

Peregrine and Prairie Falcon Interaction:
Boulder County Open Space
Boulder Mountain Parks

Andrew J. Orahoske
4/28/99

Abstract:

The study of related sympatric species, such as the genus *Falco*, yield evidence to support the competitive exclusion principle. Prairie Falcons (*F. mexicanus*) and Peregrine Falcons (*Falco peregrinus*) compete for limited cliff-nesting territories. The purpose of my research is to determine the extent of competitive interaction between falcons in four main territories. On Open Space property, I intend to look at the Mickey Mouse Wall and The Matron. On Mountain Parks' property I plan to monitor the Third Flatiron and Jam Crack Spire. Evidence supports the hypothesis that peregrines are displacing prairies. I intend to document presence or absence for each species prior to and during the initial territory selection phase. Observation and nesting records from Open Space and Mountain Parks from 1983-1999 are used to document trends. Information obtained from Open Space and Mountain Parks records represents a consistent source of large scale data. Using evidence from competitive interactions and nest site selection, I hope to make a case for Prairie falcon displacement by Peregrine falcons. Secondly, I would like to determine future directions for research concerning falcons in the Boulder area.

Introduction:

Species that share similar ecological niches contend for the same habitat and food resources. Competitive exclusion occurs when the more dominant individual displaces competitors for rights to limited resources (Lack 1971). Such is the case with two falcon species that occur in Boulder County. Competitive interactions between Peregrine Falcons (*Falco peregrinus*) and Prairie Falcons (*F. mexicanus*) have been documented in the past and the peregrine appears to be displacing Prairie Falcons from nesting territories (Lederer 1998). Peregrine Falcons suffered range wide declines in the 1960's and 1970's due to the effects of insecticides. They have since made a comeback and are expanding their range into historic and new urban territories (Pagel et al. 1996).

The purpose of this research is to discuss Peregrine-Prairie Falcon interaction and determine the extent of competitive exclusion occurring in four territories on Boulder County Open Space and Mountain Parks. If competitive exclusion exists between Peregrine and Prairie Falcons, and Peregrine Falcons displace prairies, then a shift in species occupying specific nest sites will occur. Furthermore, agonistic behavior

between the falcons should be observed. First, I will provide background for competitive exclusion among raptors and explore specific cases from the literature concerning antagonistic behavior amongst falcons. Documented observations from Boulder County Open Space and Mountain Parks raptor monitoring records and personal observations of the two falcon species provide the evidence for determining the existence of interspecific displacement in Boulder County. Lastly, I will attempt to uncover the reasons behind the trend, and discuss implications for management and future directions for research.

The Peregrine Falcon's main food sources are rock doves, jays, starlings, and other common range expanding birds. They are cosmopolitan, nesting on the buildings of many cities and appear to tolerate human disturbance so long as nest sites are remote and undisturbed (Udvardy 1992). Prairie Falcons, on the other hand, are less tolerant of human disturbance and forage in open areas of dry plateaus and grasslands on native birds and rodents (Steenhof 1998).

Competing for nest sites results in remarkable interspecific behavioral sequences filled with acrobatic flying and sometimes death (Steenhof 1998). Numerous authors describe agonistic interactions between Peregrines and Prairie Falcons, Gyrfalcons (*Falco rusticolus*), Lanner Falcons (*F. biarmicus*), Saker Falcons (*Falco cherrug*), Common Ravens (*Corvus corax*), Golden Eagle (*Aquila chrysaetos*), and Bald Eagles (*Haliaeetus leucocephalus*) (Cade 1960, Ratcliffe 1962, Nelson 1969, Nelson 1970, Von Blotzheim 1971, Porter and White 1973).

In Sonoma County, California, Walton (1973) describes an extreme example in which a female Prairie Falcon continually attacks a female peregrine only to be struck and killed by the male peregrine after an exhaustive aerial battle. In Southeastern Arizona, Ellis and Groat (1982) describe a long series of agonistic encounters between Peregrine and Prairie Falcons culminating with a fledgling prairie intruding on a peregrine eyrie and stealing three prey items from an adult peregrine. Peregrine Falcons continually commandeer nesting territories by physically dominating the equally matched prairie. (Steenhof 1998).

Genetic similarities further support the analogous nature of the falcons. Hybridization between the two species is known to occur and a comparison of karyotypes reveals virtually identical chromosomes. This indicates a closer relationship than

previously believed and implies that the male hybrid of peregrine and prairie falcons should be fertile (Schmutz and Oliphant 1987). In a specific case from 1996 on the Third Flatiron in Boulder Mountain Parks, a male peregrine and female prairie falcon mated and produced eggs. Subsequently, the Colorado Division of Wildlife removed the female and the eggs. The male then re-nested with a female peregrine (Lederer 1996). The potential for hybrids further exemplifies the sympatric relationship of these two falcon species.

Antagonistic behavior amongst falcons determines territory selection and ultimately breeding success. The dynamic nature of this interaction offers clues to the functioning of the regional landscape. The differences among foraging behavior and habitat between peregrine and prairies potentially have significant indicator power. Changes in the regional landscape are reflected in compositional changes of the species that exist within.

Methods:

Documentation

The Boulder County Open Space and Mountain Parks Raptor Monitoring Program provided a multitude of observations of Prairie and Peregrine Falcon nest success for the four territories under examination. On Open Space, The Mickey Mouse Wall and The Matron near Eldorado Springs were examined. Both of these territories are remote and adjacent to extensive open grasslands. On Mountain Parks, I investigated Jam Crack Spire and The Third Flatiron. Jam Crack Spire is located east across Shadow Canyon from The Matron and is similarly in close proximity to vast open prairie. Relative to the first three sites, The Third Flatiron is close to the suburban center of Boulder, Colorado. The Boulder County Nature Association contributed year-end reports for the years of 1983-1998. Using information from these sources, a table of each species' active territories was drawn (Table 1). In addition, yearly fledgling success for each species across all territories monitored in Boulder and adjacent Jefferson and Larimer Counties was incorporated into a table to compare fledgling rates before and after the return of the peregrine (Table 2). Productivity based on the number of

fledglings produced from all territories for each species was compared before and after the arrival of the peregrine to Boulder in 1991 (Table 3).

Personal observations were performed on the Third Flatiron on March 13, 1999. The Mickey Mouse Wall and Shadow Canyon (The Matron and Jam Crack Spire) were visited on March 14, 1999. All observations occurred from outside designated closures and followed guidelines set by Open Space and Mountain Parks. These visits were not intended to provide much information due to the extensive range of the falcons.

Results:

Long term monitoring of falcons in the Boulder area reveals a pattern in which peregrines are increasing in fledgling success while prairies are declining. Table 1 provides a listing of the species active in each of the territories under scrutiny. Peregrine Falcons displaced Prairie Falcons from each site. In 1991, peregrines appeared on The Matron and the prairies were forced to Jam Crack Spire. Peregrines removed prairies from The Third Flatiron in 1994 and have remained. On The Mickey Mouse Wall, the prairie falcons moved down to an adjacent formation called The Minnie Mouse Wall.

Table 1: Active Falcon Territories
 PEFA= Peregrine Falcon
 PRFA= Prairie Falcon

Year	Third	Jam Crack	Matron	Mickey Mouse
1983	PRFA			PRFA
1984	PRFA	PRFA		PRFA
1985	PRFA	PRFA		PRFA
1986		PRFA		
1987	PRFA	PRFA		
1988	PRFA	PRFA		
1989	PRFA	PRFA		PRFA
1990	PRFA	PRFA		PRFA
1991	PRFA	PRFA	PEFA	PRFA
1992	PRFA	PEFA	PRFA	PRFA
1993	PRFA	PEFA	PRFA	PRFA
1994	PEFA		PEFA	PRFA
1995	PEFA	PEFA	PRFA	PRFA
1996	PEFA	PRFA	PEFA	PRFA/PEFA
1997	PEFA	PRFA	PEFA	PRFA/PEFA
1998	PEFA		PEFA	PRFA/PEFA
1999	PEFA	PRFA	PEFA	PRFA/PEFA

Table 2 provides fledgling success rates for Peregrine and Prairie Falcon across all territories monitored by The Boulder County Nature Association.

Table 2: Number of Fledglings across all territories

	'84	'85	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'98	All
PRFA in 9 Territories	8	20	1	18	4	8	22	14	6	4	9	3	6	10	8	141
PEFA in 4 Territories	N	N	N	N	N	N	N	3	1	2	2	0	4	9	5	26
Total Falcon Production	8	20	1	18	4	8	22	17	7	6	11	3	10	19	13	167

Table 3 gives the average productivity of Peregrine and Prairie Falcons in two time groups. From 1984-1990, prairies held all eyries. After 1991, post-peregrine, Prairie Falcons began losing nesting territories. Subsequently, prairie productivity drops in response.

Table 3: Falcon Productivity

Years	Prairie Falcon Fledglings	Peregrine Falcon Fledglings	Total Falcon fledglings
1984-1990	81 total 11.5 per year	Not breeding	81 total 11.5 per year
1991-1998	60 total 7.5 per year	26 total 3.25 per year	86 total 10.75 per year

Discussion:

The evidence presented supports the hypothesis that competitive exclusion exists in the current status of falcons in Boulder County. Nesting niche overlap excludes both species from existing in the same territory.

Agonistic behavior between the falcon species confirms prior observations of prairie-peregrine interaction (Steenhof 1998, Walton 1978). Peregrine Falcons are expanding their range in Boulder County and Prairie Falcons must move to make room.

Additional factors in the environment changing due to human disturbance may also be affecting falcon species shift. Most of Boulder County and the surrounding

metropolitan area continues to destroy and fragment open grassland habitat necessary for Prairie Falcon foraging. Simultaneously, the Peregrine Falcon is capitalizing on the increased prey source of rock doves, jays, starlings, and other urban species. Thus development may be hastening the decline of Prairie Falcons by reducing food resources and increasing competition with Peregrine Falcons.

Therefore, I recommend that Boulder County Open Space and Mountain Parks pursue further research into falcon productivity. Applications such as prescribed fire to increase grassland habitats may prove useful in determining Prairie Falcon ecology. Expanding grassland ecosystems would increase Prairie Falcon foraging success.

I conclude that peregrines are displacing prairies in the Boulder area. More research on the long-term reproductive rates of these species is necessary to properly understand the full scope of interaction.

Acknowledgments:

I thank Steve Armstead and Boulder Mountain Parks for access to records. I also thank Anne Oyer and Boulder County Open Space for additional information. The Boulder County Nature Association provided comprehensive yearly reports. Lastly, I would like to thank all the volunteers and observers that contributed to the data set.

Literature Cited:

- Cade, T.J. 1960. Ecology of the peregrine and gyrfalcon populations in Alaska. *Univ. of Calif. Publ. Zool.* 63: 151-290.
- Ellis, D.H. and D.L. Groat. 1982. A Prairie Falcon fledgling intrudes at a Peregrine Falcon eyrie and pirates prey. *Raptor Research* 16(3): 89-91.
- Lack, D. 1971. Ecological isolation in birds. Blackwell. Oxford.
- Lederer, N. 1998. Cliff-nesting raptors in Boulder County: 1998 Status Report. Boulder County Nature Association.
- Lederer, N. 1996. Cliff-nesting raptors in Boulder County: 1996 Status Report. Boulder County Nature Association.
- Nelson, M.W. 1969. The status of the peregrine falcon in the Northwest. Pages 61-62 in *Peregrine Falcon populations: their biology and decline*, J.J. Hickey ed. Univ.

Wisconsin Press. Madison. 596 pp.

Nelson, R.W. 1970. Some aspects of breeding behavior of peregrine falcons on Langara Island, British Columbia. Thesis. Univ. Calgary. Calgary, Alberta. 306 pp.

Pagel, J.E., Bell, D.A., and B.E. Norton. 1996. De-listing the American Peregrine Falcon: is it premature? *Wildlife Society Bulletin* 24(3): 429-435.

Porter, R.D. and C.M. White. 1973. The peregrine falcon in Utah, emphasizing ecology and competition with the prairie falcon. *Brigham Young Univ. Science Bulletin* 18: 1-75.

Ratcliffe, D.A. 1962. Breeding density in the Peregrine Falcon (*Falco peregrinus*) and Raven (*Corvus corax*). *Ibis* 104: 13-39.

Schmutz, S.M. and L.W. Oliphant. 1987. Chromosome study of peregrine, prairie, and gyrfalcons with implications for hybrids. *Journal of Heredity* 78(6): 388-390.

Steenhof, K. 1998. Prairie Falcon (*Falco mexicanus*). In *The Birds of North America*, No. 346 (A. Poole and F. Gill, eds.) *The Birds of North America, Inc.*, Philadelphia, P.A.

Udvardy, M. 1992. *The Audubon Society Field Guide to North American Birds*. Knopf.

Von Blotzheim, U.N.G. 1971. *Handbook of Central European birds. Volume 4. Falconiformes*. Akademische Verlagsgesellschaft. Frankfurt, Germany. 75 pp.

Walton, B.J. 1978. Peregrine-Prairie Falcon Interaction. *Raptor Research* 12(1/2): 46-47.