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## FIDELITY OF MIGRANT BALD EAGLES TO WINTERING GROUNDS IN SOUTHERN COLORADO AND NORTHERN NEW MEXICO

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Abstract.—Ten of 36 Bald Eagles (*Haliaeetus leucocephalus*) color-marked in a Colorado wintering area were found there during subsequent winters, whereas only one was known to winter elsewhere. Four adult eagles returned to the same winter ranges on which they had been radio-tracked during the winter of their capture, one color-marked adult was seen near its capture site for six succeeding winters, and a banded adult was found dead 3 km from its winter capture site 10 yr later. Percent of marked adults observed in subsequent years in the same wintering area was equivalent to that of immatures, but mean number of years adults were seen post-marking was greater, indicating traditional use of wintering grounds by adults. Breeding grounds of some adults from a southern Colorado wintering population were at least 1900 km north in east-central Saskatchewan and western Manitoba, Canada.

### FIDELIDAD DE INDIVIDUOS MIGRATORIOS DE *HALIAEETUS LEUCOCEPHALUS* A LUGARES INVERNALES DEL SUR DE COLORADO Y EL NORTE DE NUEVO MÉXICO

Sinopsis.—Diez de 36 individuos de Águila Calva (*Haliaeetus leucocephalus*) que fueron marcados (en el ala) en una localidad invernal de Colorado, fueron encontradas en años subsiguientes en dichas localidades, a excepción de un ave que pasó el invierno en otra localidad. Cuatro águilas adultas regresaron a la misma localidad en donde fueron radio-estudiadas durante el invierno de su captura. Un individuo, marcado en el ala, fue observado cerca de su lugar de captura en seis inviernos subsiguientes, y otro adulto marcado, diez años antes, fue encontrado muerto a 3 km de su lugar de captura. El porcentaje de adultos marcados y observados en años subsiguientes en las mismas áreas invernales resultó equivalente al porcentaje a los inmaduros. No obstante, el número promedio de adultos/años, observados con posterioridad a ser marcados, resultó mayor que el de los inmaduros, lo que indica el uso tradicional de lugares para pasar el invierno. Las áreas de anidamiento de algunos de los adultos de la población invernal de Colorado estaban al menos a 1900 km (hacia el norte) de la parte este central de Saskatchewan y el oeste de Manitoba, Canada.

There is substantial evidence that individuals of migratory Falconiform species return to the vicinity of their natal area to breed (Newton 1979). There is less evidence, however, of fidelity of individual raptors to wintering areas. Four of 21 (19%) marked American Kestrels (*Falco sparverius*) and four of 27 (15%) marked Prairie Falcons (*F. mexicanus*) returned to the same areas the winter after they were marked (Enderson 1964, Mills 1975). Two distinctive Common Buzzards (*Buteo buteo*), one a white morph, were seen in the same area for eight and 12 winters (de Bont 1952, Schuster 1940). Helander (1990) found White-tailed Sea Eagles (*Haliaeetus albicilla*) color-banded in Swedish Lapland joined resident eagles on the Baltic coast during winter but did not describe fidelity of individual eagles to the wintering area over successive years.

Most research on wintering Bald Eagles (*Haliaeetus leucocephalus*) in the central United States (Platt 1976; Southern 1963, 1964; Steenhof 1983) and along the Pacific coast (Servheen 1975, Stalmaster et al. 1979) involved observations of unmarked birds concentrated where prey or carrion were abundant. Individuals were not identifiable from year to year so traditional use of wintering grounds could not be determined. Craig et al. (1988) incidentally reported that a banded adult Bald Eagle from Maine wintered four consecutive years on the same Connecticut river. Twenty-four of 111 (22%) Bald Eagles banded as nestlings in Maine were subsequently photographed during two successive winters at two winter feeding stations in coastal Maine (McCullough 1989). We analyzed records of recaptures, sightings and band encounters of 39 individually recognizable Bald Eagles in Colorado and New Mexico to investigate fidelity of long-distant migrants to established wintering grounds.

From January through March 1977 and 1978, 18 adult and 18 immature Bald Eagles were captured in the San Luis Valley (SLV) of south-central Colorado from an estimated population of 150–175 birds. Eagles were aged and sex assigned by methods developed by Harmata (1984). Each was marked with yellow, wrap-around patagial wing markers with black alpha-numeric codes. Four adults captured in 1978 were also radio-tagged and their movements monitored through the winter. Transmitters were tail-mounted and lost during subsequent summer molt.

Data on three additional Bald Eagles supplemented the marked sample. One adult male, captured, banded and radio-tagged (but not color-marked) in the SLV in January 1980, was subsequently found dead. Another adult male that was captured, banded and radio-tagged at Abiquiu Reservoir, New Mexico, 150 km south of the SLV in February 1988, had a deformed bill that was recognizable at considerable distance. He was identified in subsequent years by the combination of bill shape and aluminum band. Finally, an immature Bald Eagle whose right leg protruded laterally was observed initially by M. Vekasy (pers. comm.) during the winter of 1989 in the central Rio Grande Valley of New Mexico. An eagle with the same condition but advanced in plumage (i.e., age class) was observed in the Rio Grande Valley in New Mexico again in winter 1990. Insight

gained from observing hundreds of free-flying Bald Eagles indicated that this injury was so unique that confusion with another eagle was extremely unlikely.

Eagles subsequently were observed or recaptured in southern Colorado and northern New Mexico between 1978 and 1990. Searches for marked eagles in the SLV were most frequent during the winters of 1979–1980 and 1980–1981, but were incidental to Bald Eagle radio-telemetry studies and therefore were not systematic. Subsequent visits to the SLV were limited to investigations of the efficacy of artificial perch structures and searches for color-marked eagles were restricted to areas of historical use (Harmata 1984). Other than 3 d sojourn through western Colorado in March 1978, we did not search any other Bald Eagle wintering areas for color-marked eagles. Origins of most Bald Eagles with yellow patagial markers reported elsewhere in the western United States could not be determined definitively. Confusion resulted because eagles in Glacier National Park, Montana were marked during the same period with the same colors but with different alpha-numeric codes as eagles in the SLV. Alpha-numeric codes on markers of eagles observed outside of marking areas were seldom reported. Less than 10 h of searching were required to relocate the two New Mexico eagles in 1989 and 1990.

Six of 18 (33%) eagles marked as immature were observed during subsequent winters. Five (28%) were observed or recaptured in the SLV (Table 1), four within 12 km of their capture site. Average number of years five immatures were seen post-marking was 1.4 (range 1–4). The sixth was C19, a juvenile male marked in March 1977. He was seen six consecutive autumns (1977–1982) at a Bald Eagle concentration in Glacier National Park (B. R. McClelland, pers. comm.). Most Bald Eagles marked in Glacier National Park and seen elsewhere wintered west of the Continental Divide in the Great Basin or farther west (B. R. McClelland, pers. comm.). C19 was found dead, shot with a high-powered rifle, on the northwest shore of Flathead Lake, Montana 70 km southwest of Glacier National Park in February 1983. He was not known to have returned to the SLV subsequent to capture.

NM1, an injured immature, was regularly observed in January 1989 near Los Lunas, New Mexico (M. Vekasy, pers. comm.). The eagle was observed again in February 1990 at Bosque del Apache National Wildlife Refuge, 100 km south.

Five of 18 (28%) color-marked adult Bald Eagles were seen again in the SLV during winters after they were marked (Table 1). Average number of years seen post-marking was 3.8 (range 1–6). C11 was observed more than 20 times during six winters after his capture. All sightings were within a 10-km<sup>2</sup> area, 4 km east of his 1977 capture site.

NM2 was captured and radio-tagged at Abiquiu Reservoir in northern New Mexico during February 1988. Male sex was confirmed by copulatory position in March. He was observed again during winters of 1989 and 1990 within his 1988 winter home range. Three of four adult eagles

TABLE 1. Wintering Bald Eagles marked in south-central Colorado and north-central New Mexico and observed there in subsequent winters.

Age class	Marker code	Age <sup>a</sup>	Sex	Date captured	Year (and #) of sightings
Immatures	C01	0.5	M	Jan. 1977	78 (1) <sup>b</sup>
	C07	1.5	F	Feb. 1977	78 (3)
	C14	1.5	F	Feb. 1977	78 (1) <sup>b</sup>
					80 (2)
					81 (1)
	C32	1.5	F	Jan. 1978	79 (1)
	C2? <sup>c</sup>	—	—	Jan. 1978	79 (1)
	NM1 <sup>d</sup>	1.5	F	Jan. 1989 <sup>e</sup>	90 (1)
Adults	C04	4.5+	M	Feb. 1977	78 (3)
					79 (1)
	C11	4.5+	M	Feb. 1977	78 (>5)
					79 (1)
					80 (>5)
					81 (>5)
					82 (1)
					83 (2)
	C23	4.5+	M	Jan. 1978 <sup>f</sup>	79 (4)
					80 (5)
					81 (3)
C26	4.5+	F	Jan. 1977 <sup>f</sup>	78 (1)	
C29	4.5+	F	Jan. 1978 <sup>f</sup>	79 (2)	
				80 (3)	
				81 (2)	
	#2 <sup>g</sup>	7.5+	M	Jan. 1980 <sup>f</sup>	90 (1) <sup>h</sup>
	NM2 <sup>d</sup>	4.5+	M	Feb. 1988 <sup>f</sup>	89 (2) <sup>i</sup>
					90 (1)

<sup>a</sup> At time of capture based on Harmata (1984).

<sup>b</sup> Recaptured.

<sup>c</sup> Second number obscured by feathers; therefore individual, age and sex could not be determined.

<sup>d</sup> Eagle designation, not colormarker code.

<sup>e</sup> Not captured, but closely observed.

<sup>f</sup> Radio-tagged.

<sup>g</sup> Receiver channel number.

<sup>h</sup> Found dead, band encounter.

<sup>i</sup> Sightings in November and December 1988 were assigned to 1989.

color-marked and radio-tracked in the SLV in 1978 were subsequently observed there. Though winter ranges were not calculated for these three SLV adults, the majority of visual locations in following years occurred within areas where they had been radio-tracked during 1978.

In January 1980 an adult Bald Eagle thought to be at least 7 yr old was captured, banded and radio-tagged (but not color-marked) in the SLV. Designated #2 by transmitter frequency channel, male sex was confirmed afterward by position in copulation, observed twice in late March less than 3 km from the capture site. During late March and

early April 1980, #2 was followed 1968 km to a nest site in northeastern Saskatchewan, Canada, where he and his mate fledged one young in July (Harmata 1984).

In winter 1980–1981, an adult male Bald Eagle banded on the same leg as #2 frequented areas and perches used by #2 the previous winter. In March 1990, #2 was found dead, a victim of chronic lead poisoning, less than 3 km from his 1980 capture site. At minimum, #2 was 14.5 yr old when he died, but was probably more than 17.5 yr old, based on plumage, eye and mandible coloration at time of capture.

Summer locations of six adult Bald Eagles radio-tagged in the SLV in 1980 (including #2) and 1981 were all within an approximately 10,000-km<sup>2</sup> area of east-central Saskatchewan and western Manitoba, more than 1900 km north of the wintering grounds (Harmata 1984). NM2 migrated through the SLV in March 1988 before radio contact was lost and possibly summered in the same region. Juvenile Bald Eagles radio-tagged in the nest in north-central Saskatchewan were located moving south towards Colorado and New Mexico in autumn, bypassing Glacier National Park well to the east. In spring, these juveniles were found along the same migration routes radio-tagged SLV adults followed to Saskatchewan nest sites (Harmata et al. 1985).

Thirty-one percent (11 of 36) of eagles color-marked in the SLV were observed at least one winter post-marking. Mortality and marker loss probably decreased marked cohorts although magnitude and rate of decrease were impossible to quantify. Regardless, a substantial portion (28%) of Bald Eagles marked in the SLV was known to return to wintering grounds. Percentage of marked eagles observed during following winters is remarkable because it is higher than that observed for a Bald Eagle population studied in Maine (McCullough 1989), which presumably migrated less extensively. Percent of adults observed in subsequent years in the same wintering area was equivalent to that of immatures but mean number of years adults were seen post-marking was considerably greater (nearly four), indicating traditional use of wintering grounds by adults. Observations of three unmarked but identifiable eagles corroborate the concept of high fidelity of Bald Eagles to established wintering grounds, especially eagle #2. In all probability, he returned to the SLV each winter for 10 yr post-capture.

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