

**WINTERING RAPTOR POPULATIONS IN  
BOULDER COUNTY, 1983-1996**

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## **Introduction**

Since 1983 Boulder County Nature Association (BCNA) volunteers have counted wintering raptors along survey routes scattered throughout the plains of Boulder County. We initiated the surveys during a time when intensified poisoning efforts by private landowners and government agencies appeared to threaten prairie dog populations in parts of Boulder County. Some of these poisonings were occurring in the Boulder Reservoir area, where Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles gathered each winter. We wanted to observe the effects of fluctuating prairie dog populations on these and other species. We also hoped to locate wintering raptor concentration areas, such as Bald Eagle roosts, Northern Harrier roosts and large prairie dog colonies, so that these areas could be protected.

Throughout the 13 years of our survey effort, we have shared our data with the City of Boulder Open Space Department, the City of Boulder Parks and Recreation Department, and the Boulder County Parks and Open Space Department. BCNA has worked closely with these agencies to protect wintering raptor habitat. A Bald Eagle winter roost along Left Hand Creek, near Haystack Mountain, has been designated as "critical wildlife habitat" on the County Comprehensive Plan. The City has created wetlands on the west side of Boulder Reservoir to provide nesting and foraging habitat for Northern Harriers and Short-Eared Owls. BCNA has helped the City of Boulder Open Space Department draft a prairie dog management plan that recognizes the importance of prairie dog-raptor associations and commits the City to monitoring prairie dog and raptor populations.

Despite these efforts, wintering raptor populations in Boulder County appear to be declining. This decline is most apparent in southeastern Boulder County where a proliferation of subdivisions and golf courses has replaced native grasslands. In the triangle of land bounded by the Boulder-Denver Turnpike (U.S. 36) to the north, the Foothills Highway (S.H. 93) to the west, and the Jefferson County Line to the south, numbers of Ferruginous Hawks and Bald Eagles seen on winter raptor surveys declined by more than 85% from 1993-96 as one prairie dog colony after another succumbed to development.

## **Methods**

We began driving a single 19 km survey route in the Boulder Reservoir-Haystack Mountain area during the winter of 1983-84 (Figure 1). In 1989-90 we added additional routes in the Rabbit Mountain-Hygiene Road area (43 km), the South County area between the foothills and McCaslin Blvd. (32 km), and the Southeast County area between McCaslin Blvd. and Broomfield (19 km).

Volunteers drive each route 5-15 times on calm days between 15 October and 15 March. Teams of 1-3 volunteers drive at a steady rate of 40 km/hr, stopping only when they see a perched or flying raptor with the naked eye. They then get out of the car, identify the raptor and any other raptors visible from the stopping point, and mark the raptors' locations on a 7-1/2' topographic map.

We did not attempt to control for biases related to having varying numbers of observers in each vehicle and conducting counts at varying times of day under varying weather conditions.

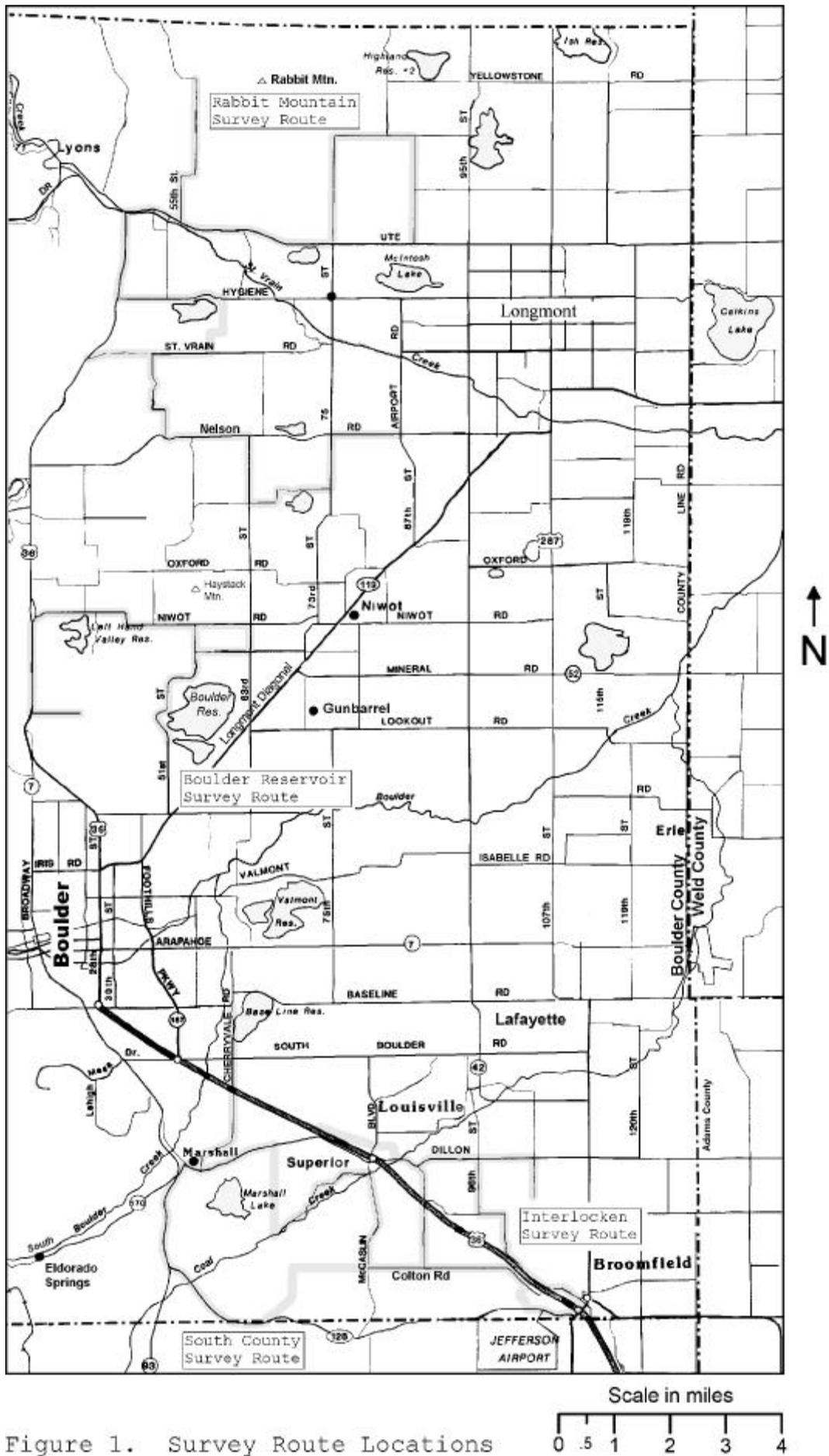


Figure 1. Survey Route Locations

However, results obtained by a single individual who drove the Boulder Reservoir route at least four times yearly from 1989-95 differed little (less than 25% for most species during most years) from results obtained by groups of 1-3 different observers who drove the same route during the same period.

From 1984-85 to 1986-87, we mapped prairie dog colonies within all 2.6 km<sup>2</sup> land sections intersected by the Boulder Reservoir survey route. We then estimated the percent of land within these sections that was occupied by active prairie dog colonies. The Boulder County Health Department conducted countywide estimates of prairie dog populations in 1985 and 1986 (Boulder County Health Department 1987). The City of Boulder Open Space Department analyzed aerial photographs to estimate prairie dog colony sizes on Boulder Open Space during the years 1937-38, 1955, 1958, 1974, 1992, and 1993.

## **Results and Discussion**

Christmas Count data suggest that wintering raptors, particularly those that feed on prairie dogs, were less numerous in Boulder County during the 1950s and 1960s than during the 1970s, 1980s, and 1990's. Prior to 1970, Ferruginous Hawks, which hunt prairie dogs, and Bald Eagles, which scavenge prairie dogs from Ferruginous and Red-Tailed Hawks (Jones 1989), were rarely seen in Boulder County. On 21 Boulder Audubon Christmas Counts conducted from 1950-70, observers reported a total of only one Ferruginous Hawk and no Bald Eagles. During the same period, observers on the Longmont count reported a total of only 6 Ferruginous Hawks and 16 Bald Eagles.

The scarcity of Bald Eagles on these counts probably reflects a nationwide decline in Bald Eagle populations throughout the first half of the century. The scarcity of Ferruginous Hawks is more difficult to explain. We initially suspected that prairie dog colonies must have been nearly nonexistent in Boulder County during the 1950s and 1960s. The City of Boulder Open Space Department's analysis of 1955 and 1958 aerial photographs of the Boulder Valley suggest that this was not the case. In fact, these data suggest that prairie dog populations in the Boulder Valley were approximately as high in 1955 and 1958 as in subsequent years (Table 1).

Table 1. Estimated Boulder Valley Prairie Dog Populations from Aerial Photography<sup>1</sup>

<u>Coverage Area</u>	<u>1937</u>	<u>1955</u>	<u>1958</u>
Total Photo Coverage (acres)	28527	63186	46335
Land with Burrows (acres)	130	3299	2553
Land with Burrows as Percentage of Total	0.4	5.0	5.2

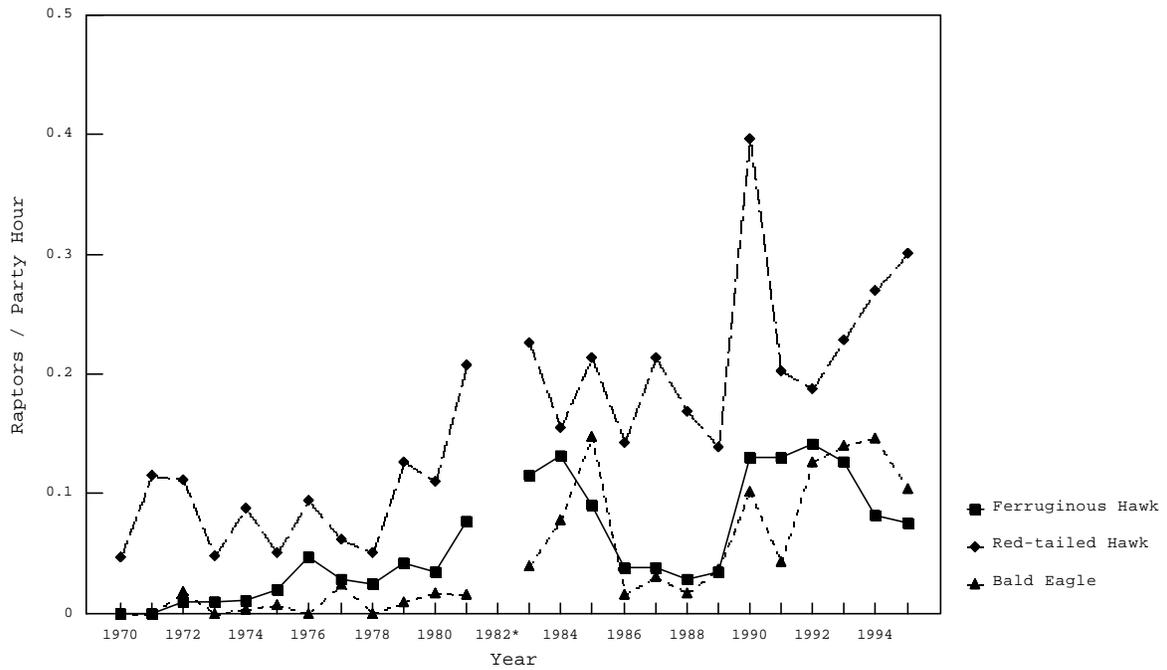
<sup>1</sup>Margulies 1995.

Because prairie dog populations fluctuate dramatically in response to plague epizootics and changing land uses, data collected from 6 years of a 56-year period may not provide an accurate picture of long-term population trends. Also, aerial photographs show where burrows were located but do not indicate whether burrows were occupied. Prairie dog populations may have been depressed throughout much of the 1950s and 1960s, or the scarcity of wintering Ferruginous Hawks may reflect regional or national Ferruginous Hawk population trends that have not been documented.

During the late 1970's and early 1980's, prairie dog colonies appeared to expand in many areas of the county as government open space programs and private developers acquired agricultural lands on the periphery of expanding urban centers. By 1985, according to Boulder County Health Department estimates, there were more than 200 active prairie dog colonies in Boulder County. Numbers of Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles seen on Boulder Audubon Christmas Counts increased throughout the 1970's and early 1980s (Figure 2).

During the first three years of the BCNA winter raptor survey, numbers of prairie dogs in the Boulder Reservoir region increased steadily (Table 2). Numbers of Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles seen on the Boulder Reservoir survey route more than doubled from 1984-86 (Table 2, Figure 3).

Figure 2. Boulder Audubon Christmas Count, Prairie Dog Dependent Species, 1970-1995



\*Complete data are not available for the 1982 count.

Figure 3. Boulder Reservoir, Prairie Dog Dependent Species, 1984-1996

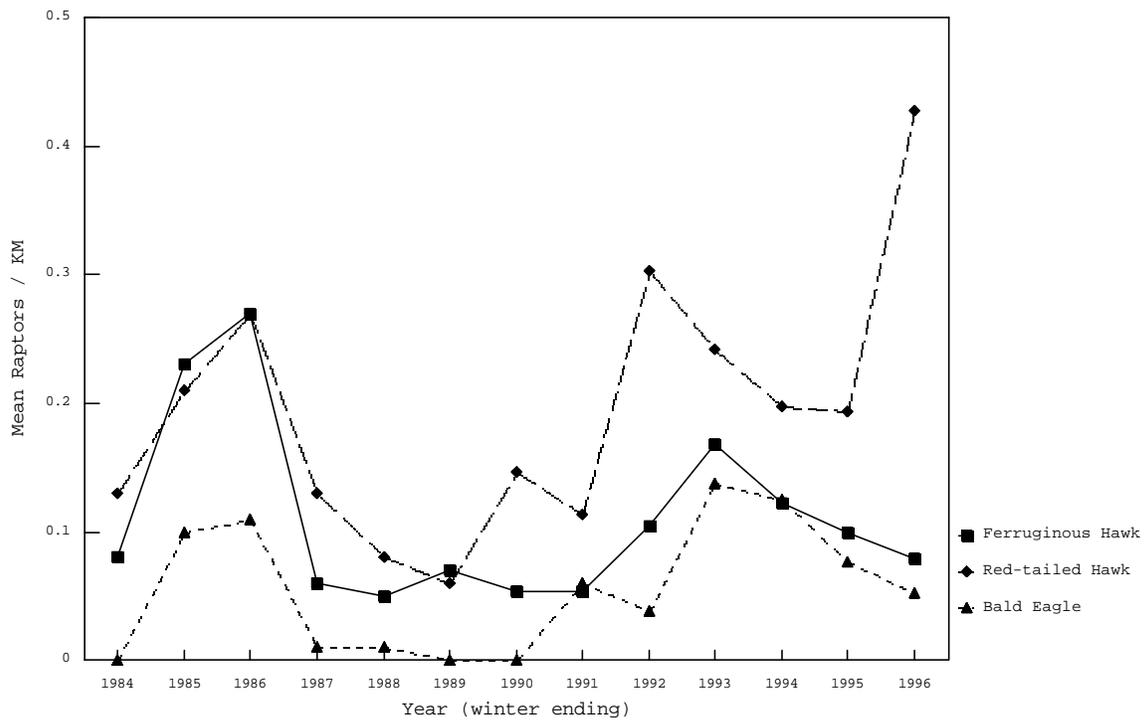


Table 2. Prairie Dog and Wintering Raptor Densities on Boulder Reservoir Survey Route, 1984-85 to 1986-87.

<u>Year</u>	<u>Prairie Dog Density<sup>1</sup></u>	<u>Red-tailed Hawk</u>	<u>Ferruginous Hawk</u>	<u>Rough-legged Hawk</u>
1984-85	7.59	0.22	0.18	0.05
1985-86	8.24	0.29	0.26	0.06
1986-87	0.03	0.13	0.06	0.05

<sup>1</sup>Percent of land occupied by active prairie dog colonies within 2.6 km<sup>2</sup> land sections intersected by survey route.

Prior to 1984, few Bald Eagles had been sighted in the Boulder Reservoir area (Boulder County Audubon Society 1978-95). During the winter of 1985-86, we observed groups of Bald Eagles perching around active prairie dog colonies. On several occasions during that winter, we watched as many as ten Ferruginous Hawks and five Bald Eagles converging on a single prairie dog carcass. Many of these Bald Eagles roosted in a cottonwood grove on Left Hand Creek near the 47th Street bridge. During December, 1985, we counted 40 Bald Eagles at this roost.

In spring, 1986, a sylvatic plague epizootic swept through the Boulder Reservoir-Haystack Mountain area, killing most of the prairie dogs in that region (Boulder County Health Dept. 1987). By the following winter, Ferruginous Hawk sightings on the Boulder Reservoir survey route had declined by 70%, and Bald Eagle sightings had declined by more than 90% (Figure 3). The 47th street roost appeared to support fewer than five Bald Eagles.

Prairie dog populations in the Boulder Reservoir-Haystack Mountain area appeared to remain low from 1986-89 and then increase from 1989-96. Populations of wintering Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles rose sharply from 1989-93, although Ferruginous Hawk numbers never recovered to the levels of the mid 1980's (Figure 3); by 1993, some of the prairie dog colonies on private land in the area had been converted into hay meadows or plowed under to make room for rural mansions.

In winter, 1993-94, a second plague epizootic struck. Unlike the 1985-86 epizootic, which killed almost all the prairie dogs in the area, the 1993-94 outbreak left some prairie dog colonies intact. Numbers of Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles seen on the Boulder Reservoir survey route declined, but not nearly as steeply as in 1986-87.

The 1993-94 plague epizootic affected prairie dog colonies throughout Boulder County and contributed to a countywide decline in numbers of Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles (Figure 4). However, the effects of the plague outbreak on prairie dog populations only partially explain the decline in numbers of buteos and Bald Eagles observed on survey routes throughout the county (See Figures 5 and 6).

In 1989 the small town of Superior annexed 1,570 acres south of the Boulder-Denver Turnpike (U.S. 36) and east of McCaslin Blvd. to facilitate construction of a massive housing development. The proposed development encompassed several hundred acres of active prairie dog colonies along Rock Creek, east of McCaslin Blvd. These prairie dog colonies supported high concentrations of wintering raptors. During a November 1992 field trip to this area, participants standing at the intersection of McCaslin Blvd. and Coalton Rd. counted more than 20 soaring hawks and eagles.

By 1994 nearly all of the prairie dog colonies east of McCaslin Blvd. had been destroyed, and nearly 1,000 new homes had been constructed between U.S. 36 and the south county line. From 1993-94 to 1995-96, numbers of Ferruginous Hawks seen on the two survey routes passing through this area declined by more than 90%, from .32/ km to .03/ km (Figure 5). From 1992-93 to 1995-96, numbers of Bald Eagles seen on these two survey routes declined by 85%, from .21/ km to .03/ km (Figure 5). As was the case in the Boulder Reservoir area, Red-Tailed Hawks, which are habitat generalists, seemed less affected by the prairie dog population reduction.

From 1992-96, eastern Boulder County populations of wintering Ferruginous Hawks and Bald Eagles declined (Figure 4). This decline began before the plague epizootic of 1993-94. We believe that urbanization and the concomitant destruction of prairie dog colonies are contributing

Figure 4. All Routes, Prairie Dog Dependent Species, 1990-1996

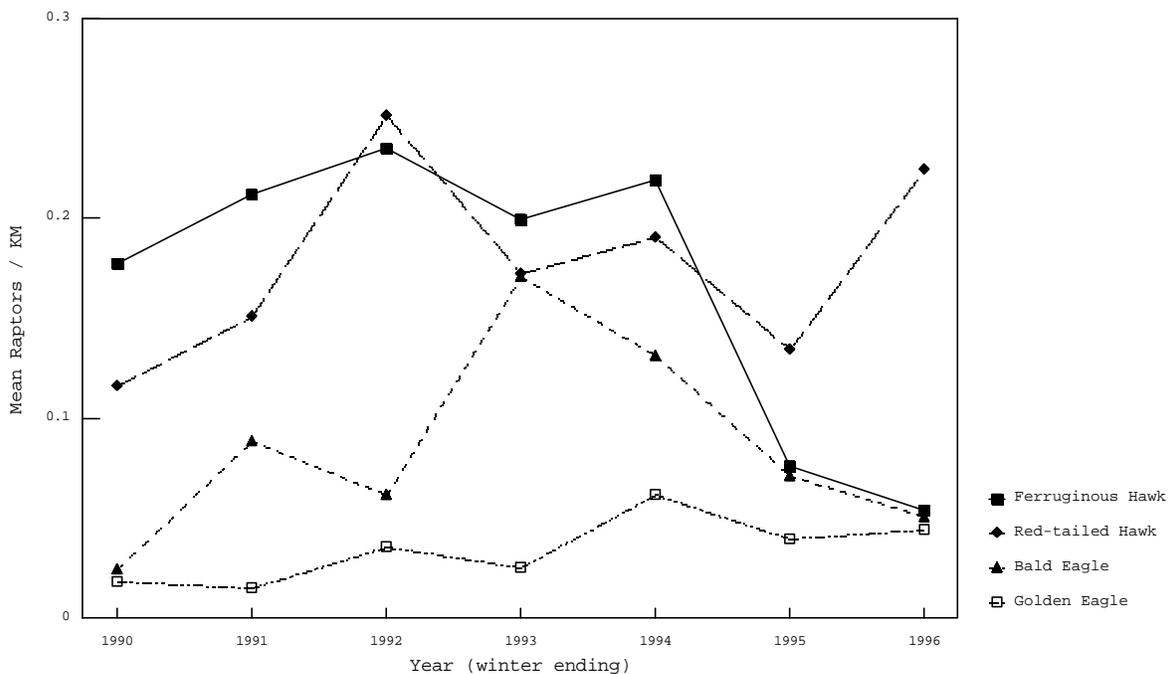


Figure 5. South County Routes, Prairie Dog Dependent Species, 1990-1996

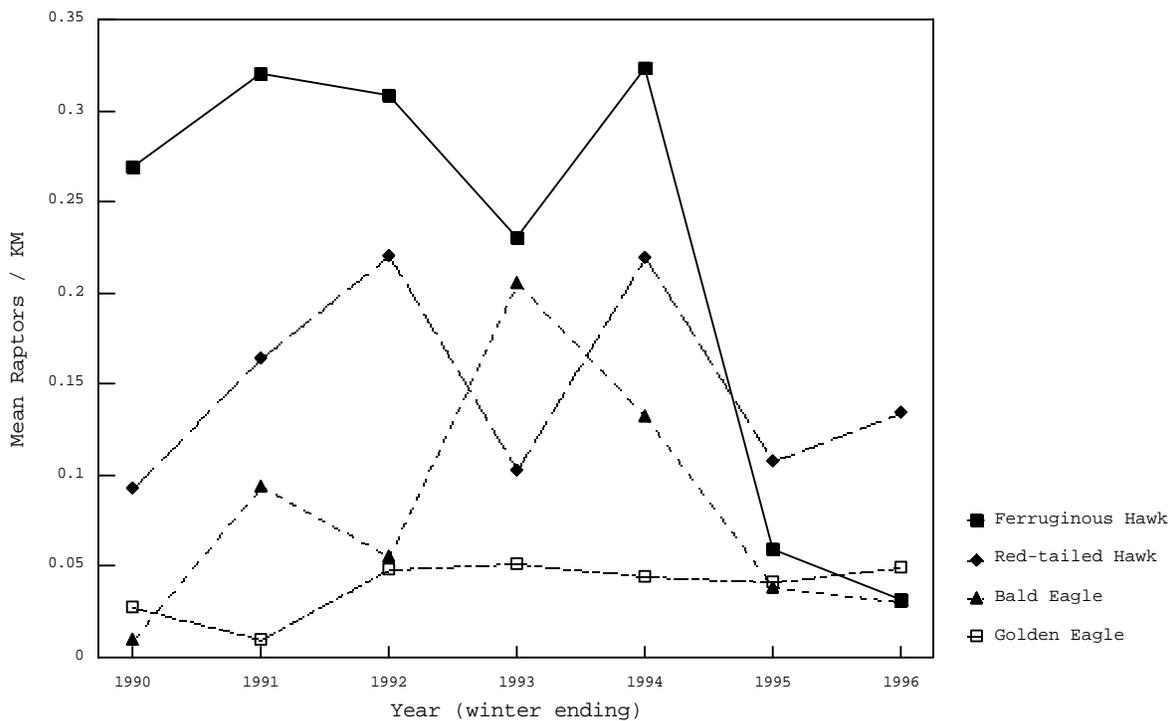
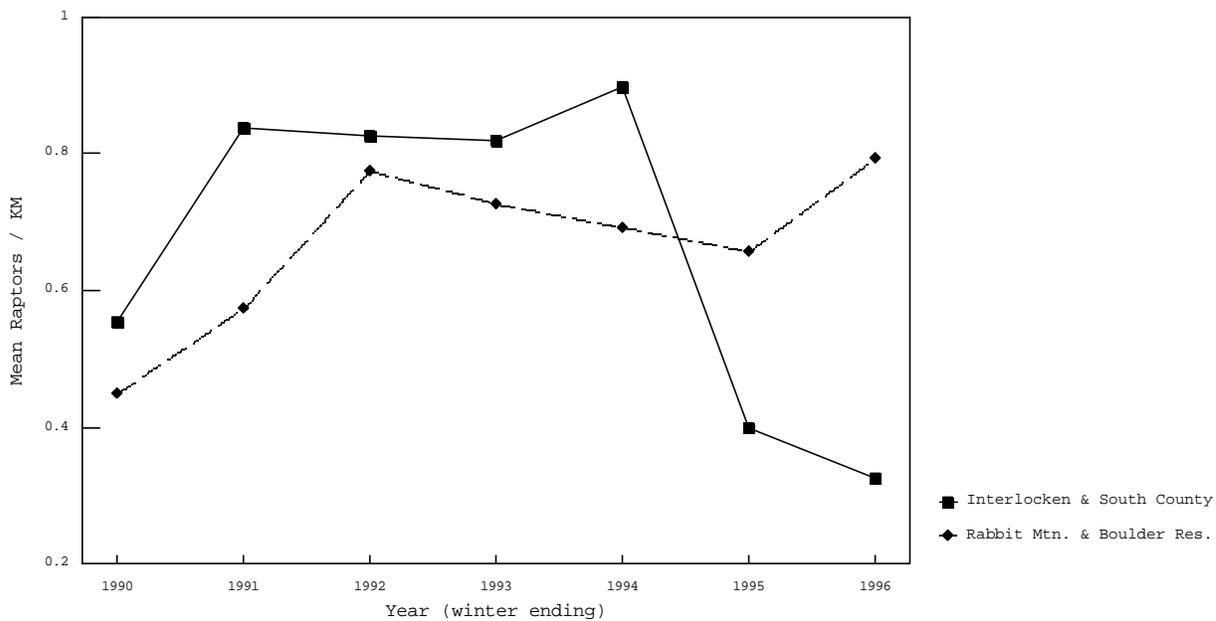


Figure 6. All Raptors, North County vs. South County, 1990-1996



to a dislocation of wintering raptors from Boulder County to other areas. The affect of this dislocation on populations of prairie dog-dependent species will depend on the quality of winter foraging habitat available elsewhere.

### **Vole-Dependent Species**

We had expected wintering populations of Rough-legged Hawks, Northern Harriers, and American Kestrels to correspond more closely with vole population cycles than with prairie dog population cycles. Rough-legged Hawks and Northern Harriers, which prey predominantly on voles and other small mammals, may occasionally scavenge dead prairie dogs but probably do not depend on them for a large proportion of their winter diets. American Kestrels hunt birds, small rodents, and insects (Bent 1937, Craighead and Craighead 1956, Jones 1989).

Figures 7 and 8 show numbers of these vole-dependent species seen on all routes from 1989-95 and on the Boulder Reservoir route from 1984-95. Fluctuations in Northern Harrier wintering populations corresponded with fluctuations in American Kestrel wintering populations throughout most of the study period. Rough-legged Hawk wintering populations varied independently of both Northern Harriers and American Kestrels. Since Rough-legged Hawks migrate over great distances, they may respond less predictably than American Kestrels and Northern Harriers to fluctuations in local prey populations. We did not carry out small mammal trapping in conjunction with our raptor counts, so it is difficult to know whether fluctuations in wintering populations of these three species were driven by vole population fluctuations or by other factors.

Wintering populations of Rough-legged Hawks, Northern Harriers, and American Kestrels appear to have remained steady or increased slightly from 1990-96 (Figures 7 and 8). Since wetlands receive considerably more government protection than do prairie dog colonies, we would expect vole-dependent species to fare better than prairie dog dependent species in an urbanizing environment.

### **Conclusion**

From 1970-92, numbers of wintering Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles increased dramatically in Boulder County. Populations of other raptor species remained relatively steady throughout this period. Plague epizootics, which killed many prairie dogs within the County during 1985-86 and 1993-94, caused sharp short-term declines in populations of wintering Ferruginous Hawks, Red-Tailed Hawks, and Bald Eagles. Beginning in the early 1990's, destruction of prairie dog colonies by urban development has probably triggered a long term decline in wintering populations of these prairie dog-dependent species.

As urbanization of Boulder County progresses, destroying most remaining prairie dog colonies on private land, maintenance of wintering raptor foraging habitat will depend on the actions of government parks and open space agencies. These agencies must develop creative strategies to maintain prairie dog populations while at the same time pursuing stated goals of restoring native grassland vegetation and controlling weed infestation. Failure to maintain prairie dog populations will have a particularly detrimental effect on Ferruginous Hawks, who depend on prairie dogs for a major portion of their winter forage (Jones 1989).

Figure 7. All Routes, Vole Dependent Species, 1990-1996

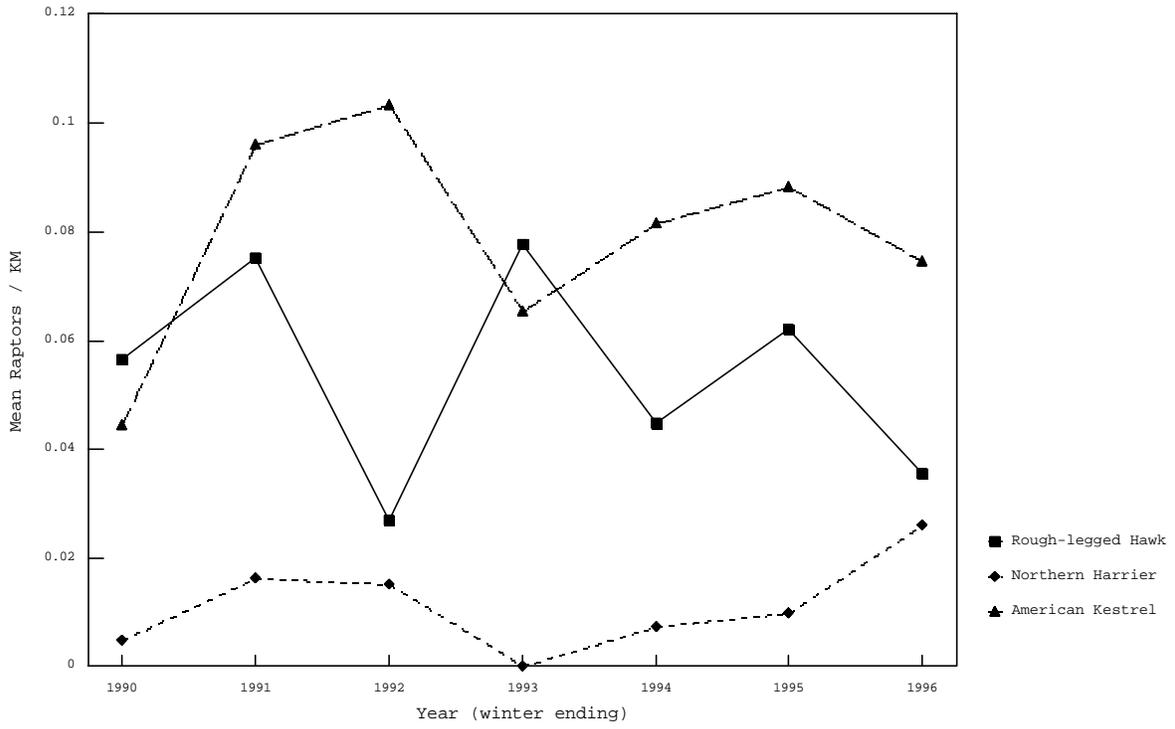
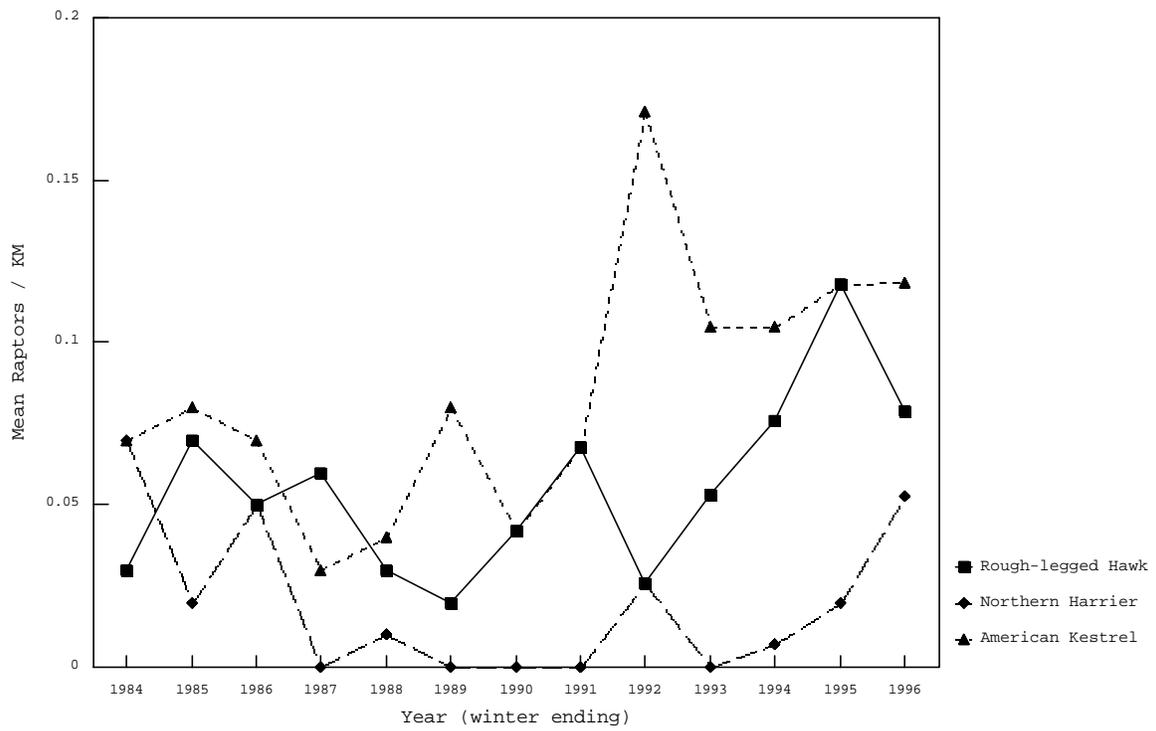


Figure 8. Boulder Reservoir, Vole Dependent Species, 1984-1996



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