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The Effect of Human Disturbance on Raptors in the City of Boulder

Project Summary:

The objective of this study was to evaluate if raptor density and habitat use in riparian areas is affected by the presence of recreational trails. In order to determine this we compared data collected from riparian areas without trails (control sites) and those with trails (experimental sites). Because trails are often placed along riparian corridors this study examined if human presence is forcing raptors off preferred habitat. Our hypothesis is that raptor density, raptor diversity, and habitat use will be higher on our control sites. In addition, we predicted that perches will be close to or in the riparian zone in control sites and further away in experimental sites.

Project Background:

The loss of open spaces in and around urban areas has caused a decrease in size of raptor habitats. In order to conserve raptor populations information on what makes certain habitats preferable must be obtained. The data collected in this study will help formulate strategies to maintain and grow raptor populations. If our hypothesis is proven recommendations concerning moving certain trails and changing the planning of new trails would be made. To our knowledge, no studies on this subject have been conducted.

The majority of research on human effects on raptors is limited to studies on the effects of specific pollutants (Okoniewski 1993), resource extraction (Wilden 1994) and large projects, such as dams and power plants (Steenhot 1993) However, because one raptor, which was threatened with extinction, is the symbol for our country there are a handful of studies on more subtle human activities and their effects on bald eagles. The following is a brief summarization of several studies that relate closely to our study.

Stalmaster and Newman (1978) studied the effects of human activity on wintering bald eagles in northwestern Washington state. The study revealed that the distribution of eagles was affected and that eagles were displaced to areas of

lower human activity. The study also found that older birds were affected more strongly. Fraser, Frenzel and Mathisen (1985) examined the impact of human activity on breeding bald eagles in north central Minnesota. Although they concluded that human activity had no "important impacts" they did discover that eagles on developed shoreline nested further from the water than eagles on undeveloped shoreline. Grier (1968) studied the effects of climbing into nests of bald eagles in northwestern Ontario when the fledglings are between 2 and 11 weeks old. Grier found that this human encounter did not have significant effect on bald eagle productivity. Mathisen (1968) also found that human activity around bald eagle nest sites had no measurable effect on nesting success or occupancy. In addition, Mathisen stated that timber management in the immediate area did not effect bald eagle productivity. This may be attributed to the evidence that Wilden (1994) uncovered in his research in Sweden that states decreased vegetation cover when coupled with some perch sites (snags and young trees the were not yet harvested) can be a beneficial habitat for raptors. McGarigal, Anthony and Isaacs (1991) found that in the Columbia River of Oregon boating activities have an affect on bald eagles activity. Eagles in the area stayed 300-400 meters away from boats. Because of the these observations their study recommended buffer zones of 400-800 meters around high use bald eagle foraging areas.

Methodology:

The study included three control and three experimental sites. The 75th street has an experimental site next to waste treatment plant and control site across the street. Bobolink and Sage trails are both experimental sites. The Ditch near Cherryvale road and 63rd street and Valmont are the two other control sites. The sites were surveyed three times a week between seven and eleven a.m. The order of site visitation was varied. Each survey consisted of a fifteen minute line transect in which the data was gathered. The data was collected using binoculars and a spotting scope. The data collected was categorical (species of raptor and perch selected) as well as continuos (distance of perch from riparian zone and/or trail and height of perch). Data was analyzed by analysis of variance, comparing raptor densities and diversity at riparian areas with trails versus without trails and perch selection as a function of distance from riparian zone and/or trail.

Results and Discussion:

Table 1. *The number of observations of each species observed*

Species	experimental (n=37)	control (n=56)
Red-tailed Hawk(*Buteo jamaicensis*)*	33	25
Bald Eagle(*Haliaeetus leucocephalus*)**	3	20
Rough-legged Hawk(*Buteo lagopus*)***	1	3
Ferruginous Hawk(*Buteo regalis*)***	0	3
Northern Harrier(*Circus cyaneus*)***	0	2
Golden Eagle(*Aquila chrysaetos*)***	0	1
Prairie Falcon(*Falco mexicanus*)***	0	1

*Red-tailed Hawks showed no significant preference for areas with trails over areas without trails(X^2=1.1, p>0.05, df=1)

**Bald Eagles significantly preferred areas without trails(X^2=12.56, p<0.001, df=1)

***All other raptors showed preference for areas without trails(X^2=7.36, p<0.05, df=1)

Species Abundance and Diversity

Species diversity was greater on control sites; of the seven raptor species observed in this study, only three were found on experimental sites and all seven were found on the control sites. With the exception of the Red-tailed Hawk, the raptors preferred the control sites. In addition, overall abundance was higher on control sites (56) compared to experimental sites (37).

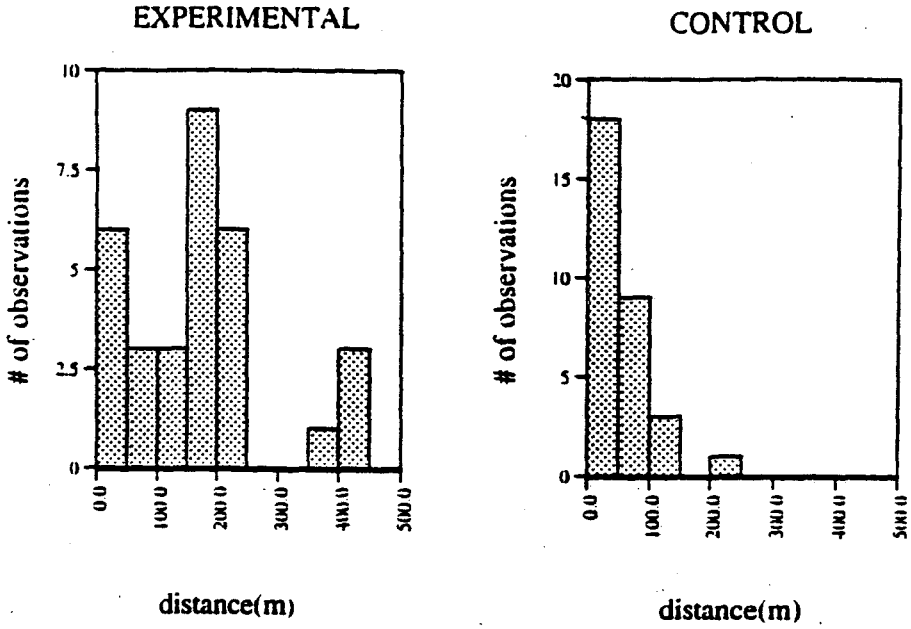
Table 2. *The relative abundance of raptors and perch distances in control and experimental sites.* Relative abundance is considered the number of raptors/ km^2/survey. Perch distance is the distance from riparian corridors(in meters).

Mean Value	Experimental	Control
relative abundance(#/km^2/survey)*	2.11	7.20
perch distance(m)**	155.92	42.32

*The relative abundance was significantly higher in areas without trails (ANOVA, p<0.01, df=1)

**The perch distance was significantly further from riparian corridors in areas with trails (Kruskal-Wallis non-parametric test, p<0.0001, df=1)

Fig .1 The observed perch distances in the control and experimental sites. Perch distances are measured from the riparian corridor to the observed perch being used.



Perch Selection

Perch selection, as a function of distance from riparian zone and/or trail, was found to vary between the experimental and control sites. Riparian corridors were used significantly more (X^2=5.26, $p<0.05$, df=1) in the control sites, indicating that the presence of trails in the experimental sites was displacing raptors.

Conclusion:

Grassland habitats in Boulder County contain many recreational trails that are frequented by hikers and bicyclists. This habitat is also home to wintering raptors. The City of Boulder Open Space Department has often positioned trails along riparian corridors because many people enjoy recreating near water. This study found that trail use lowers the relative abundance and species diversity of raptors. In addition, when trails are located along riparian corridors raptors are less likely to use perches on the corridor; in the absence of trails raptors prefer perches on the riparian corridor. In order to preserve raptor abundance and diversity in Boulder County land that includes riparian corridors needs to be conserved for non-human uses.

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