

## RESULTS OF A RAPTOR SURVEY IN SOUTHWESTERN NEW MEXICO

WADE L. EAKLE<sup>1</sup>

*Dames & Moore, Environmental Services Group, 7500 North Dreamy Draw Drive, Suite 145, Phoenix, AZ 85020  
U.S.A.*

E. LINWOOD SMITH

*Dames & Moore, Cambric Corporate Center, 1790 East River Road, Suite E-300, Tucson, AZ 85718 U.S.A.*

STEPHEN W. HOFFMAN

*HawkWatch International, P.O. Box 660, Salt Lake City, UT 84110 U.S.A.*

DALE W. STAHLECKER

*Eagle Ecological Services, 30 Fonda Road, Santa Fe, NM 87505 U.S.A.*

RUSSELL B. DUNCAN

*Southwestern Field Biologists, 8230 East Broadway, Suite W-8, Tucson, AZ 85710 U.S.A.*

**ABSTRACT.**—Eight roadside surveys for raptors were conducted in southwestern New Mexico from May 1988–January 1989 to examine seasonal abundance and habitat use. Of the 17 species observed, American kestrels (*Falco sparverius*), red-tailed hawks (*Buteo jamaicensis*), turkey vultures (*Cathartes aura*), and northern harriers (*Circus cyaneus*) were most common and occurred along the entire survey route in all habitats. Bald eagles (*Haliaeetus leucocephalus*) were recorded less frequently only in January in riparian habitats and pinyon-juniper and Ponderosa pine ecotones, and Swainson's hawks (*B. swainsoni*) were infrequently observed in mesquite grasslands and Chihuahuan desertscrub in May and July. Golden eagles (*Aquila chrysaetos*), ferruginous hawks (*B. regalis*), prairie falcons (*F. mexicanus*), and Cooper's hawks (*Accipiter cooperii*) were also recorded infrequently but occurred widespread along the survey route.

**KEY WORDS:** *southwestern New Mexico, distribution, relative abundance, habitat use, raptor roadside survey.*

---

Resultados de rutas de estudio de rapaces en el suroeste de New Mexico

**RESUMEN.**—Ocho estudios de ruta para rapaces fueron ejecutados en el suroeste de New Mexico desde mayo de 1988 a enero de 1989, con el fin de examinar abundancia estacional y uso de hábitat. De las 17 especies observadas, *Falco sparverius*, *Buteo jamaicensis*, *Cathartes aura* y *Circus cyaneus* fueron las más comunes con presencia a lo largo de todas las rutas y hábitats. *Haliaeetus leucocephalus*, fue registrada con menor frecuencia solamente en diciembre y en ciertos hábitat y *Buteo swainsoni* fue poco observado en praderas en mayo y julio. *Aquila chrysaetos*, *Buteo regalis*, *Falco mexicanus* y *Accipiter cooperii* fueron registrados infrecuentemente pero se presentaban muy dispersos a lo largo de la ruta de estudio.

[Traducción de Ivan Lazo]

El Paso Electric Company initiated construction of the Arizona Interconnection Project (AIP), a 345 kv transmission line between Deming and Red Hill, New Mexico in 1988. As part of the environ-

mental review process, we conducted eight raptor surveys along roads parallel to or near the transmission line right-of-way (ROW). Our objectives were to: (1) compile a species list, (2) determine the distribution of raptors along the transmission line ROW, (3) document habitat use by raptors, and (4) estimate the relative abundance of raptor species observed.

---

<sup>1</sup> Present address: U.S. Army Corps of Engineers, San Francisco District, Regulatory Branch, 333 Market Street, San Francisco, CA 94105–2197.

## STUDY AREA AND METHODS

The AIP crosses seven major biotic communities or biomes between Red Hill and Deming (Fig. 1). Nearly 80% of the area traversed is grassland or desertscrub (Table 1). We followed the classification system described by Brown (1982) to determine habitat types along the survey route, and Brown and Lowe (1983) to further identify habitat types traversed during our surveys.

The survey route we selected provided access along many portions of the AIP ROW and crossed habitats representative of those crossed by the AIP where access was limited. The route followed improved and unimproved surface roads, as well as the AIP corridor whenever possible. The length of the route was approximately 515 km, whereas the length of the AIP corridor was approximately 419 km.

Surveys along the route were scheduled in May 1988 to coincide with nesting, in July 1988 to coincide with fledging, in October 1988 to coincide with fall migration, and in January 1989 to coincide with wintering. Each seasonal survey was conducted by two teams of two observers each. One team began at Red Hill in the north and the other near Deming in the south. Each team surveyed the entire route by vehicle over a 5–6 d period, simultaneously and independently of the other team. For example, Surveys 1 and 2 were conducted concurrently from 2–7 May 1988, Surveys 3 and 4 from 11–15 July 1988, Surveys 5 and 6 from 26–30 October 1988, and Surveys 7 and 8 from 24–28 January 1989. Surveys were conducted during variable weather conditions, but were always terminated during periods of precipitation (rain or snow).

Each survey team drove the route at 17–40 km/hr. When raptors were observed, vehicles were stopped momentarily to identify the birds. Periodic stops were also made to scan for distant raptors. All raptor observations were recorded on data forms and mapped. Data recorded for each observation included date, time, location, species, age, sex, number, habitat, activity, and perching substrate, if applicable. Weather conditions and vehicle mileage were also recorded. Surveys were initiated between 0600–0900 H Mountain Standard Time (MST) and were terminated between 1600–1900 H MST.

The survey route was treated as a line transect to estimate the relative abundance of each species of raptor. Line transects are considered to be one of the best techniques for estimating raptor relative abundance (Fuller and Mosher 1987). We used the index of relative abundance developed by Woffinden and Murphy (1977) for diurnal raptors in the eastern Great Basin of Utah that is based on km traveled during roadside surveys. The index is calculated as follows:

$$\text{Relative Abundance} = \frac{\text{Number of species observed}}{\text{Number of km traveled}} \times 1000$$

To examine seasonal differences, we pooled the data from Surveys 1–4 to calculate a Spring/Summer relative abundance index and the data from Surveys 5–8 to calculate a Fall/Winter index.

## RESULTS AND DISCUSSION

Of the 43 raptor species found in New Mexico, 29 are falconiforms and 14 are strigiforms (Glinski et al. 1988). We observed 17 of the falconiform species during our surveys. Interestingly, Kimsey and Conley (1988) observed only 11 species in their 4-yr study of raptor habitat use near Las Cruces, slightly southwest of our study area.

Plains grassland accounted for the largest percentage of habitat crossed by the AIP, approximately 30% (Table 1). This cold temperate plant community is characterized by essentially open landscapes of either sod-forming short grasses or tall grass species. American kestrels (*Falco sparverius*), red-tailed hawks (*Buteo jamaicensis*), and northern harriers (*Circus cyaneus*) were the most frequently observed species, followed by prairie falcons (*F. mexicanus*), ferruginous hawks (*B. regalis*), and turkey vultures (*Cathartes aura*) (Table 2). Golden eagles (*Aquila chrysaetos*) and merlins (*F. columbarius*) were infrequently observed. Nearly all of the sightings of northern harriers in grasslands were in October and January, indicating that plains grassland habitat may be important to migratory and wintering populations of this species (Table 3).

Semidesert grassland accounted for the second largest percentage of habitat crossed by the AIP ROW (26%, Table 1). This warm temperate grassland community, sometimes called "mesquite grassland," is a highly diverse assemblage of perennial bunch grasses, woody perennial shrubs, leaf succulents, and cacti. Large numbers of several species were observed in these grasslands during all seasons (Tables 2, 3). American kestrels and red-tailed hawks were recorded during every survey while turkey vultures and Swainson's hawks (*B. swainsoni*) were observed only in May and July and golden eagles only in July, October, and January. Northern harriers and prairie falcons were commonly seen, especially in October and January. Other fall and winter observations included ferruginous hawks, rough-legged hawks (*B. lagopus*), and merlins (Table 3).

Chihuahuan desertscrub accounted for approximately 23% of the habitat crossed by the AIP ROW (Table 1). This warm temperate vegetation type is frequently characterized by creosotebush (*Larrea tridentata*), tarbush (*Flourensia cernua*), mesquite (*Prosopis spp.*), and other shrubs. Large numbers of several species were recorded in these habitats during all seasons (Table 2). Turkey vultures and

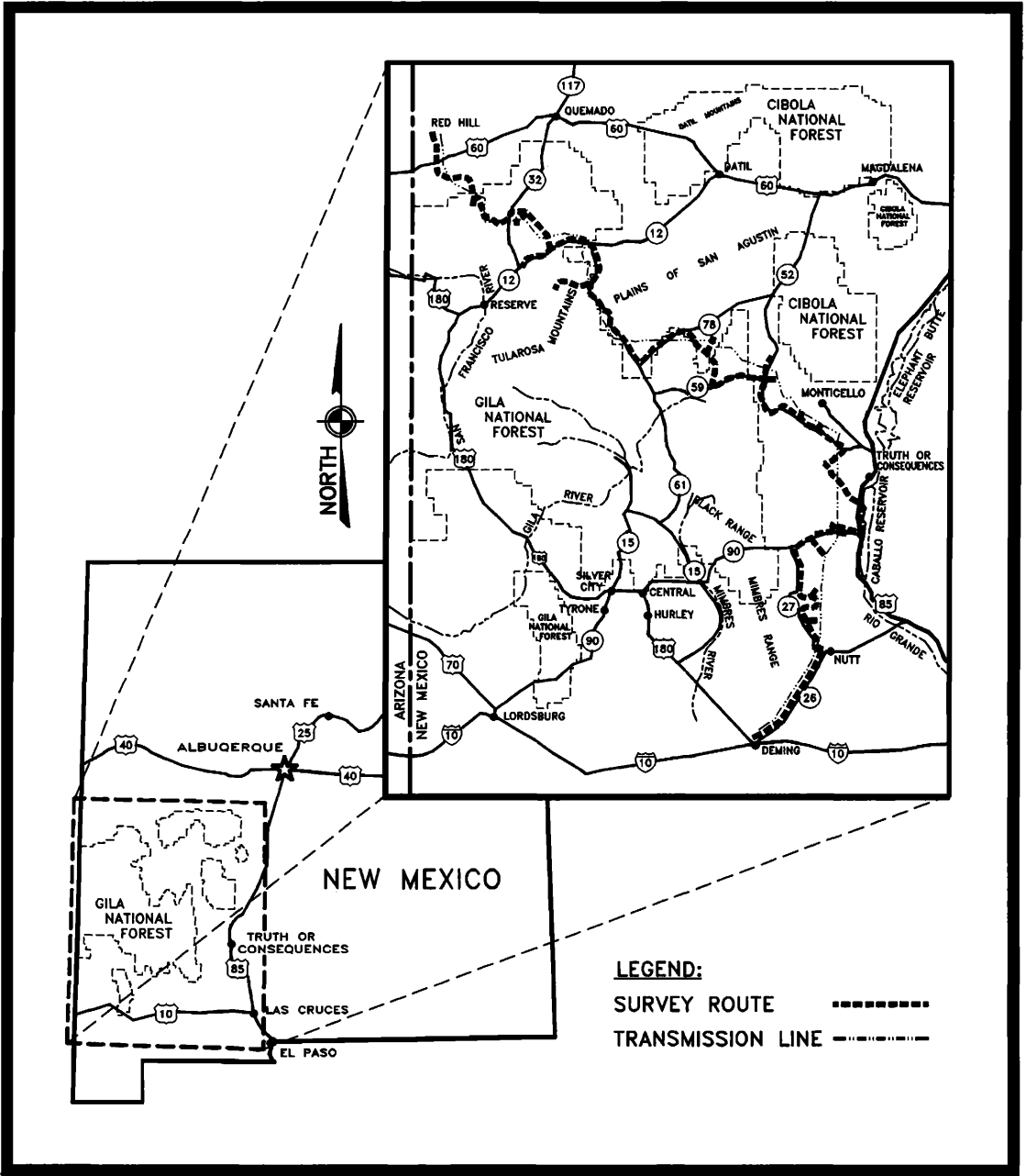


Figure 1. Raptor survey route along the AIP corridor in southwestern New Mexico, 1988–89.

Swainson's hawks were observed in May and July, red-tailed hawks and American kestrels from May to January, golden eagles and prairie falcons from July to January, and northern harriers and ferruginous hawks in October and January (Table 3).

Great Basin conifer woodland accounted for approximately 12% of the habitat crossed by the AIP ROW (Table 1). This cold temperate, dry, mid-elevational biome, often referred to as pinyon-juniper woodland, is dominated by junipers (primarily *Ju-*

Table 1. Habitats along the AIP transmission line right-of-way. Habitat types follow Brown (1982).

HABITAT TYPE	LENGTH (km)	% AIP
Plains grassland	125.6	30.0
Semidesert grassland	109.5	26.2
Chihuahuan desertscrub	96.6	23.1
Great Basin conifer woodland	49.9	11.9
Pinyon-juniper/ponderosa pine ecotone	17.7	4.2
Rocky Mountain montane conifer forest (ponderosa pine)	8.1	1.9
Rocky Mountain montane conifer forest (mixed)	8.1	1.9
Riparian deciduous woodland	1.6	0.4
Rocky Mountain montane grassland	1.6	0.4
Total	418.7	100.0

*niperus monosperma*) and pinyon pines (*Pinus edulis*). Red-tailed hawks and American kestrels were the most frequently observed species (78% of total observations), but turkey vultures were also frequently observed (Table 2). At the ecotone where this community met plains grasslands, raptors were particularly abundant. In October and January, golden eagles, ferruginous hawks, and rough-legged hawks were commonly observed at this ecotone. Pinyon-juniper woodlands also came into contact with semidesert grasslands along the AIP ROW. At this ecotone, golden eagles were observed in July, while bald eagles (*Haliaeetus leucocephalus*) were observed in pinyon-juniper and Ponderosa pine (*P. ponderosa*) ecotones in January (Tables 2, 3).

Rocky Mountain montane conifer forest accounted for approximately 2% of the habitat crossed by the AIP ROW (Table 1). This cold temperate community is generally found above 2,250 m and is dominated by ponderosa pine with lesser areas of mixed conifer forests of Douglas-fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), white pine (*P. flexilis*), or aspen (*Populus tremuloides*). Red-tailed hawks and American kestrels were the most frequently observed raptors in these forest habitats (Table 2). Several unidentified accipiters, including an adult northern goshawk (*A. gentilis*), were observed in a potential nesting area. In January, several bald eagles were observed in areas of forest-plains grassland ecotones. These parklands, or montane grasslands, are scattered throughout the

northern portion of the AIP ROW (Fig. 1, Table 2).

The AIP crossed several large drainages supporting riparian deciduous forest and woodland communities, particularly Animas and Palomas creeks near Truth or Consequences (Fig. 1). Several species were observed or heard in these drainages, including Cooper's hawks (*A. cooperii*), sharp-shinned hawks (*A. striatus*), red-tailed hawks, and American kestrels (Table 2). Riparian habitats along the northern portion of the survey route included the Tularosa River and Apache Creek, where American kestrels, red-tailed hawks, ferruginous hawks, and bald eagles were observed. Bald eagles were also observed along the shoreline of Caballo Reservoir in January.

In addition to native habitats surveyed along and near the AIP ROW, agricultural and urban areas were also traversed along the survey route. Red-tailed hawks and American kestrels were the most frequently observed species in these habitats, but turkey vultures, Swainson's hawks, northern harriers, ferruginous hawks, merlins, and rough-legged hawks were also seen (Table 2).

The overwhelming number of American kestrels and red-tailed hawks observed during all surveys and all seasons indicated they were the most abundant raptors in the region. Their combined observations accounted for over 60% of individuals observed (Table 3). Kimsey and Conley (1988) also found American kestrels and red-tailed hawks to be the most abundant species in their study area in southcentral New Mexico. We also found Swainson's hawks, northern harriers, golden eagles, ferruginous hawks, and Cooper's hawks in approximately the same relative abundances. The most notable difference between the two surveys was that no turkey vultures were recorded during their 4-yr study in southcentral New Mexico. This difference could partially be explained because, unlike our survey, the previous survey excluded the months of June and July.

We also observed more red-tailed hawks in the fall and winter (70%), while more American kestrels were observed in the spring and summer (76%). This suggests that large numbers of red-tailed hawks overwinter in the area, augmenting the resident population as reported by Hubbard et al. (1988), and that most of the breeding kestrels migrated further south for the winter. Other species which overwintered in the study area, as shown by increased observations in October and January,

Table 2. Numbers of raptors observed in habitat types included in the AIP surveys, 1988–89.

SPECIES	HABITAT TYPE <sup>a</sup>						
	PP <sup>a</sup>	PJ	PG	SDG	CD	R	A/U
Turkey vulture ( <i>Cathartes aura</i> )	6	34	12	50	74	20	7
Golden eagle ( <i>Aquila chrysaetos</i> )	3	14	9	34	30	2	
Bald eagle ( <i>Haliaeetus leucocephalus</i> )	7	2				16	
White-tailed kite ( <i>Elanus caeruleus</i> )		1					
Northern harrier ( <i>Circus cyaneus</i> )	1	5	41	63	47	3	4
Sharp-shinned hawk ( <i>Accipiter striatus</i> )	2	1				2	
Cooper's hawk ( <i>A. cooperii</i> )	2		2	5	7	12	
Northern goshawk ( <i>A. gentilis</i> )						1	
Red-tailed hawk ( <i>Buteo jamaicensis</i> )	66	124	70	97	160	28	14
Swainson's hawk ( <i>B. swainsoni</i> )		1		55	13	1	3
Rough-legged hawk ( <i>B. lagopus</i> )		1	3	5	1		1
Ferruginous hawk ( <i>B. regalis</i> )	3	7	19	6	4	6	4
Harris' hawk ( <i>Parabuteo unicinctus</i> )					4		
Zone-tailed hawk ( <i>B. albonotatus</i> )		1			1		
American kestrel ( <i>Falco sparverius</i> )	98	128	187	66	46	35	21
Merlin ( <i>F. columbarius</i> )	1		5	2			1
Prairie falcon ( <i>F. mexicanus</i> )	1	1	18	12	8		

<sup>a</sup> Habitat types: PP = Ponderosa pine, PJ = Pinyon-juniper, PG = Plains grassland, SDG = Semidesert grassland, CD = Chihuahuan desertscrub, R = Riparian woodland, A/U = Agricultural/Urban.

included golden eagles, bald eagles, northern harriers, rough-legged hawks, ferruginous hawks, merlins, and prairie falcons. Turkey vultures and Swainson's hawks appeared to be the only species which summered in the study area and wintered elsewhere (Table 3; Kimsey and Conley 1988).

Like Kimsey and Conley (1988), we found Chihuahuan desertscrub with power lines to be an important habitat type for golden eagles, Swainson's hawks, red-tailed hawks and northern harriers, whereas riparian habitats appear to be important for bald eagles and Cooper's hawks. Turkey vul-

tures, ferruginous hawks and American kestrels appear to be more variable in their habitat use.

Hubbard et al. (1988) found red-tailed hawks and American kestrels to be more abundant in southwestern New Mexico than elsewhere in the state. They reported an average of 2.5 red-tailed hawks/100 km and 4.1 American kestrels/100 km traveled during vehicular surveys from 1974–85. We found 13.6 red-tailed hawks/100 km and 14.1 American kestrels/100 km traveled during our surveys. We suspect these differences were largely due to differences in study design, including slower ve-

Table 3. Numbers and relative abundance (RA) of raptors observed during the AIP surveys in southwestern New Mexico, 1988–89.

SPECIES	SPRING/SUMMER		FALL/WINTER	
	NO.	RA	NO.	RA
American kestrel	440	213.5	141	68.4
Red-tailed hawk	165	80.1	394	191.2
Turkey vulture	201	97.5	2	1.0
Northern harrier	7	3.4	157	76.2
Golden eagle	20	9.7	72	34.9
Swainson's hawk	73	35.4	0	0.0
Ferruginous hawk	2	1.0	47	22.8
Prairie falcon	8	3.9	32	15.5
Cooper's hawk	7	3.4	21	10.2
Bald eagle	0	0.0	25	12.1
Rough-legged hawk	0	0.0	11	5.3
Merlin	0	0.0	9	4.4
Sharp-shinned hawk	1	0.5	4	1.9
Harris' hawk	1	0.5	3	1.4
Zone-tailed hawk	2	1.0	0	0.0
White-tailed kite	0	0.0	1	0.5
Northern goshawk	0	0.0	1	0.5

hicle speeds, increased observer numbers, and the overall focus of surveys. Hubbard et al. (1988) also found turkey vultures to be most abundant in southeastern New Mexico, followed by the southwestern portion of the state, which included our survey area. They reported observing 3.4 turkey vultures/100 km traveled in southwestern New Mexico, while we observed 4.9 turkey vultures/100 km.

ACKNOWLEDGMENTS

We thank El Paso Electric Company for funding the study. T.J. Hayden at The University of New Mexico, Albuquerque, B.A. Kimsey, U.S. Bureau of Land Management, Las Cruces District, and the U.S. Forest Service, Gila National Forest, provided valuable technical assis-

tance. J. Carrion assisted with word processing, and P.J. Scheetz prepared the figure of the study area. J.L. Ganey, B.A. Millsap, B.A. Kimsey, J.P. Hubbard, J.M. Ramakka, and one anonymous referee provided helpful comments on earlier drafts of the manuscript.

LITERATURE CITED

BROWN, D.E. [ED]. 1982. Biotic communities of the American Southwest—United States and Mexico. *Desert Plants* 4(1–4).

——— AND C.H. LOWE. 1983. Biotic communities of the Southwest. General Tech. Rep. RM-78. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Arizona State Univ., Tempe, AZ U.S.A.

FULLER, M.R. AND J.A. MOSHER. 1987. Raptor survey techniques. Pages 37–65 in B.A. Giron Pendleton, B.A. Millsap, K.W. Cline and D.M. Bird [EDS.], Raptor management techniques manual. Natl. Wildl. Fed., Washington, DC U.S.A.

GLINSKI, R.L., B.A. GIRON PENDLETON, M.B. MOSS, M.N. LEFRANC, JR., B.A. MILLSAP AND S.W. HOFFMAN [EDS.] 1988. Proceedings of the southwest raptor management symposium and workshop. Natl. Wildl. Fed., Washington, DC U.S.A.

HUBBARD, J.P., J.W. SHIPMAN AND S.O. WILLIAMS, III. 1988. An analysis of vehicular counts of roadside raptors in New Mexico, 1974–1985. Pages 204–209 in R.L. Glin-ski, B.A. Giron Pendleton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap and S.W. Hoffman [EDS.], Proceedings of the southwest raptor management symposium and workshop. Natl. Wildl. Fed., Washington, DC U.S.A.

KIMSEY, B. AND M.R. CONLEY. 1988. Habitat use by rap-tors in southcentral New Mexico. Pages 197–203 in R.L. Glin-ski, B.A. Giron Pendleton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap and S.W. Hoffman [EDS.], Proceedings of the southwest raptor management symposium and workshop. Natl. Wildl. Fed., Washing-ton, DC U.S.A.

WOFFINDEN, N.D. AND J.R. MURPHY. 1977. A roadside rap-tor census in the eastern Great Basin—1973–1974. *Raptor Res.* 11:62–66.

Received 13 April 1996; accepted 14 July 1996