	Sa	T
Hammond's Flycatcher	CR	A	I	A	Sa	T
Dusky Flycatcher	WD	A	I	A	Sa	S
Cordilleran Flycatcher	CAR	A	I	A	Sa	RG
Warbling Vireo	ARW	A	I	F	G	TS
Gray Jay	CsC	R	O	F	F	T
Steller's Jay	C	R	O	FG	F	T
Clark's Nutcracker	C	R	O	FG	F	T
Black-billed Magpie	CRD	V	I	G	G	S
American Crow	C	R	O	G	F	T
Common Raven	CEAM	R	O	G	F	TR
Tree Swallow	ACLW	B	I	A	Sc	Co
Violet-green Swallow	ACELW	A	I	A	Sc	Co
N. Rough-winged Swallow	LW	A	I	A	Sc	G
Barn Swallow	UEWM	A	I	A	Sc	Co
Black-capped Chickadee	ARW	R	I	F	G	Co
Mountain Chickadee	CRA	R	I	F	G	Co
Red-breasted Nuthatch	CRA	R	I	B	G	Cs
White-breasted Nuthatch	CRA	R	I	B	G	Cs
Pygmy Nuthatch	Cp	R	I	B	G	Cs
Brown Creeper	CR	R	I	B	G	Co
Rock Wren	ECF	B	I	G	G	R
House Wren	CAR	A	I	F	G	Co
American Dipper	L	V	I	W	G	G
Golden-crowned Kinglet	CsRC	R	I	F	G	T

Table 3: Habitat, Migratory Status, Feeding and Nesting Information

Species	Habitat	Migratory Status	Food Type	Food Substrate	Feeding Method	Nesting Location
Ruby Crowned Kinglet	CRA	B	I	F	G	T
Mountain Bluebird	CwAU	B	I	G	G	Co
Townsend's Solitaire	CCwM	B	I	A	Sa	G
Veery	W	A	O	G	F	G
Swainson's Thrush	WR	A	O	G	F	S
Hermit Thrush	C	B	I	G	G	G
American Robin	ACMRW	B	V	G	G	ST
Orange-crowned Warbler	DCw	A	I	F	G	G
Virginia's Warbler	CpD	A	I	F	G	G
Yellow Warbler	W	A	I	F	G	S
Yellow-rumped Warbler	CRA	B	I	F	G	T
MacGillivray's Warbler	WDR	A	I	F	G	S
Wilson's Warbler	W	A	I	F	G	GS
Western Tanager	CpD	A	O	F	F	T
Green-tailed Towhee	DCw	A	O	G	F	GS
Chipping Sparrow	CwDM	A	O	G	F	T
Brewer's Sparrow	D	A	I	G	G	S
Vesper Sparrow	M	B	O	G	F	G
Savannah Sparrow	Mw	B	O	G	F	G
Fox Sparrow	W	B	O	G	F	GS
Song Sparrow	W	B	O	FG	F	GS
Lincoln's Sparrow	W	A	O	G	F	G
White-crowned Sparrow	W	B	O	G	F	S
Dark-eyed Junco	CAMD	B	O	G	F	G
Black-headed Grosbeak	WRACp	A	O	F	F	S
Red-winged Blackbird	LW	B	O	G	F	S
Western Meadowlark	M	B	I	G	G	G
Brewer's Blackbird	M	B	O	G	F	TSG
Common Grackle	MU	B	O	G	F	T
Brown-headed Cowbird	CMRWA	B	O	G	F	TSG
Pine Grosbeak	Cs	R	O	F	F	T
Cassin's Finch	C	B	O	G	F	T
Red Crossbill	C	R	O	F	F	T
Pine Siskin	C	B	O	FG	F	T
Lesser Goldfinch	MD	B	G	GF	G	TS
American Goldfinch	RC	B	O	FG	F	ST
Evening Grosbeak	CR	R	O	F	F	T

Habitat: A - aspen; C - coniferous forest; Cp - ponderosa pine forest; Cw - coniferous woodland; Cs - spruce-fir forest; D - dry shrublands; E - cliffs; F - in flight; L - lakes, ponds, streams; M - meadows; Mw - wet meadows; R - wooded creekbottoms; W - wet shrublands, marshes; U - dwellings.

Migratory Status: A - long-distant migrant; B - short-distance migrant; V - vertical migrant; R - resident.

Food Type: C - carnivore (vertebrates); F - frugivore (fruits); G - granivore (nuts and seeds); I - insectivore (insects); O - omnivore (variety); P - piscivore (fish); V - vermivore (earthworms).

Food substrate: A - air; B - bark; F - foliage (leaves, twigs, branches, flowers); G - ground; W - water.

Feeding Method: A - ambusher; D - dabbler; E - excavator; F - forager; G - gleaner; H - hawk; Hg - hover/gleaner; P - plunger; Pf - foot plunger; Pr - prober; S - scavenger; Sa - sallier; Sc - screener; Sr - scaler.

Nesting Location: Co - tree cavity excavated by others; Cs - tree cavity excavated by self; G - ground, stream bank, aquatic vegetation; R - rocks, cliffs, ledges, caves; S - shrubs, small trees; T - tree limbs.

Foraging guilds can be broken into the type of food eaten (e.g., insects, seeds), where the food is obtained (substrate, e.g., on the ground, in the air) and the method of catching food (e.g., excavate, glean, ambush). The information is derived from De Graaf et al. (1985).

The food type of a species is based on the major food items (minimum 20%) taken during the breeding season and does not represent all foods. Species which prefer insects comprise half the individual birds observed, including flycatchers, swallows, chickadees, nuthatches, kinglets, bluebirds and warblers (Table 5). The second major food type guild is those who eat a variety of items (omnivores) and include sapsuckers, sparrows, blackbirds and finches. Hawks and owls comprise the carnivore guild. American robins and common snipe prefer earthworms (vermivores).

Food Type	% of Species	% of Individuals	Food Type	% of Species	% of Individuals
Insectivores	43%	50%	Piscivores	3%	1%
Omnivores	36%	43%	Vermivores	2%	4%
Carnivores	9%	1%	Frugivores	1%	1%
Granivores	4%	1%			

Substrate refers to the place where a food item is found or taken. The birds in the study area favor foliage (twigs, branches and flowers) and the ground (Table 6). The foliage guild is dominated by warblers and hummingbirds while owls, thrushes, American robins, sparrows and blackbirds favor the ground. Flycatchers, hawks and swallows take to the air in search of food while sapsuckers, woodpeckers, nuthatches and brown creepers search under tree bark. Great blue herons, ducks, osprey, belted kingfishers and American dippers find their food in ponds, lakes and streams.

Substrate	% of Species	% of Individuals	Substrate	% of Species	% of Individuals
Ground	40%	27%	Bark	10%	6%
Foliage	26%	56%	Water	9%	1%
Air	15%	10%			

Birds use a variety of techniques for obtaining food. Fourteen categorical techniques are used by the species in the study area. Technique descriptions are as follows:

Ambusher: slowly stalks or waits for prey to come within reach.

Dabbler: submerges head and neck or tips up.

Excavator: locates food in bark by drilling holes.

Foot Plunger: catches prey by plunging from air to water surface and seizing prey in talons.

Forager: takes almost any food items encountered upon the substrate.

Gleaner: selects particular food items from the substrate.

Hawker: flies after prey and captures it either in air or on ground.

Hover-gleaner: hovers in air while selecting prey.

Plunger: dives from air into water to capture prey in bill or gular pouch.

Prober: inserts bill into substrate (beach, mud, ground) and locates prey by touch.

Sallier: perches on exposed branch, waits for insect to fly by, and then pursues and catches insect in air.

Scaler: exposes prey under bark by scaling off loose bark.

Scavenger: takes a variety of items, including refuse or carrion.

Screener: flies with bill open and screens prey from air.

Foraging and gleaning are the most common feeding techniques used by birds on the property (Table 7). The most common foragers are Steller's jays, sparrows, blackbirds and finches. Gleaners include chickadees, nuthatches, brown creepers, kinglets, bluebirds and warblers. The only hover-gleaner is the broad-tailed hummingbird and osprey is the only foot plunger. Woodpeckers and sapsuckers are either excavators or scalers. Flycatchers are aerial salliers while swallows use a screening technique.

Table 7: Feeding Techniques of Breeding Bird Species on Caribou Ranch Open Space

Technique	% of Species	% of Individuals	Technique	% of Species	% of Individuals
Gleaner	34%	44%	Ambusher	1%	0%
Forager	34%	34%	Dabbler	1%	1%
Hawker	9%	1%	Foot Plunger	1%	0%
Sallier	7%	7%	Plunger	1%	0%
Screener	6%	2%	Prober	1%	0%
Excavator	2%	2%	Scaler	1%	0%
Hover-gleaner	1%	10%	Scavenger	1%	0%

As might be expected from the vegetation inventories, trees are the most common object used for nesting sites (Table 8). The largest percentage of species and individuals, including most hawks, doves, flycatchers, jays, kinglets and finches, utilize the limbs of trees for their nest location. Cavity-nesters are another significant nesting guild and include small owls, sapsuckers, woodpeckers, swallows, chickadees, nuthatches and brown creepers. Ground nesters include waterfowl, blue grouse, shorebirds, hermit thrush and most sparrows. Shrub nesters include broad-tailed hummingbird, dusky flycatcher and several types of warbler and sparrow. Rock outcrops are present and provide nesting sites for turkey vulture, raven and rock wren.

Location	% of Species	% of Individuals	Location	% of Species	% of Individuals
Tree	34%	42%	Shrub	13%	18%
Ground	29%	19%	Rock, Cliffs	2%	1%
Cavity	22%	20%			

RICHNESS AND ABUNDANCE DIFFERENCES OF HABITAT TYPES

Many bird species are selective in their use of different vegetative communities. Hence, some habitats will have more species or individual birds than others. Most of the point count transects were located in single vegetation types (see Figure 3 for vegetative communities and Figure 4 for transect locations).

The point count information provide some insight into the richness and abundance of birds in different habitat on the property (Table 9). Two habitat types stand out in terms of number of species and number of individuals: willow carr/riparian and mixed-conifer woodland. Ponderosa pine forests and meadow/forest edge had slightly lower species richness and abundance of individuals. The poorest habitats were lodgepole pine forests, spruce-fir forests and mixed-conifer forests. The data correlate with other local studies of breeding birds in similar habitat (Table 10).

Montane willow carrs have some of the highest breeding bird densities of any habitat type in Colorado approaching 8 pairs of birds per acre (Hallock 1984). The mixture of willow-alder shrublands, sedge-reedgrass wetlands and beaver ponds provide good habitat diversity. Avian use is dominated by neo-tropical migrants, especially several types of warbler and sparrow. This habitat has the greatest number of breeding species (21) which are primarily restricted to this habitat type on the property: mallard, green-winged teal, ring-necked duck, sora, killdeer, spotted sandpiper, belted kingfisher, northern rough-winged swallow, American dipper, veery, Swainson's thrush, yellow warbler, Wilson's warbler, fox sparrow, song sparrow, black-headed grosbeak and red-winged blackbird.

Mixed-conifer woodlands are also significant habitat for avian species. They have good structural diversity as the open canopy allows good understory and shrub development. The canopy trees, comprised mostly of ponderosa pine and Douglas fir, have little competition and a high survival rate from ground fires, hence large-diameter and old-growth trees are present.

Table 9: Point Count Transect Summary on Caribou Ranch Open Space				
Transect	Habitat	# of Points in Transect	# of Species	Individuals per Point Count
CR02	Willow carr/Riparian	15	30	8.8
CR06	Mixed-conifer woodland	12	31	12.8
CR04b	Mixed-conifer woodland	7	20	7.9
CR05	Meadow/forest edge	10	28	8.1
CR01	Ponderosa pine forest	15	27	7.6
CR11	Lodgepole pine forest	14	20	6.9
CR10	Lodgepole pine forest	14	20	4.3
CR09	Lodgepole pine forest	20	18	4.0
CR08	Lodgepole/spruce-fir forest	16	18	6.6
CR13	Lodgepole/spruce-fir forest	8	15	4.1
CR12	Spruce-fir forest	10	16	5.5
CR04a	Mixed-conifer forest	8	11	3.2
CR07	Switzerland trail south multiple habitats	20	37	8.6
CR03	Switzerland trail north multiple habitats	20	35	8.1

See Figure 4 for transect locations.

Table 10: Local Breeding Bird Studies in Similar Habitat to Caribou Ranch		
Study	# of Species	Pairs of Breeding Birds Per Acre
Montane Willow Carr 8,500' (Hallock 1984b); Boulder County, Tucker Willow Carr	19	7.6
Montane Willow Carr 8,400' (Figgs 1984); Boulder County, Copeland Willow Carr	25	5.2
Mixed-Conifer Old-Growth 8,320' (Lederer 1987); Boulder County, Copeland Moraine	34	3.8
Mountain Meadow and Open Coniferous Forest 7,700' (Stiles-Wainwright and Wainwright 1984) Boulder County, near Kossler Lake	30	2.1
Aspen Grove 8,400' (Alles 1984); Larimer County, Rocky Mountain National Park	29	1.8
Ponderosa Pine/Douglas Fir Forest 8,800' (Snyder 1950); Boulder County, Mountain Research Station	15	1.0
Lodgepole Pine Forest 8,600' (Hallock 1989); Boulder County, near Nederland	13	1.0
Lodgepole Pine Forest 9,500' (Snyder 1950); Boulder County, Mountain Research Station	14	0.6
Spruce-Fir Forest 10,200' (Snyder 1950); Boulder County, Mountain Research Station	13	1.0
Old-Growth Spruce-Fir Forest 10,700' (Hallock 1988); Boulder County, Chittenden	20	1.6
Spruce-Fir Forest 10,100' (Alles 1985); Boulder County, Mountain Research Station	9	0.7

Large-diameter snags and deadfall are also present. This habitat type has not been well studied. The census by Lederer (1988), located in the Wild Basin entrance to Rocky Mountain National Park in northwest Boulder County, is probably the most typical. Species primarily restricted to this habitat type on the property include olive-sided flycatcher, western-wood pewee, mountain bluebird, Virginia's warbler and western tanager.

The meadow/forest edge point count transect included species found in both habitat types. Few species utilize only the meadow. Vesper sparrows are the only breeding species found during the study to be restricted to meadow habitat. The high species richness and abundance comes from the many adjacent forest and woodland species, including northern flicker, chipping sparrow and dark-eyed junco, that will utilize the resources found in meadows.

Ponderosa pine forests are fairly rich habitat, especially when compared to lodgepole pine and spruce-fir forests. Few species are found to be restricted to these forests. Pygmy nuthatch, white-breasted nuthatch and mourning dove were found only in these forests and mixed-conifer woodlands.

Lodgepole pine and subalpine spruce-fir forests are generally not considered to have high species richness nor abundance. This is substantiated by the point count transects and other local breeding bird studies. However, forests in the old-growth stage tend to have greater diversity and density of breeding birds (Hallock 1988). Small patches of old-growth spruce-fir are present on the property but they do not form extensive stands. Species restricted to the spruce-fir forests on the property during the breeding season include three-toed woodpecker, gray jay and pine grosbeak.

The two point count transects that followed the Switzerland Trail had high species richness and abundance because they traversed several habitat types. Both transects went through mixed conifer woodlands which made important contributions to the high counts.

Aspen forests were not inventoried because few sizeable stands are present on the property which lend themselves to the transect methodology. They generally have high species richness (Table 10) and should be viewed as important habitat for breeding birds. Few species are restricted to them, but several have high breeding densities including red-naped sapsucker, downy woodpecker, black-capped chickadee and warbling vireo. They are important habitat for many cavity-nesting birds. All three accipiter species will nest within aspen groves (Kingery 1998). It is interesting to note that warbling vireos were found in a high number of point counts during the inventory which indicates that aspen are present throughout the property. But there are few large stands.

SPECIES OF SPECIAL CONCERN

Species of Special Concern are those which have 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 Avian 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 11 species of special concern were seen within the study area during the 1999 breeding season (Table 11). One is of Primary Concern and 10 are Watchlisted. Following are species accounts and habitat requirements.

Ring-necked Duck

Ring-necked ducks are a watchlisted species. They are considered restricted breeders in the county by BCNA. They nest in the mountains in marshes adjacent to ponds. A pair was seen on the beaver ponds in the Delonde willow carr (Figure 5). Throughout the study season, a male was seen on the pond. Later in the breeding season, a hen with young were observed.

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 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 (2 m) in depth (Bellrose 1976).

Northern Goshawk

Northern goshawks are listed as a sensitive species by the Forest Service, watchlisted by CNHP, and considered restricted breeders by BCNA. A single goshawk nest was found on National Forest land within 1/4 mile of the property (Figure 6). Other observations were made, most in or near Delonde Gulch.

Goshawk nesting areas (approximately 30 acres [12 ha]) are generally located on a northerly aspect in a drainage or canyon, and are often near a stream (Reynolds et al. 1992). The nest area contains stands of large, old trees with dense canopy cover. This description matches the nest found in the study area, which is a small unnamed drainage that contains large-diameter conifers. Goshawks will use the nesting area from March through the end of September. During this time there should be minimal human presence in the nesting area.

The post-fledging family area generally covers approximately 400 acres (162 ha) around the nesting area. Though dominated by mature and old forests, it should contain a mosaic of structural stages and include small openings. Again, during the nesting period, human activity should be minimized in this area.

The foraging area is generally 5,000-6,000 acres (2024-2429 ha) in size around the nesting area. A mosaic of vegetation structural stages should be present along with large-diameter trees, snags and deadfall. The importance of the foraging area is to maintain prey. Openings and woody debris are important for some prey species while patches of high density mature trees are required for squirrels and other prey species.

Table 11: Avian Species of Special Concern Seen on Caribou Ranch Open Space
(**Bolded** species are of primary concern; non-**bolded** species are watchlisted)

Species	USFS	CNHP	PIF	BCNA
Ring-necked Duck				4
Northern Goshawk	S	W		4
Three-toed Woodpecker	S,M			4
Olive-sided Flycatcher	S			4
Pygmy Nuthatch	S,M			4
Golden-crowned Kinglet	S,M			4
Veery				3
MacGillivray's Warbler			1D	
Western Tanager			1D	
Savannah Sparrow				4
Fox Sparrow				4

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

Colorado Natural Heritage Program (CNHP):

1999 Conservation Status Handbook (CNHP 1999).

Categories: W - Watchlisted. Species do not meet the criteria for tracking nor harbor substantial conservation concern, but still should be monitored.

Partners in Flight (PIF):

Methods for Setting Bird Conservation Priorities for States 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 (1999).

Categories: 3 - Rare; 4 - Isolated or Restricted Populations (Species that are found only at certain locations and/or have narrow habitat niche)

FIGURE 5 - RING-NECKED DUCK

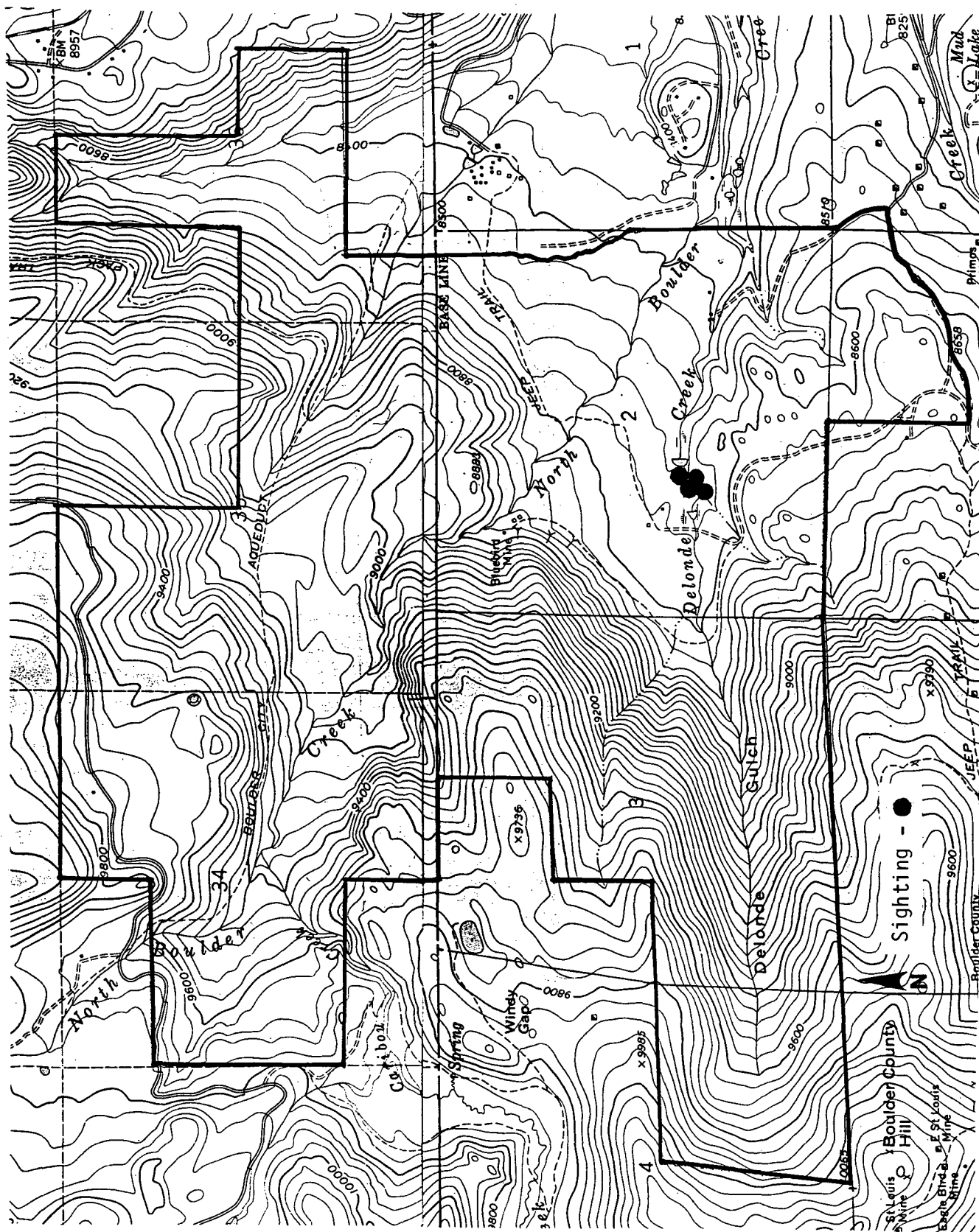
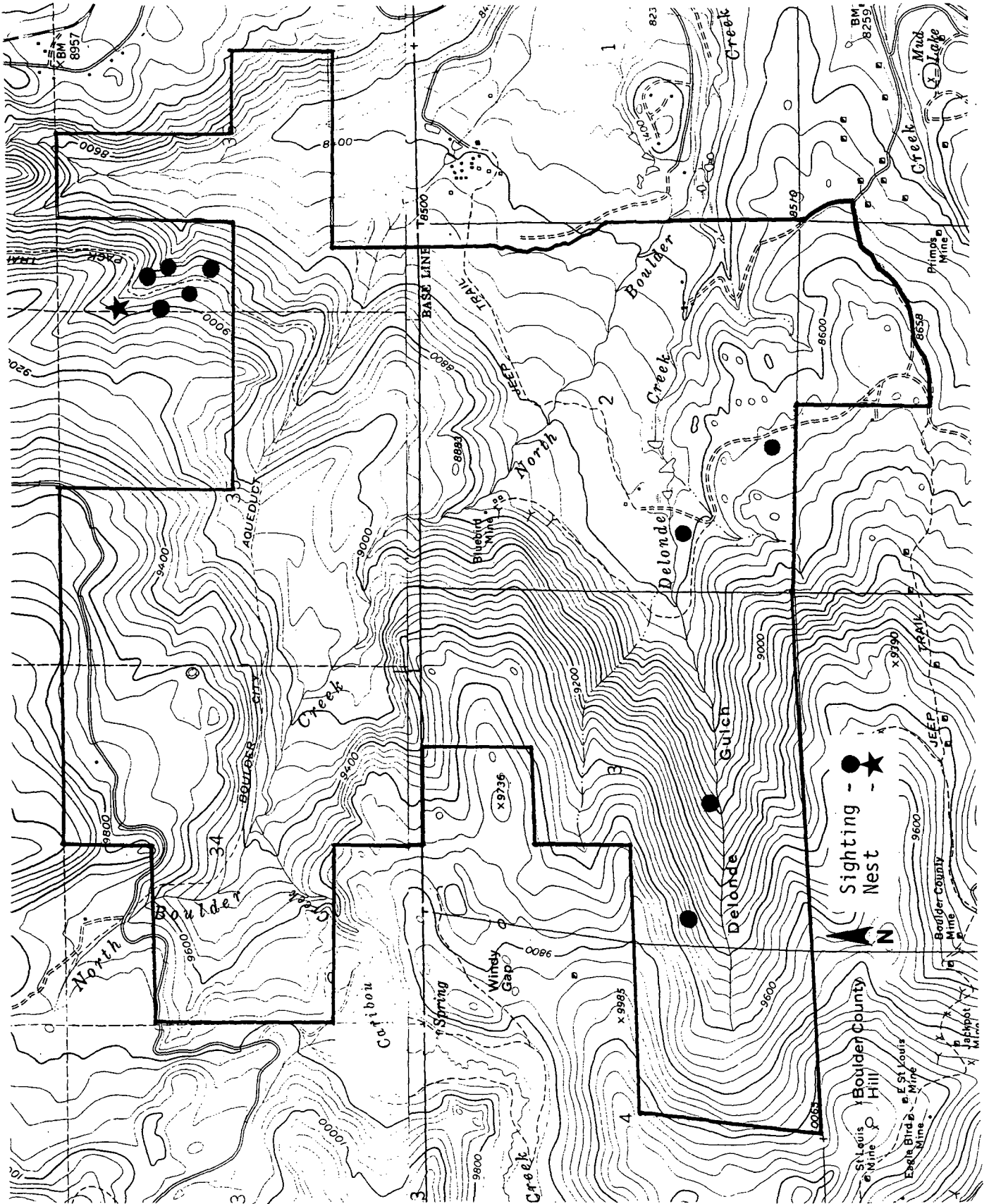


FIGURE 6 - NORTHERN GOSHAWK



The habitat around the located nest site matches the foraging area requirements. The variety in topographic aspect of the surrounding landscape provide of variety of dense forest, open woodland and meadow. Delonde Gulch also has suitable goshawk habitat for nesting and foraging.

Goshawks are considered fairly intolerant of human presence and need large blocks of effective habitat (Finch 1992). Known nesting locations in Boulder County are generally in areas with little human presence.

Three-toed Woodpecker

Three-toed woodpeckers are listed as USFS Region 2 sensitive species, a management indicator species by Arapaho and Roosevelt National Forests, and a restricted breeder by BCNA. A nest was located in upper Delonde Gulch (Figure 7). A pair of three-toeds was observed and young were heard within a tree-cavity located in an Engelmann spruce tree within a mature spruce-fir forest. A single female three-toed was observed in a mature spruce-fir forest west of North Boulder Creek.

Their most productive breeding habitat in Boulder County is mature to old-growth subalpine spruce-fir forest. They are also found in areas with high tree mortality due to recent fires or insect infestations, and may come down to lower elevation forests in search of the bark-boring insects that inhabit the recently killed trees. Their breeding territories are large, averaging 70 acres (30 ha) in size.

Olive-sided Flycatcher

Olive-sided flycatcher is a USFS Region 2 sensitive species and considered a restricted breeder by BCNA. They were observed singing at three locations on the property and at one site on Forest Service land just north (Figure 8). At three of the locations they were heard singing on more than one occasion.

Their breeding habitat generally has three basic components: tall conifers, snags and forest openings (Kingery 1998). They are birds of the forest and their favorite haunts are open coniferous woodlands. They are almost always perched on a snag or the dead limb of a living tree. The open habitat around the tree allows for easy sallying of flying insects. All four sighted locations on the property combined snags with forest openings, with three of the sites being well-developed mixed-conifer woodlands that contain large-diameter trees and snags.

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 forests located in the southeast corner and the mixed-conifer woodlands above Delonde and North Boulder creeks (Figure 9).

Pygmy nuthatches are considered excellent indicators of mature ponderosa pine forests. Because they usually drill their own cavities, they need mature ponderosa, with old or 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). As evidenced by where they were found on Caribou Ranch, the mixed-conifer woodlands provide excellent habitat for these nuthatches.

FIGURE 7 - THREE-TOED WOODPECKER

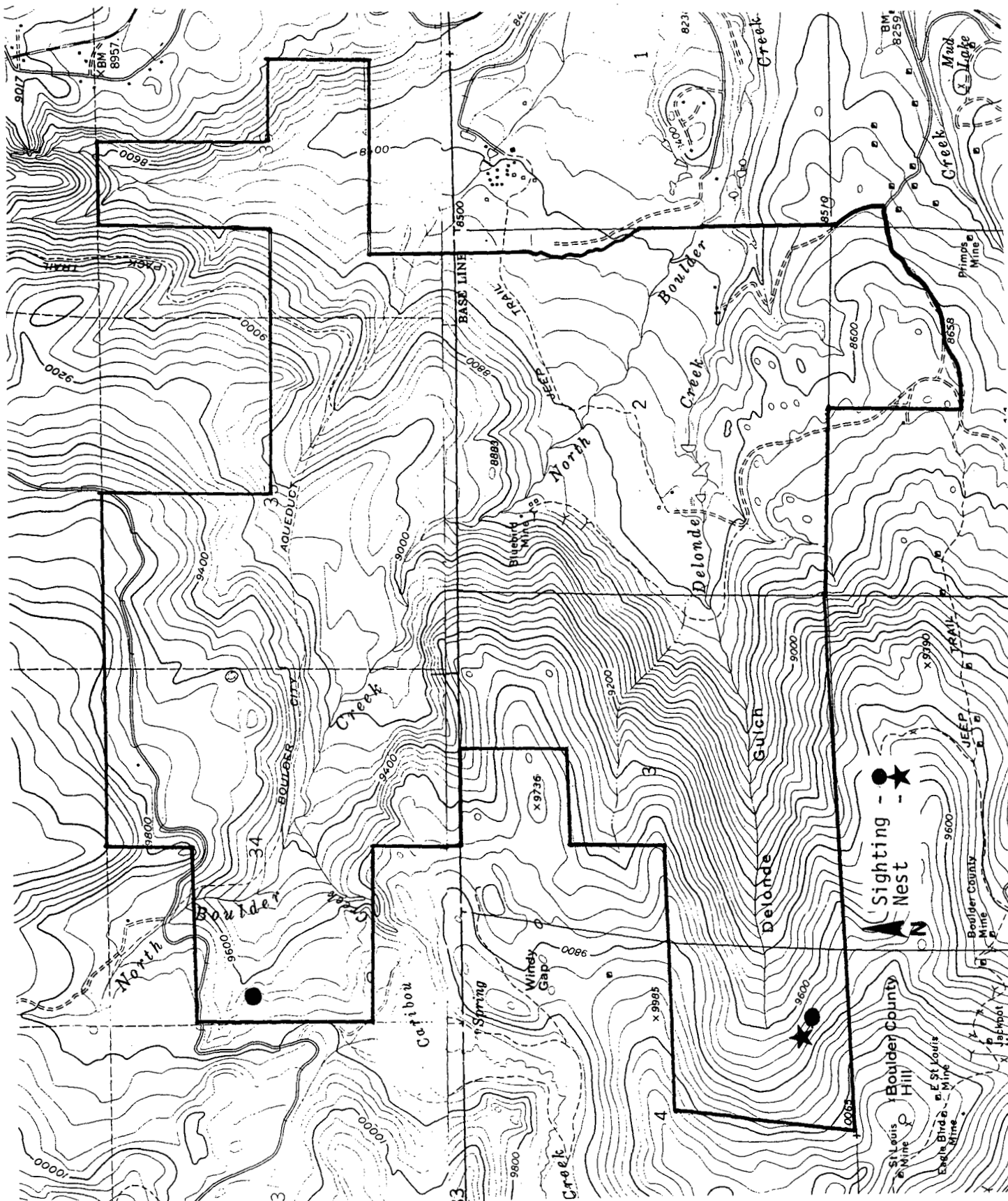


FIGURE 8 - OLIVE-SIDED FLYCATCHER

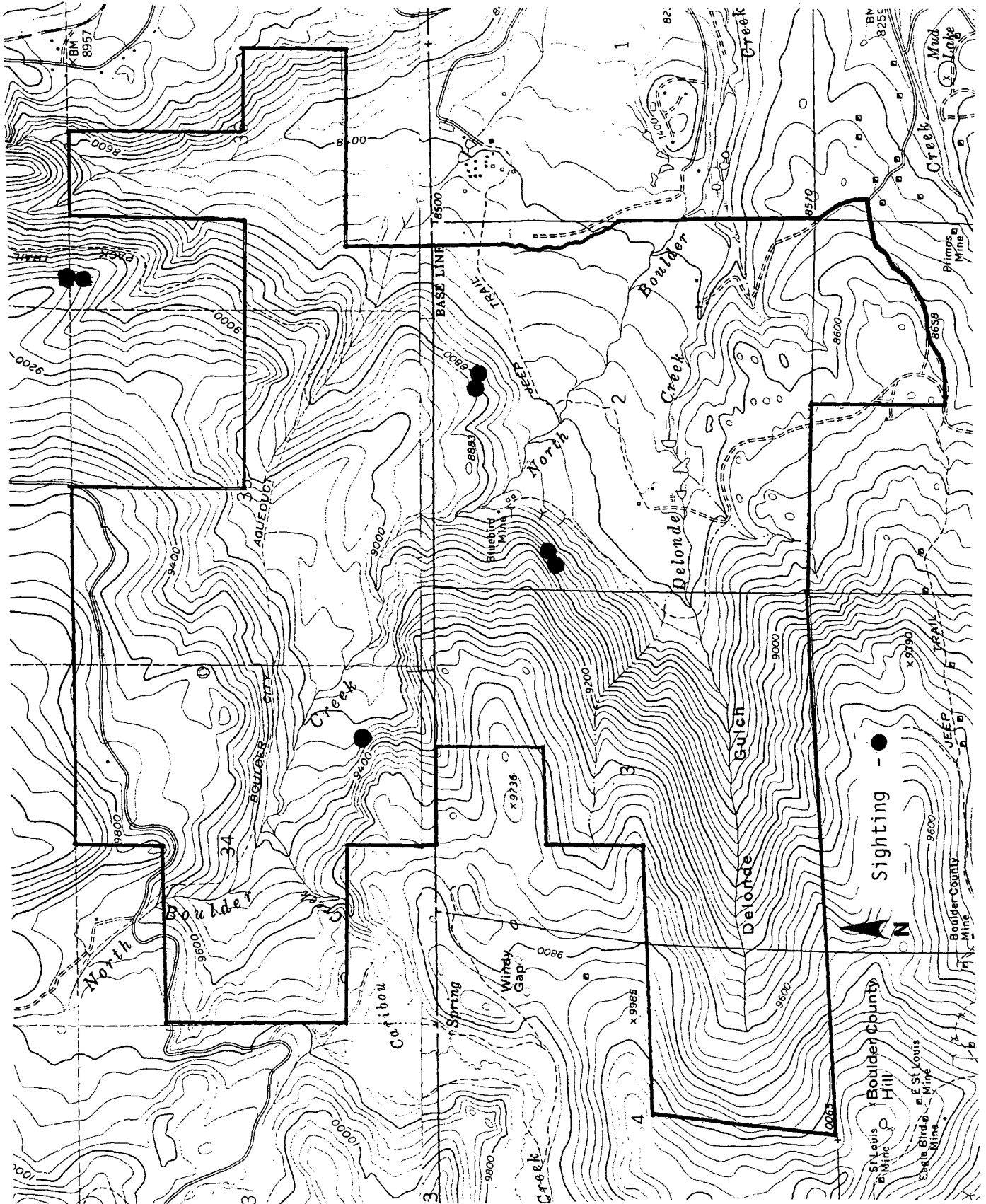
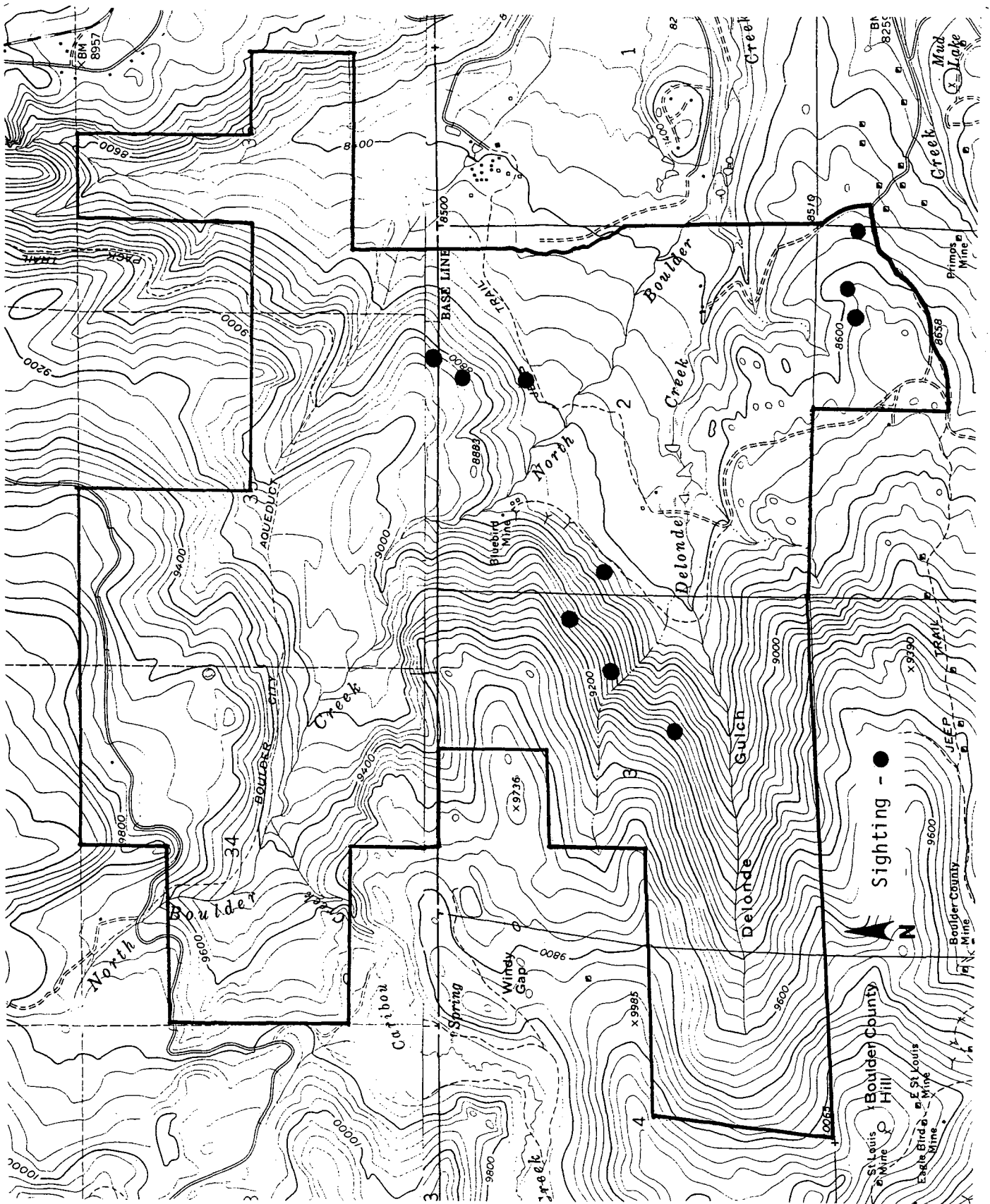


FIGURE 9 - PYGMY NUTHATCH



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 Delonde Gulch, and in several small ravines in the north half of the property (Figure 10).

They are birds of interior forests and tend to favor riparian coniferous forests with large-diameter trees (Kingery 1998). Engelmann spruce, subalpine fir and Douglas fir are preferred tree types. They glean for insects at the outer tips of boughs in foliage. During the study, their greatest numbers were found in the trees along Delonde Gulch. Most of the other locations where they were sighted had the habitat characteristics of large-diameter trees with water nearby.

Veery

Veeries are listed as a rare breeding species in Boulder County by BCNA. A single veery was observed in the Delonde willow carr (Figure 11).

Veeries are an infrequent breeder in Colorado (Kingery 1998). They are occasionally found in western Boulder County during the breeding season. Their preferred habitat includes moist, dense riparian thickets such as willow carrs. They nest on the ground.

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 along Delonde and Como creeks and in the shrub understories of mixed conifer woodlands (Figure 12).

Their habitat centers on shrublands in both wet and dry situations (Colorado Partners in Flight 1999). They are found in the Delonde willow carr, and additional riparian shrublands along Delonde and Como creeks. They are also present in the shrub understory of the south and east facing mixed conifer woodlands where they prefer the taller shrubs such as mountain maple.

FIGURE 10 - GOLDEN-CROWNED KINGLET

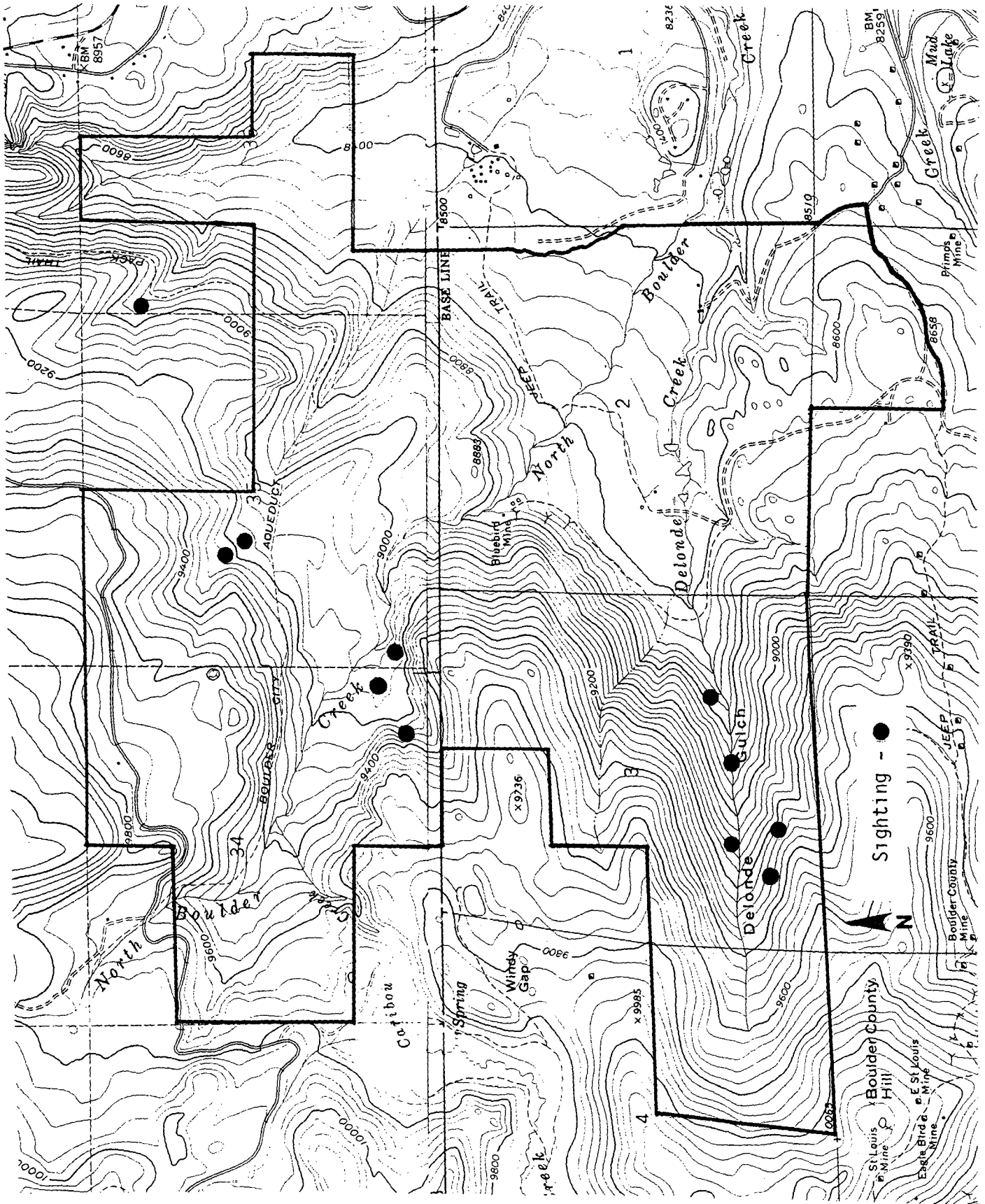


FIGURE 11 - VEERY

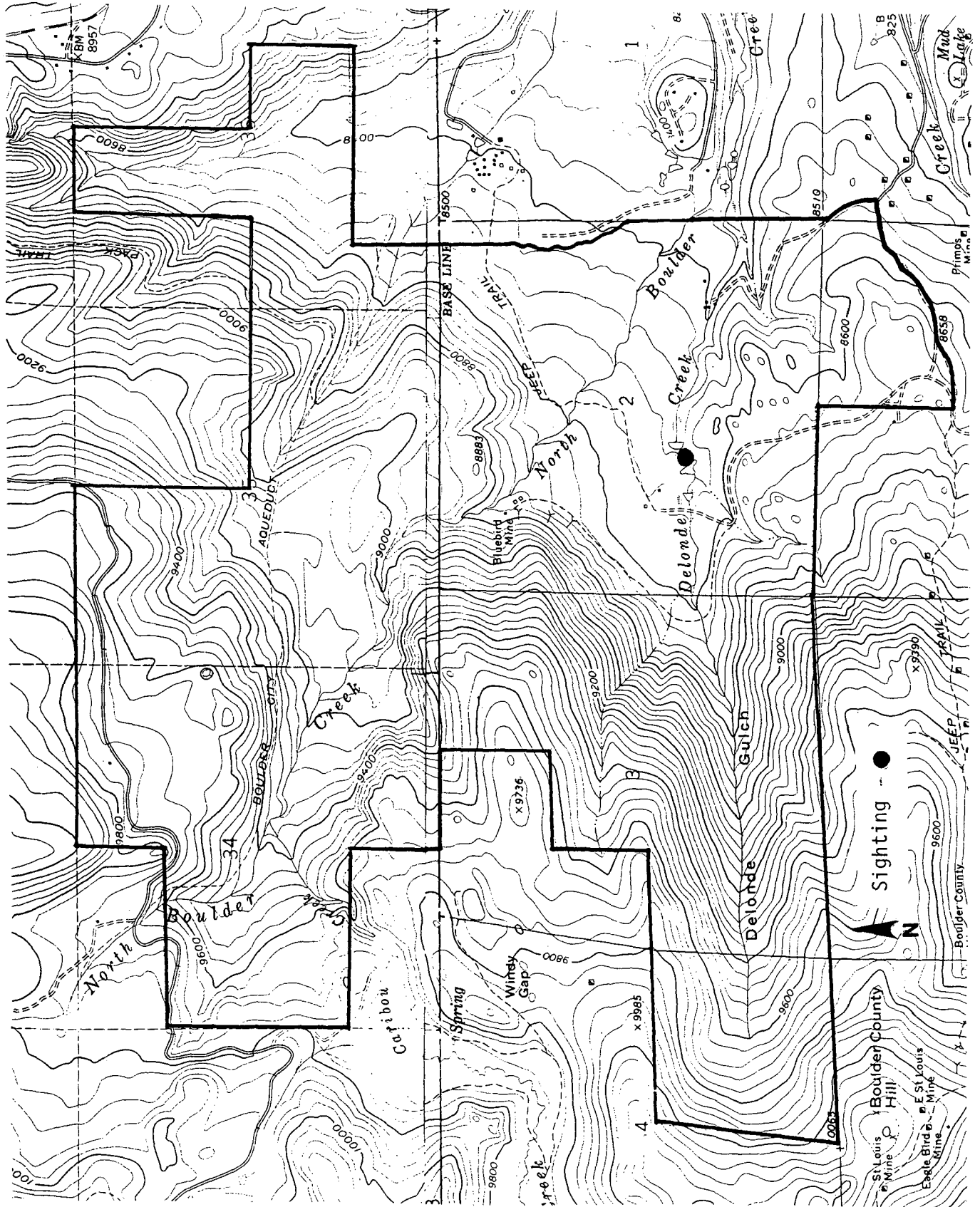
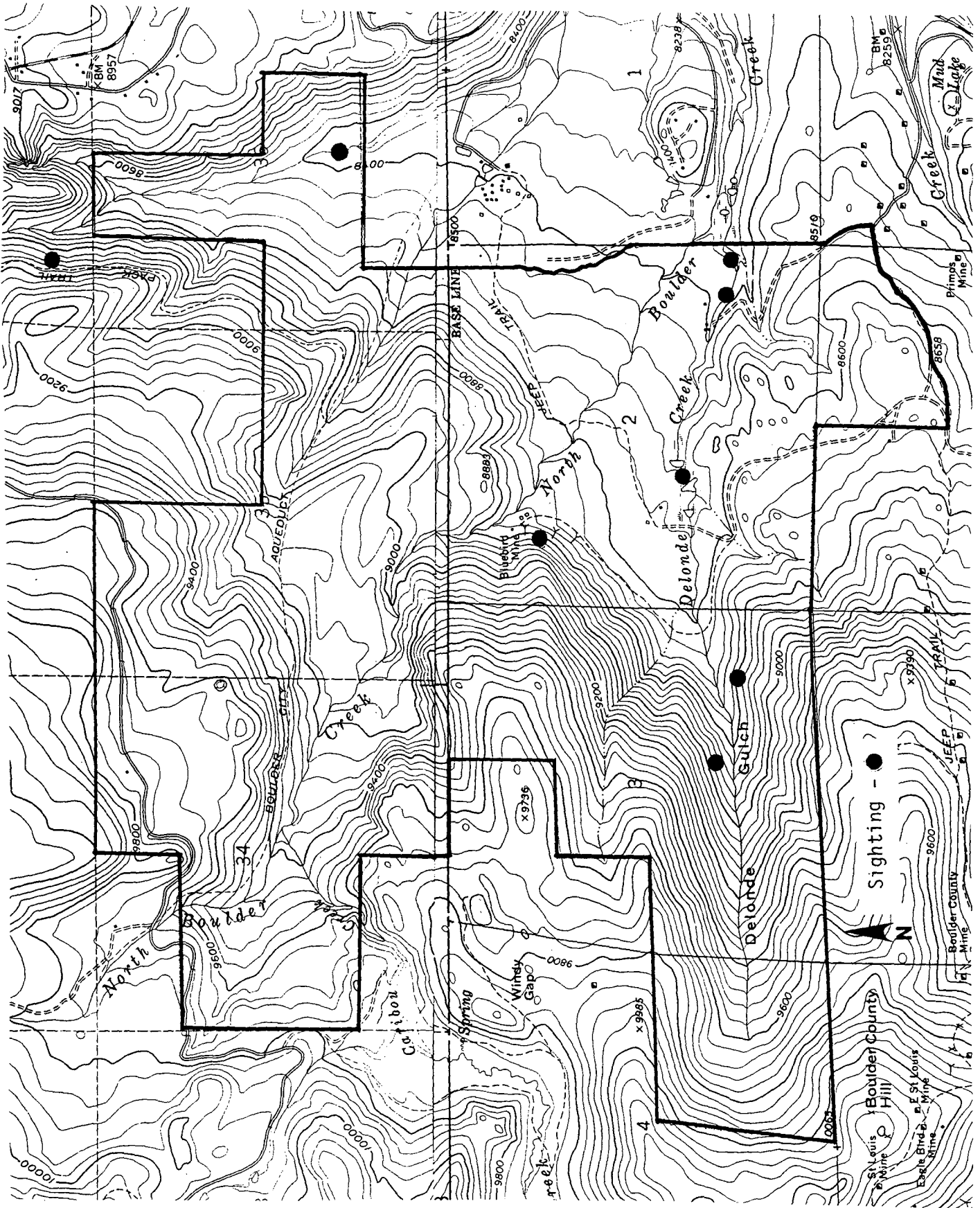


FIGURE 12 - MACGILLIVRAY'S WARBLER



Western Tanager

Western tanagers are listed by Partners in Flight because of a possible population decline in the American west. They were seen on Caribou Ranch in the mixed-conifer woodlands (Figure 13).

Though they breed in a variety of habitats, they prefer ponderosa pine and mixed-conifer woodlands (Kingery 1998). On Caribou Ranch they are seen in the mixed-conifer woodlands above Delonde Creek and farther north above and below the Switzerland Trail railroad grade. They typically place their nest on the branch of a conifer tree.

Savannah Sparrow

Savannah sparrows are considered restricted breeders by BCNA. They were seen on the property in the irrigated meadow along Como Creek (Figure 14).

Moist, grassy, mountain meadows provide their favored habitats in Colorado (Kingery 1998). Savannah sparrows were considered common breeders in Boulder County in the early part of the 20th century (Alexander 1937). It is probable they were more common during this earlier time period in the mountains because of more irrigated hay meadows. Their current habitat on Caribou Ranch are the wet meadows. Their nests are placed on the ground. In western Boulder County they are also found in natural wet meadows such as the wetland around Giggey Lake along Magnolia Road. Their numbers appear to have declined since the early 1900s, but their numbers back then were probably artificially high.

Fox Sparrow

Fox sparrows are listed as USFS Region 2 sensitive species and restricted breeders by BCNA. They were observed on the property in the Delonde willow carr (Figure 15).

Dense thickets of shrubs associated with streams are the preferred habitat in Colorado (Kingery 1998). They also tend to have larger breeding territories than other sparrows of riparian shrublands (Hallock 1984b) so require a dense shrub thicket several acres in size. On Caribou Ranch, they were found only in a willow and alder shrub thicket along Delonde Creek. Here, beaver have dammed the river leading the development of a sizeable shrub thicket. The Delonde willow carr is sized to support 1 to 2 breeding pairs. Fox sparrows place their nest on the ground or slightly elevated near the base of a shrub.

CORVIDS, AGRICULTURAL AND URBAN SPECIES

Several species of birds, particularly corvids and cowbirds, are of interest because of their response to land use change and their impacts on other avian species. Their numbers are of interest because they can have adverse impacts on the nesting success of other birds, particularly open-cup nesting neotropical species, including dusky flycatcher, warbling vireo, yellow warbler, Virginia's warbler and western tanager. Future monitoring should focus on the numeric and locational changes of these species in relation to land use alterations, particularly recreation

FIGURE 13 - WESTERN Tanager

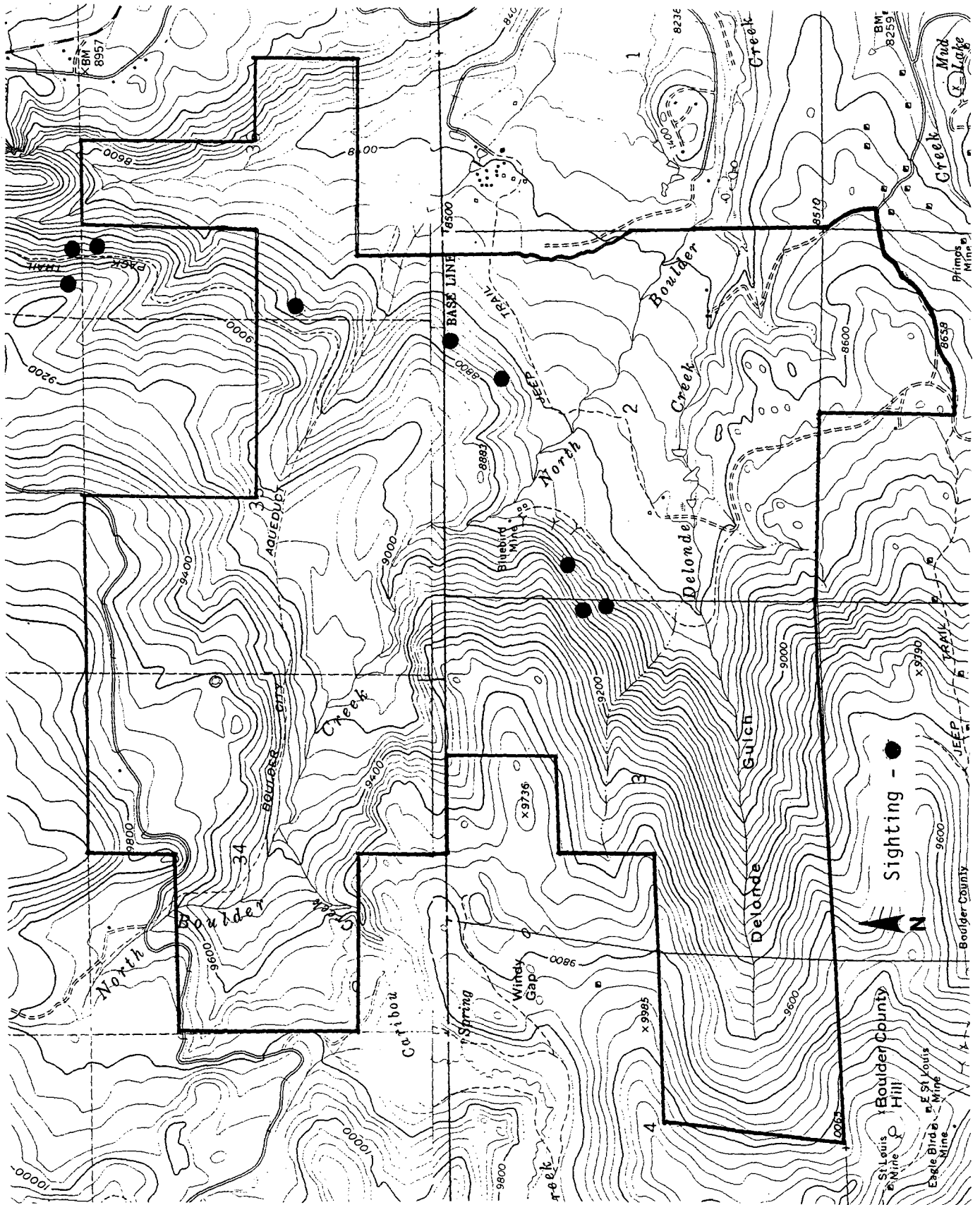


FIGURE 14 - SAVANNAH SPARROW

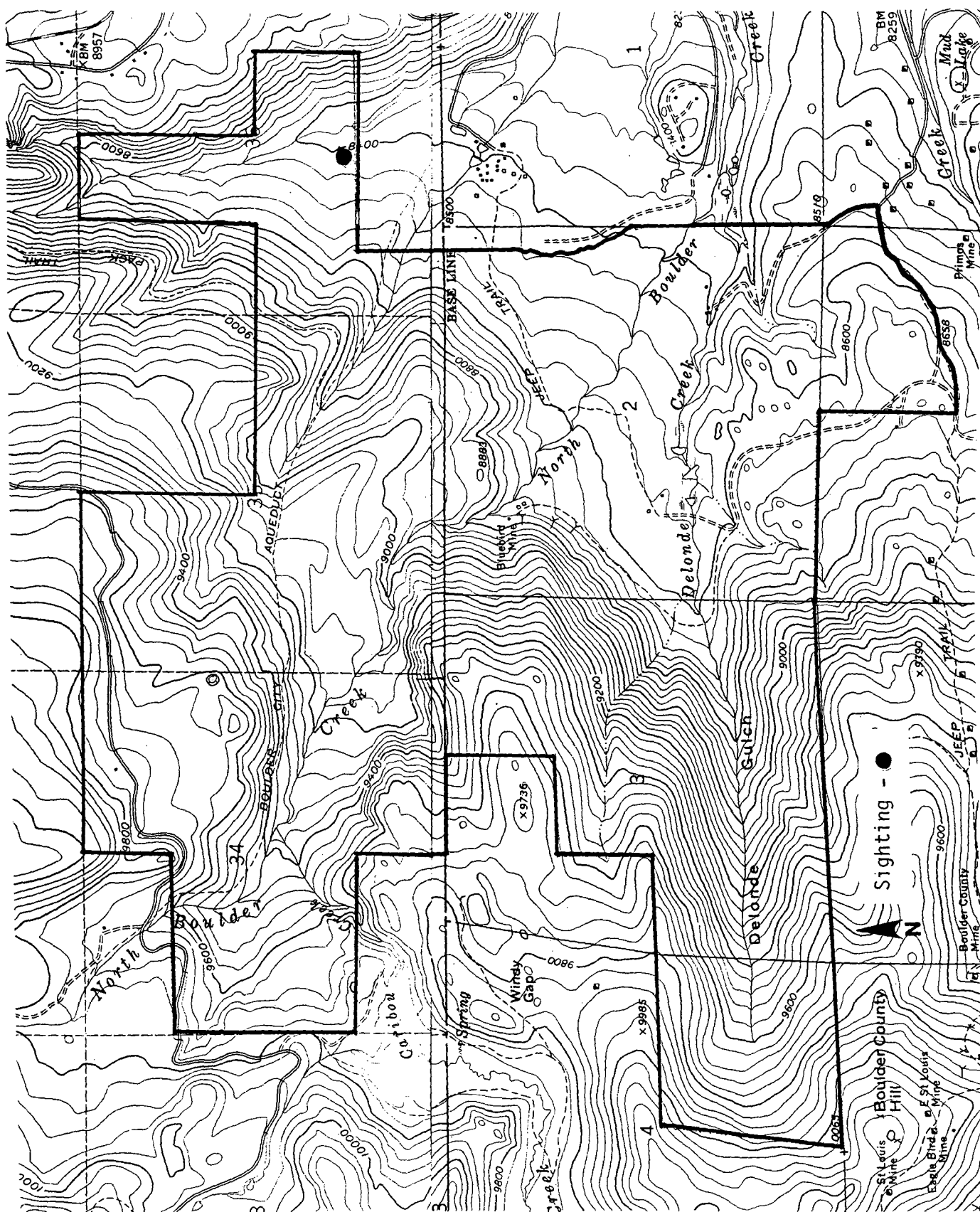
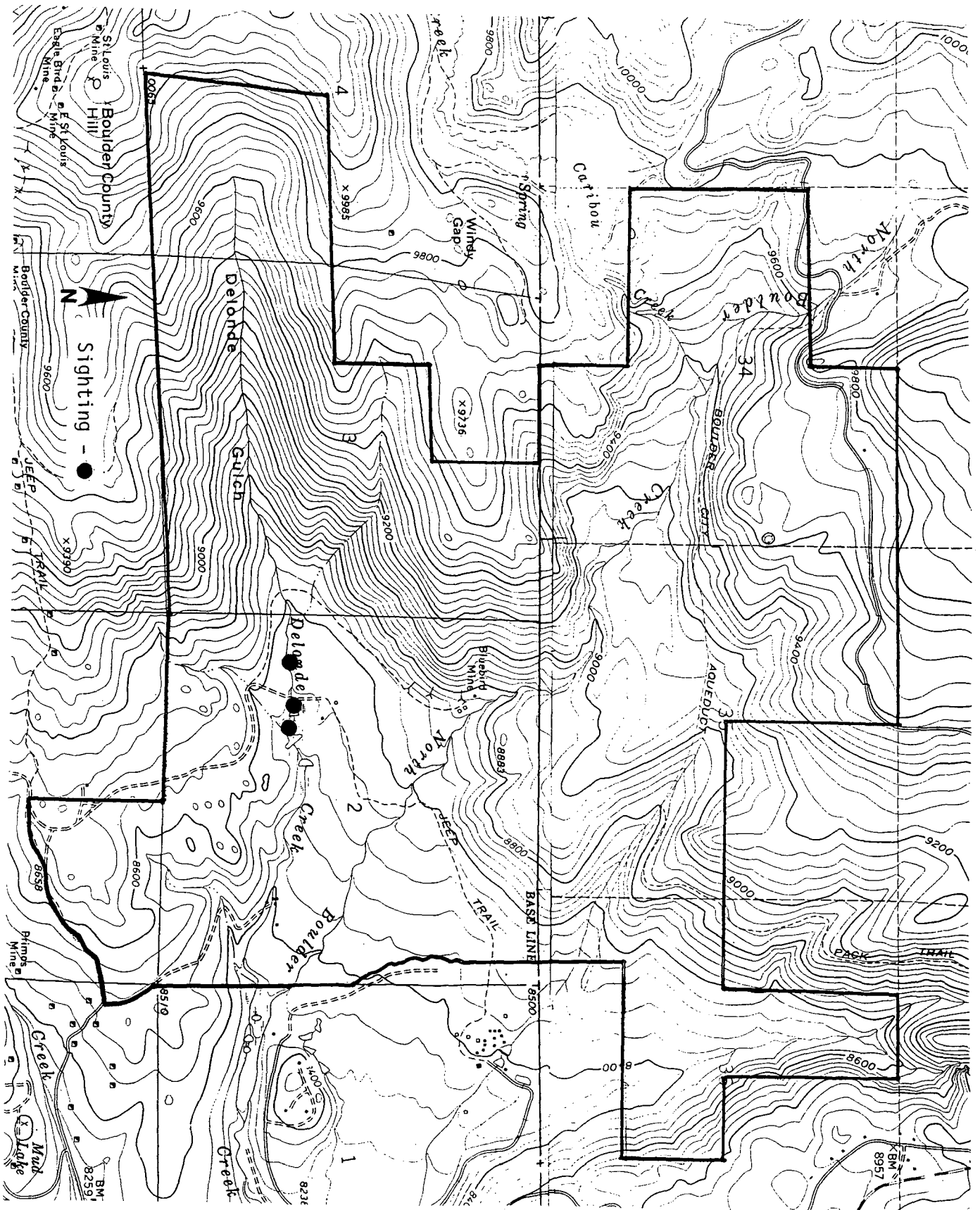


FIGURE 15 - FOX SPARROW



and grazing.

Birds in the family *Corvidae* (jays, nutcrackers, magpies, ravens and crows) function as nest predators and thrive in areas with greater human presence (Craig 1997). Steller's jay is the most common corvid currently found on the property (Table 12). Most are found in mixed-conifer woodlands and ponderosa pine forests. Clark's nutcracker is a distant second in abundance with most being seen in Delonde Gulch. Corvids appear to be increasing in western Boulder County over the past two decades, with American crow having the greatest numeric increase (Hallock 1998). Craig (1997) found significantly higher numbers of Steller's jay, common raven and black-billed magpie in a rural residential region of Boulder County (near Sugarloaf Road) than in a less developed landscape (North St. Vrain). He also documented higher nest predation rates in the rural residential landscape.

Brown-headed cowbirds are brood parasites who lay their eggs in the nests of other birds, often reducing the nesting success of the host species. They breed and forage in different habitats, generally searching for nest hosts near the edges of woodlands or forests while foraging for seeds and arthropods in open areas, often in association with livestock (Rothstein et al. 1980). Their abundance increases when humans provide foraging opportunities (e.g., seeds, livestock). Their impacts to host species increases with additional forest fragmentation and edge. During the point count transects, cowbirds were most often seen in meadow, willow carr and woodland habitats. Few were observed in the coniferous forests on the western half of the property.

Two other species related to agricultural landscapes, Brewer's blackbird and common grackle, were present on the property but not recorded along the point count stations.

European starling, house sparrow and house sparrow are noted urban species; they are generally found in close proximity to high densities of human habitation. None were observed on the property during the study. They are found within the vicinity, particularly in Nederland and along Sugarloaf Road (Hallock 1998). Their presence should be monitored in the future to track avian community changes in relation to surrounding and on-site land use changes.

Species	# of Individuals	# of Point Counts	Other Species Seen
Gray Jay	2	1	
Steller's Jay	36	34	
Clark's Nutcracker	11	7	
Black-billed Magpie	5	4	
American Crow			X
Common Raven	6	4	
Brewer's Blackbird			X
Common Grackle			X
Brown-headed Cowbird	12	10	

DISCUSSION

HABITAT OF SPECIAL INTEREST

The results of the study indicate there are areas on the property that warrant special attention. 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 a complex of species of concern. Two habitat types covering six geographic areas stand out: mixed-conifer woodlands and montane willow carrs. Additionally, the nesting and post-fledging family areas for northern goshawk also warrant special attention.

Following are descriptions of these sites (Figure 16).

Mixed-Conifer Woodlands

Mixed-conifer woodlands are rich avian habitats and have a high abundance of breeding birds. Additionally, four species of special concern are present: olive-sided flycatcher, pygmy nuthatch, MacGillivray's warbler and western tanager. There are a number of species found primarily in this habitat on the property, including olive-sided flycatcher, western-wood pewee, mountain bluebird, Virginia's warbler and western tanager.

Mixed-conifer woodlands occupy steep south to southeast facing aspects on the property. The aspect provides for a micro-habitat with increased solar radiation. This seems to favor grasses over conifer reproduction, as well as a probable increase in the return interval of fire when compared to surrounding forests. The open canopy results in ground fires which spare trees that are well enough developed to resist such events, but generally lethal to many smaller seedlings and saplings, further perpetuating the open structure.

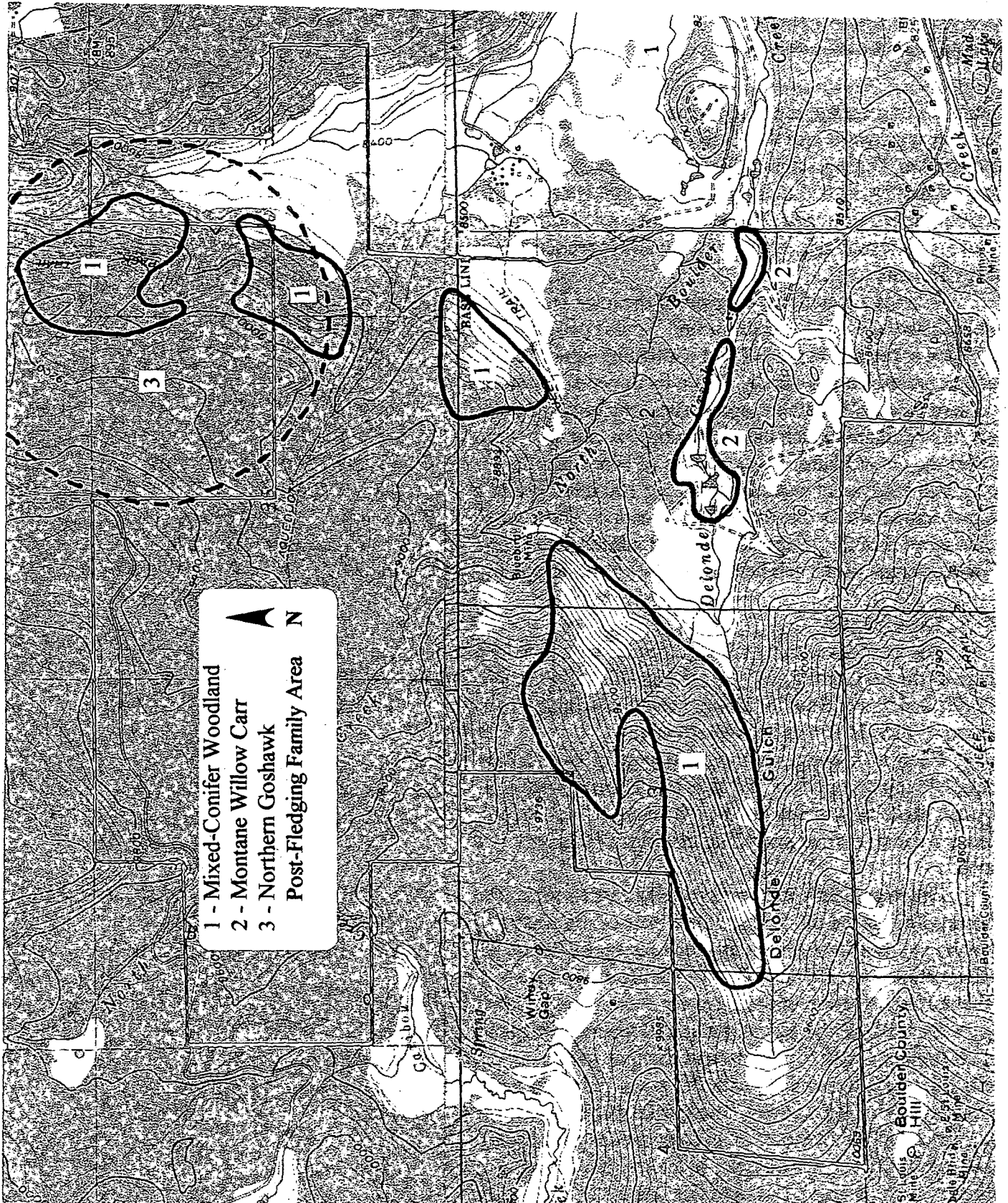
Ponderosa pine and Douglas fir are the dominant tree types. Large-diameter trees, snags and deadfall (over 50 cm [20"] DBH) are present, further increasing the structural diversity of these stands. Small patches of aspen are present in these sunny, open exposures. The open structure is favorable to the presence of understory shrubs, including big sagebrush, Rocky Mountain maple and chokecherry. Small patches of denser mixed-conifer forest are present, particularly in ravines with east to northeast aspects.

The overall high structural diversity results in a habitat rich for breeding birds. The open canopy allows for the presence of aerial salliers, such as olive-sided flycatcher and western wood-pewee. Large-diameter trees result in the presence of many cavity-nesters and late-successional specialists, including pygmy nuthatch and northern saw-whet owl. Patches of understory shrubs create nesting sites for dusky flycatcher and MacGillivray's warbler.

Mixed-conifer woodlands should be retained on the property. Structurally, the most important features appear to be an open canopy along with large-diameter trees, snags and deadfall. These features should be retained. Management activities (e.g., mechanical thinning, prescribed fire) should be conducted with an objective to retain the openness of these stands along with large-diameter trees, snags and deadfall.

The location of these stands is related, to a large extent, to their aspect and topographic

FIGURE 16 - AVIAN HABITAT OF SPECIAL INTEREST ON CARIBOU RANCH



position which favor an open canopy along with grass and shrub development. It is probable that these stands are smaller in extent and have denser canopies than during the pre-settlement era due to 20th century land use practices, particularly fire suppression and over-grazing by livestock, which allowed greater conifer regeneration (Veblen and Lorenz 1991, Veblen et al. 1996, Brown and Sieg 1996). Active management aimed at expanding the coverage of these stands and diminishing understory regeneration should be considered, but needs to recognize the locational advantage of woodlands on these sites and be balanced with the likely disturbance regimes of the surrounding landscape.

Montane Willow Carrs

Montane willow carrs are rich avian habitats and have a high abundance of breeding birds. Their density of breeding birds is considered the highest of any habitat in Boulder County. Additionally, four species of special concern are present: ring-necked duck, veery, MacGillivray's warbler and fox sparrow. This habitat has the highest number of breeding species (21) which are restricted in breeding to a few habitat types on the property, including mallard, green-winged teal, ring-necked duck, sora, killdeer, spotted sandpiper, belted kingfisher, northern rough-winged swallow, American dipper, veery, Swainson's thrush, yellow warbler, Wilson's warbler, fox sparrow, song sparrow, black-headed grosbeak and red-winged blackbird.

Montane willow carrs are found where creeks flow through broad, flat floodplains. These sites are the most likely locations for long-term beaver habitation. Beavers dam the creek and raise the water table allowing for wetland vegetation to expand in coverage. The vegetation is dominated by tall, deciduous shrubs interspersed with wet meadows, open stream channels and beaver ponds. CNHP (1999) characterized the plant community as Geyer willow-mountain willow/bluejoint reedgrass deciduous alluvial shrubland. Sites dominated by Geyer willow appear to be stable, long-lived communities. Beaver activity is important in maintaining this plant community (Cooper and Cottrel 1990).

The Delonde willow carr is located along Delonde Creek below the Switzerland Trail railroad grade. Here, there is an active beaver colony. Below these beaver dams the floodplain becomes more constricted and the riparian shrubland is found closer to the creek. A second beaver colony is found below the Forest Lakes housing complex.

The mixture of tall shrubs, wet meadows, stream channels and beaver ponds provide good habitat diversity. Avian use is dominated by neo-tropical migrants, especially several types of warbler and sparrow, as well as dusky flycatcher, veery, Swainson's thrush and black-headed grosbeak, who nest and feed in the shrubs or on the ground below. The beaver ponds and adjacent patches of sedge-reedgrass meadows provide nesting habitat for waterfowl and sora. Swallows, who generally nest in adjacent forests, find rich food caches in the insects that breed on the ponds. Dippers and kingfishers nest in the streambank.

The importance of montane willow carrs make them a significant habitat worthy of protection and special management. Structurally, willow carrs are a mosaic of shrubs, wet meadows, ponds and stream channels; all of these components are needed for the richest habitat. Retaining an adequate flow of water and an active colony of beaver are significant to these sites. Grazing practices need careful management in order to minimize impacts to the vegetative structure and the hydric soils. Expansion of the Delonde willow carr may be possible and should be considered.

Nearly 20% of montane and subalpine willow carrs in Boulder County have been lost to adverse land use practices including conversion to pasture, filling for parking lots or home sites, peat mining and inundation by reservoirs. (Hallock 1984). Besides the Delonde site, the most significant montane willow carrs in Boulder County are Wild Basin, Tucker Homestead and Arapaho Ranch.

Important Habitat for Northern Goshawk

Northern goshawks are listed as a sensitive species by the Forest Service, watchlisted by CNHP, and considered restricted breeders by BCNA. They were under consideration for Federal listing under the Endangered Species Act several years ago, but the available data were not conclusive enough to warrant such designation.

One goshawk nest was found on National Forest land within 1/4 mile of the property. The habitat matched that described by Reynolds et al. (1992) as being preferred by goshawks for nesting. The nest is on the northern aspect of a small drainage that contains a closed canopy stand of uneven-aged mixed conifer trees, some of which are large-diameter. The post-fledging family area (PFA), which surrounds the nest area, is generally 400 acres (162 ha) in size. It is an area of concentrated use by the goshawk family where young are taught to hunt. The nest site and PFA are used from March through the end of September. During this time there should be minimal human presence around the nest and within the PFA.

Northern goshawks nest throughout western Boulder County. Almost all known nesting sites are located away from homes, roads and trails. The nest site found near Caribou Ranch is adjacent to the Switzerland Trail railroad grade, a feature which currently receives very low recreational use. Observations made during this study indicated that the goshawks paid close attention to people present in the area by continually giving the alarm call. It is highly likely that an increase in trail use in the vicinity of the post-fledging family area will cause abandonment of this nest site. A 1/2 mile buffer where human use is minimized should be retained around the nest from March through the end of September in order to protect this nesting pair of raptors.

Northern goshawks were observed on the property, mostly in the vicinity of Delonde Gulch. No nest was found nor were any post-fledging family groups observed. Only individual goshawks were seen, suggesting that this area is being used for hunting by adults. Nesting is certainly a possibility for the area and additional surveys are warranted.

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 mixed-conifer woodland or lodgepole pine forest, montane willow carr or meadow. 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, much like photos indicate it was 75 years ago. Some vegetation types are more dynamic than others in terms of their rate of change due to disturbance. The locations of montane willow carrs, kettle ponds or riparian areas are highly influenced by geology and hydrology. The locations of mixed-conifer woodlands are largely determined by

topography and aspect. The changes in location, or even presence and absence, of lodgepole pine, aspen and spruce-fir forests represent a shifting mosaic which moves at a faster speed.

Aspen is currently not well represented on the property in extensive stands. 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 high habitat effectiveness by providing sizeable blocks of land where recreational use is discouraged and fragmentation is minimal. This will benefit species with large territories, such as northern goshawk, 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.
- Riparian areas and wetlands should be treated as significant habitat and managed with the goal of maintaining and, where appropriate, enhancing their values for wildlife.
- Meadows are important hunting and foraging areas for some avian species and should be retained and perpetuated. The largest meadows on the property are situated in areas where alluvial soils appear to provide some competitive advantage to grasses.
- Continued research and monitoring should focus on the following: the status of the known goshawk nest; the status and distribution of other species of concern; and the continued surveying of point count transects as an index of change in the numbers of avian species in response to recreational and other land use changes on the property.

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