

FALL 2000 RAPTOR MIGRATION STUDIES IN THE GOSHUTE MOUNTAINS OF NORTHEASTERN NEVADA

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INTRODUCTION

The Goshute Mountains Raptor Migration Project in northeastern Nevada is an ongoing effort to monitor long-term trends in populations of raptors using this Intermountain migratory flyway (Hoffman et al. in review). HawkWatch International (HWI) began an extensive trapping and banding program at the project site in 1980 and initiated standardized counts of the autumn raptor migration through this region in 1983. To date, HWI observers have recorded 18 species of migratory raptors at the site, with counts current ranging between 15,000 and 25,000 migrants per season. The 2000 season marked the 21st consecutive season of banding and 18th consecutive standardized count of migrating raptors at this site. This report summarizes the 2000 count and banding results.

The Goshute project was 1 of 15 long-term, annual migration counts (12 fall, 3 spring) and 1 of 7 migration banding studies (6 fall, 1 spring) conducted or sponsored by HWI in North America during 2000. The primary objective of these efforts is to track long-term population trends of diurnal raptors throughout primarily western North America (see Smith and Hoffman 2000 for a comprehensive review of raptor migration monitoring in western North America). Raptors feed atop food pyramids, inhabit most ecosystems, occupy large home ranges, and are sensitive to environmental contamination and other human disturbances. Therefore, they serve as important biological indicators of ecosystem health (Cade et al. 1988; Bednarz et al. 1990a; Bildstein and Zalles 1995). Moreover, due to the remoteness and widespread distribution of most raptor populations, migration counts likely represent the most cost-effective and efficient method for monitoring the regional status and trends of multiple raptor species (Bednarz and Kerlinger 1989, Titus et al. 1989, Bildstein and Zalles 1995, Bildstein et al. 1995, Dunn and Hussell 1995, Dixon et al. 1998, Smith and Hoffman 2000).

The intensive counting and banding operations also provide valuable information about breeding and wintering distributions, migratory routes, migratory behavior, population demographics, mortality factors and longevity, morphometric variation, molt sequences and timing, and health assessments. This information enables us to better understand the life histories, ecology, status, and conservation needs of raptor populations in North America. In addition, these migration studies offer unique opportunities for the public to learn about raptors and the natural environment, and providing such opportunities is another important component of HWI's mission. Accordingly, since 1993 the Goshute field crew has included one or more trained educators dedicated to conducting environmental education programs at the site and facilitating interactions between visitors and the field biologists.

STUDY SITE

The Goshute Mountains form a 100-km ridge that runs north–south along the Utah–Nevada border. The study site is located in the Goshute Wilderness Study Area approximately 40 km southwest of Wendover, Nevada, on land administered by the Bureau of Land Management (BLM), Elko District (40° 25.417' N, 114° 16.276' W; Figure 1). The site is reached via a primitive trail that ascends Christmas Tree Canyon from the east. The main observation post (OP1) is located at an elevation of 2,743 m (8,999 ft) near the south end of the ridge. The location provides an expansive 360° view of the surrounding landscape, with visibility extending to the Ruby Mountains 100 km to the west and to the Cedar Mountains 120 km to the east. A second observation post (OP2) is located 100 m north of the main observation post and is used during east winds when birds often pass below eye-level along the east side of the ridge.

In 2000, four banding stations were located 250–600 m to the north, northwest, south, and east of OP1 (Figure 1). **North** station, established mid-season in 1989 and modified slightly in 1998, is located about 600 m north-northwest of OP1 directly on top of the ridge at 2,700 m elevation, and is the first station southbound migrants encounter. **West** station, established in 1980 and modified slightly in 1995 and

2000, is located about 500 m south of North station and 250 m north of OP1 on the west flank of the ridge at 2,720 m elevation. **Meadow** station, established in 1987 and modified in 1996, 1998, and 2000, is located about 350 m east of OP1 on the east flank of the ridge in a natural sagebrush meadow at 2,620 m elevation. **South** station (established in 1982 and modified in 1998) lies about 500 m south of OP1 in a topographic saddle at 2,660 m elevation.

The Goshute Mountains are typical of the Great Basin region: dry, sparsely forested, and rocky. Pinyon pine (*Pinus monophylla*) and Utah juniper (*Juniperus osteosperma*) dominate lower slopes. White fir (*Abies concolor*), limber pine (*Pinus flexilis*), and bristlecone pine (*Pinus aristata*) dominate the overstory along the crest and on north-facing slopes. Mountain mahogany (*Cercocarpus montanus*) is a prominent shrub, especially on exposed portions of the ridge.

The geographic location and physiographic characteristics of the Goshute observation site make it an ideal spot for monitoring the autumn raptor migration through the region. The relatively inhospitable Great Salt Lake Desert lies immediately east of the Goshute range and represents a formidable barrier to most migrating raptors (Figure 2), providing neither prey, roosting habitat, nor strong updrafts that provide lift. Instead, migrating raptors moving south from breeding grounds north of the desert tend to funnel to the west (and east) and therefore concentrate along the Goshute range where steep slopes and forest habitat provide favorable migration conditions. Moreover, the Goshute Mountains lie at the southern tip of a large funnel that is fed by the Black Pine, Raft River, Grouse Creek, Pilot, and Toana Mountains. These ranges act as “leading lines” (Mueller and Berger 1967) that guide raptors toward the Goshute range from the north and northeast. These conditions are responsible for the Goshute flyway attracting one of the largest known concentrations of migrant raptors in western North America.

METHODS

STANDARDIZED COUNTS

Two official or designated observers (actually three people with rotating responsibilities), relieved or supplemented by other trained volunteers, conducted standardized daily counts of migrating raptors from two traditional observation sites. The observers used the main observation post (OP1) on west wind days and the secondary post (OP2) on days with light winds or winds with an easterly component. Primary observers Jerry Liguori, Jeff Maurer, and Nathan McNett had 16, 3, and 2 full-seasons, respectively, of previous experience counting migratory raptors (see Appendix A for a complete history of observer participation). Site coordinator and regular substitute observer Aaron Barna had five seasons of previous experience counting migrants. Visitors also frequently assisted with spotting migrants. Weather permitting, observations usually began between 0800 and 0900 hrs Mountain Standard Time (MST) and ended near sunset, usually between 1800 and 1900 hrs.

The observers routinely recorded the following data:

1. Species, age, sex, and color morph of each migrant raptor, whenever possible and applicable (Appendix B lists common and scientific names for all species, information about the applicability of age, sex, and color morph distinctions, and two-letter codes used to identify species in some tables and figures).
2. Hour of passage for each migrant; e.g., the 1000–1059 hrs MST.
3. Wind speed and direction, air temperature, percent cloud cover, predominant cloud type(s), precipitation, visibility, and an assessment of thermal lift conditions, recorded for each hour of observation on the half hour.

4. Predominant direction, altitude, and distance from the lookout of the flight during each hour.
5. Total minutes observed and mean number of observers (official observers plus visitors who actively scanned for migrants for more than 10 minutes in a given hour) and visitors (all other guests) present during each hour.
6. Daily start and end times for each official observer.

The observers used high quality 7–10x binoculars and a 20–60x spotting scope to assist in spotting and identifying birds. Clark and Wheeler (1987), Dunne et al. (1988), and Wheeler and Clark (1995) served as primary identification references. Assessments of wind speed, cloud type, cloud cover, and flight altitude followed guidelines published by the Hawk Migration Association of North America (HMANA). Assessments of thermal lift conditions as poor, fair, good, or excellent involved subjective evaluations of solar intensity, wind speed, and migrant behavior.

The observers classified as residents and excluded from daily counts any raptor that exhibited hunting, territorial display, or perching behaviors for extended periods. The observers occasionally recorded as migrants birds that were not moving in a southerly direction, if such birds otherwise displayed migrant characteristics; i.e., continuous flight without stopping or substantially changing directions for several kilometers. Such birds may be dispersing juveniles or adults dispersing relatively short-distances from their nesting territories to favored wintering grounds in the same general region. However, we also know from recent satellite telemetry work that species such as Prairie Falcons and Ferruginous Hawks frequently “migrate” in non-standard directions to take advantage of favored post-breeding and wintering grounds (Watson and Pierce 2000, K. Steenhof personal communication).

Two of the four banding stations were located north of the observation lookout. The observers disregarded the trapping operations and counted all raptors that passed by observation. Released birds typically fly into cover or low along the ridge, so observers and banders maintained close radio contact to assist with detection of released birds. This procedure likely resulted in a slight undercount of migrants, but avoided the problem of duplicate counts associated with other methods, such as having observers try to identify and disregard released birds and later add trapping totals to the count.

For purposes of examining long-term variation in annual counts, we manipulated the count data to standardize sampling periods and adjust for daily variation in observation effort and observer numbers. The seasonal and daily duration of observation effort can greatly affect count statistics (Hussell 1985, Kerlinger 1989, Bednarz et al. 1990b), and both have varied in the Goshutes during the course of the study, particularly during the first several years of observations. To standardize seasonal sampling effort, we defined a consistent annual sample period following conventions proposed by Bednarz and Kerlinger (1989) and Bednarz et al. (1990b). Specifically, we converted counts to passage rates on a daily basis (raptors/100 hours of observation) to adjust for daily variation in sampling effort, summed daily rates by Julian date across all years, and defined standardized passage periods for each species by eliminating approximately 2.5% from each extreme of the cumulative passage-rate distributions. Because entire count days must be either included or excluded, the defined sample period for a given species included between 95–100% of the detected number of migrants. For some species, the sample periods defined in this way encompassed dates earlier or later than periods of continuous observations. In these cases, we further restricted the adjusted sample periods to between mean starting and ending dates of continuous observations for 1983–2000: 15 August – 2 November.

Recent analyses (HWI unpublished data) suggested that passage rates documented at this site through 1999 increased significantly when the daily-average number of observers increased to two or more (observers included official and designated counters, plus qualified visitors that actively participated for more than 10 minutes in a given hour). Before 1987, a single official observer conducted all counts. From 1987 to 1990, a second observer participated during the peak month of activity. Thereafter, a

system of two official observers throughout the season became standard. Guest observers have participated in the counts throughout the study. We applied correction factors derived from these analyses to adjust for variation in observer numbers before examining patterns in the data.

After standardizing sample periods and adjusting daily counts for observer numbers (henceforth called “adjusted” counts), we calculated adjusted annual passage rates for each species (adjusted total count / total hours of observation for a given year * 100 = raptors/100 hrs). Using passage rates rather than counts as the index for analysis avoids potential biases caused by variation in sampling effort due to inclement weather and other unforeseeable events.

We also recently completed a comprehensive analysis of long-term trends in counts from HWI’s four longest-term migration sites, including the Goshutes (HWI unpublished data). For the Goshutes, the analyses involved linear and quadratic regressions examining trends in annual passage rates between 1983 and 1999. Reference to significant trends indicates $P \leq 0.05$.

We also compare 2000 annual statistics against means \pm 95% confidence intervals (CI) for previous seasons. Here, we equate significance with a 2000 value falling outside of the 95% CI for the associated mean. We limit most comparisons of age and sex statistics to 2000 values versus means for 1992–1999, because pre-1992 class data have not yet been computerized.

TRAPPING AND BANDING

Rotating crews of 2–5 trappers and processors operated each trapping station, with crew size depending on trapper experience, characteristics of the station, and flight volume. The crews generally trapped between 0900 and 1700 hrs MST. Capture devices included mist nets, remotely triggered standard bow nets (Meng 1963, Austing 1964), remotely triggered surge bow nets, and dho-gaza nets (Clark 1971). Each banding station typically operated 3–6 standard bow nets, 1 surge bow net, 1–3 dho-gazas, and 3–4 mist nets. Trappers lured migrating raptors into the capture stations from camouflaged blinds using live, non-native Rock Doves (*Columba livia*), Ringed Turtle-doves (*Streptopelia risoria*), European Starlings (*Sturnus vulgaris*), and House Sparrows (*Passer domesticus*) attached to lure lines manipulated from the blinds. Unless already banded, all captured birds were fitted with a uniquely numbered USGS Biological Resources Division aluminum leg band. Processors identified species, subspecies, sexes, and ages using morphological characteristics described in the U.S. Bird Banding Laboratory (BBL) Manual, Clark and Wheeler (1985), Wheeler and Clark (1995), and Hoffman et al. (1990). Processors also recorded a series of standard morphometric, health, and molt data for each bird. Unless chosen to be outfitted for satellite telemetry, all birds were released within 45 minutes from the time of capture.

RESULTS AND DISCUSSION

WEATHER

The weather was variable for most of the 2000 season, and included multiple snowstorms (see Appendix C for daily weather records). Most weather fronts were substantial, causing an above average number of observation days with overcast skies and rain or snowfall. Inclement weather precluded five full days of observation, and rain, snow, or fog limited observations to <5 hrs on seven other days. Wildfire danger remained high in the area for the second consecutive year and several fires burned nearby during the season; however, unlike in 1999, no observation days were missed due to wildfire smoke. Average daily temperatures ranged from -3.9°C to 25.5°C throughout the season and remained above 10°C until early October, at which time temperatures dropped and were generally below 10°C for the remainder of the season. Thermal lift was rated fair to poor on 67% of all days, a near normal value, with nearly all the

remaining observation days (32%) receiving a good rating. Strong winds (>20 kph) prevailed on only 10% of the active observation days and were generally associated with smaller flights than moderate to light wind days (<20 kph) with similar weather. Southwest winds, which typically have been associated with peak flights, predominated on 50% and occurred during part of another 10% of the active observation days this season. Northeast winds were the next most common (21% of days). Of 12 days with flights above 40 raptors/hr, 83% had southwest winds occurring for at least a portion of the day, 8% had northeast winds, and 8% had east winds.

OBSERVATION EFFORT

The observers worked on 78 of 83 possible observation days between 15 August and 5 November. The numbers of observation days and hours (681.50) were both slightly but not significantly higher than average (Table 1). The 2000 average of 2.2 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) was significantly lower (21%) than the 1985–1999 mean of $2.8 \pm 95\%$ CI of 0.30 observers/hr. An average of more than two observers per day generally results in counts being adjusted downward to standardize for the usual results obtained by two observers. This was the case this season, as the total count was adjusted downward from 17,327 to 16,656 birds (compare values in Table 1 and Appendix E).

MIGRATION SUMMARY

The observers counted 17,327 migrant raptors of 18 species during the 2000 season (see Appendix D for unadjusted daily count records). No record low or high counts occurred this season; however, the count of Broad-winged Hawks was the second highest ever and the single Red-shouldered Hawk was only the sixth individual of this species ever recorded at the site (see Appendix E for unadjusted count summaries by species for each year of the project).

Based on adjusted counts, the 2000 flight was composed of 54% accipiters, 21% buteos, 18% falcons, 2% vultures, 2% eagles, 1% harriers, 1% Ospreys, and <1% unidentified raptors. The 2000 season featured significantly higher than average proportions of Ospreys and falcons, and a significantly lower than average proportion of accipiters (Figure 3). The most common species was the Sharp-shinned Hawk (35% of the total unadjusted count), followed by Red-tailed Hawk (20%), American Kestrel (18%), and Cooper's Hawk (17%). No other species comprised more than 2% of the total count.

Adjusted passage rates were significantly higher than average for 8 of 18 species seen this season (Osprey, Northern Harrier, Sharp-shinned Hawk, Red-shouldered Hawk, Broad-winged Hawk, Red-tailed Hawk, American Kestrel, and Peregrine Falcon), whereas only Swainson's Hawk showed a significantly lower than average adjusted passage rate (Table 1). The 1983–1999 regression analyses indicated significant linear increasing trends for Turkey Vultures, Ospreys, Sharp-shinned Hawks, Cooper's Hawks, Broad-winged Hawks, Swainson's Hawks, American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons (Figures 4–9). A significant quadratic regression indicated an increasing trend for Ferruginous Hawks through 1995, but stabilization thereafter (Figure 7). A significant quadratic trend for Northern Harriers indicated relatively stable rates through 1993, but an accelerating increasing trend thereafter (Figure 4). No significant long-term trends were indicated for the remaining species. The 2000 adjusted passage rates generally extended these patterns. However, two consecutive moderate passage rates dampened the increasing pattern for Turkey Vultures (Figure 4), and a low 2000 passage rate dampened the increasing trend for Swainson's Hawks (Figure 6). In addition, between 1990 and 1999, both Sharp-shinned and Cooper's Hawks showed a remarkably similar pattern of annual oscillations with an increasing trajectory, but moderate passage rates in 2000 broke the pattern for both species (Figure 5).

Immature : adult ratios were significantly lower than average for Northern Harriers, Cooper's Hawks, Broad-winged Hawks, and Red-tailed Hawks in 2000 (Table 2). Moreover, for all but Broad-winged Hawks, the low age ratios resulted in part from low numbers of young birds. In contrast, only Golden Eagles showed a significantly higher than average age ratio in 2000, and the difference was partly due to high numbers of immature/subadult birds (Table 2). It is important to note, however, that high variation in the proportions of unknown-age birds confound the comparisons for Sharp-shinned Hawk, Northern Goshawk, and Broad-winged, Red-tailed and Ferruginous Hawks (Table 2). Regardless, the Cooper's Hawk and Northern Goshawk are the only species for which low productivity and juvenile recruitment might have contributed to a low overall count.

At the species level, most species showed average median passage dates and there were no distinct multi-species patterns among the exceptions (Table 3, and see Figure 10 for the combined-species seasonal pattern). However, although there were still no distinct multi-species patterns of variation, age-specific data indicated significant variation in timing among adults for 8 of 10 species with sufficient data for comparisons (Table 4). In contrast, among immatures only Ferruginous Hawks showed significant variation. This suggests that unusual weather patterns and extensive summer wildfires may have generally disturbed the usual patterns of migration timing among adults.

TRAPPING EFFORT

The crews operated at least one banding station on 62 of 69 days between 21 August and 28 October (see Appendix F for daily capture records and Appendix G for annual summaries). The number of trapping days and station hours (1287) were 12% and 3% higher than average, respectively.

TRAPPING SUMMARY

The 2000 capture total of 2,148 raptors included 11 species, 2,139 newly banded birds, 6 recaptures of birds previously banded in the Goshutes, and 3 foreign recaptures (i.e., recaptures of birds originally banded elsewhere; Table 5, Appendix G). The 2000 effort raises the total number of birds captured since project inception to 41,922, including 65 Goshute recaptures and 22 foreign recaptures. Sharp-shinned Hawks accounted for 58% of the total captures, followed by Cooper's Hawks (23%) and American Kestrels (13%). Each of the remaining species accounted for less than 5% of the total.

The 2000 combined-species capture total was 24% below average (Table 5), but this primarily reflects the effects of eliminating one trapping station in 1999 (Appendix G). Capture totals, rates, and successes were all at least slightly below average for all three accipiters, Red-tailed Hawks, and Golden Eagles; however, the opposite applied to Northern Harriers, Broad-winged Hawks, American Kestrels, and Prairie Falcons (Table 5).

Compared to the counts, banding at this site yields unique and substantial sex-age specific data only for Sharp-shinned Hawks, Cooper's Hawks, Northern Goshawks, and American Kestrels. In this case, however, for the three accipiters the capture and count data give very different indications concerning age ratios. The count data suggest that age ratios for three accipiters were 10–47% below average (Table 2), whereas the capture data indicate an average ratio for Cooper's Hawks and 97% and 173% higher than average ratios for Sharp-shinned Hawks and Northern Goshawks, respectively (Table 6). Detailed examination reveals that the 2000 capture totals for adults were 38–100% below average, despite adult counts that were all within 12% of average. For immatures, however, the proportional differences in capture and count totals were more similar (i.e., sharp-shins: capture totals 16–26% below average, count 18% below average; coops: capture totals 36–52% below average, count 55% below average; goshawk: capture totals 21–29% below average, count 5% below average). This suggests that especially adults of these species were less susceptible than usual to capture this season.

ENCOUNTERS WITH PREVIOUSLY BANDED BIRDS

Recaptures

The 2000 captures included six recaptures of Cooper's Hawks originally banded in the Goshutes between 1994–1999 (Table 7), which brings the total number of Goshute recaptures since 1980 to 64 birds (Appendix G), all accipiters.

Foreign Recaptures

The 2000 captures included three foreign recaptures of birds originally banded elsewhere (Table 7). These included the fifth exchange of banded Northern Goshawks between the Goshutes and Dr. Marc Bechard's nest-monitoring project in the Independence Mountains of north-central Nevada, and the eleventh exchange of banded birds between the Goshutes and Idaho Bird Observatory's (IBO) migration monitoring project at Lucky Peak, Idaho.

Foreign Encounters

Nineteen raptors originally banded in the Goshutes were encountered elsewhere in 2000, bringing the total foreign encounters since 1980 to 229 birds (Table 8, Appendix G). With the exception of a female Cooper's Hawk caught and released at IBO's Lucky Peak migration site in Idaho, all of the foreign encounters involved dead birds, most with the cause of death unknown (Table 8). All of the encounter locations but one were in typical Intermountain/northern Rockies migration/summer ranges or southwestern Mexico winter ranges (Hoffman et al. in review). The exception was a Sharp-shinned Hawk that died when it hit a stationary human structure in La Mesa near San Diego, California. Although a recovery from southern California is not unprecedented, most Goshute recoveries occur further east or south of this area. The other noteworthy recovery was of a Cooper's Hawk in Phoenix, Arizona. The bird was apparently caught alive by hand, but later died due to injuries. The noteworthy aspect of this recovery was that the bird was at least 11.3 years old when it was found. The current longevity record for wild birds of this species is 12.8 years (another Goshute-banded bird).

RESIDENT RAPTORS

Residents seen this season included a pair of adult Golden Eagles, usually seen to the north of the count site throughout the season; a pair of adult light-morph Red-tailed Hawks, usually seen over the knoll to the northeast through much of the season; at least one and probably a pair of Prairie Falcons seen to the east of the count site during September; and a pair of adult Northern Goshawks and two juveniles seen to the north throughout September. This resident assemblage is typical for the site. In addition, for the past couple of years during the first few weeks of the migration season, our crews have recorded several observations of a Red-shouldered Hawk(s) near Ferguson Springs to the east of the Goshute ridge. This species is rare in Nevada, having been recorded as a Goshute migrant only six times in 20 years (Appendix E). Although individuals have been seen throughout the year in the state, the species has never been confirmed as a breeder (Chisholm et al. 2000). However, young birds are being reported with increasing frequency in late summer and early fall in several areas, including the Ruby Valley about 90 km west of the Goshutes.

SITE VISITATION

In 2000, HWI welcomed more than 300 visitors to the Goshute site, including three groups of elementary school children and two groups of ornithology students from Utah State University and the University of Utah. Our on-site educators greeted all visitors, helped answer questions about raptor identification, ecology and conservation issues, gave many visitors the opportunity to see live hawks in hand after banding, and generally facilitated interactions between visitors and the field crews.

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Table 1. Adjusted annual counts and passage rates by species: 1983–1999 versus 2000.

	1983–1999 ¹	2000	% CHANGE	1983–1999 ¹	2000	% CHANGE
Start Date	15-Aug ± 0.7	15-Aug				
End Date	3-Nov ± 2.9	5-Nov				
Observation Days	77 ± 2.9	78	+1			
Observations Hours	655.83 ± 35.638	681.50	+4			
SPECIES	COUNTS			RAPTORS/100 HOURS		
Turkey Vulture	263 ± 67.3	295	+12	76 ± 16.5	81	+7
Osprey	76 ± 17.8	148	+95	18 ± 3.7	34	+84
Northern Harrier	164 ± 29.2	228	+39	27 ± 4.0	37	+37
Sharp-shinned Hawk	4657 ± 934.3	5903	+27	1016 ± 168.9	1222	+20
Cooper's Hawk	3204 ± 707.6	2917	-9	752 ± 139.4	663	-12
Northern Goshawk	125 ± 23.9	108	-13	21 ± 4.0	18	-16
Unidentified accipiter	382 ± 92.0	83	-78	93 ± 22.2	19	-80
TOTAL ACCIPITERS	8368 ± 1582.3	9011	+8	1882 ± 289.6	1922	+2
Red-shouldered Hawk	0.3 ± 0.26	1	+264	0.1 ± 0.05	0.2	+217
Broad-winged Hawk	35 ± 20.0	85	+142	13 ± 6.6	30	+132
Swainson's Hawk	171 ± 54.1	122	-29	47 ± 15.2	31	-35
Red-tailed Hawk	2648 ± 301.3	3300	+25	464 ± 46.1	567	+22
Ferruginous Hawk	15 ± 3.0	17	+13	2.8 ± 0.52	3.0	+11
Rough-legged Hawk	13.7 ± 4.62	18.0	+31	2.4 ± 0.74	3.1	+30
Unidentified buteo	76 ± 27.0	20	-74	14 ± 5.2	3	-75
TOTAL BUTEOS	2960 ± 346.8	3563	+20	543 ± 58.8	637	+17
Golden Eagle	256 ± 18.7	290	+13	43 ± 3.4	47	+10
Bald Eagle	13 ± 3.2	13	+2	2.7 ± 0.63	2.7	-1
Unidentified eagle	1 ± 0.7	0	-100	0.2 ± 0.11	0.0	-100
TOTAL EAGLES	269 ± 20.7	303	+12	46 ± 3.7	50.2	+9
American Kestrel	1789 ± 375.0	2974	+66	402 ± 73.9	656.9	+63
Merlin	39 ± 14.6	45	+16	7.8 ± 2.84	9.0	+16
Prairie Falcon	30 ± 6.3	33	+10	5.0 ± 0.97	5.4	+8
Peregrine Falcon	9 ± 4.1	21	+131	1.6 ± 0.71	3.7	+126
Unidentified falcon	7 ± 1.7	3	-55	1.4 ± 0.37	0.6	-57
TOTAL FALCONS	1874 ± 393.2	3076	+64	418 ± 76.9	675.6	+62
Unidentified raptor	133 ± 59.4	32	-76	28 ± 14.3	6.4	-77
GRAND TOTAL	14106 ± 2272.3	16656	+18	3038 ± 405.6	3443.9	+13

¹ Mean ± 95% confidence interval.

Table 2. Adjusted counts by age class and immature : adult ratios for selected species: 1992–1999 versus 2000.

	TOTAL AND AGE-CLASSIFIED COUNTS						IMMATURE : ADULT			
	1992–1999 AVERAGE			2000			% UNKNOWN AGE		RATIO	
	TOTAL	IMM	ADULT	TOTAL	IMM	ADULT	1992–1999 ¹	2000	1992–1999 ¹	2000
Northern Harrier	210	70	57	228	41	113	41 ± 15.3	32	1.30 ± 0.369	0.36
Sharp-shinned Hawk	5678	2111	1674	5903	1737	1566	33 ± 5.6	44	1.24 ± 0.381	1.11
Cooper's Hawk	4139	1063	1134	2917	468	1003	47 ± 5.4	50	0.89 ± 0.417	0.47
Northern Goshawk ²	125	61	38	108	58	40	20 ± 5.4	9	2.14 ± 0.755	1.45
Broad-winged Hawk	51	13	20	85	15	48	37 ± 9.6	26	0.68 ± 0.246	0.31
Red-tailed Hawk	2894	623	1577	3300	472	2320	24 ± 6.6	15	0.38 ± 0.074	0.20
Ferruginous Hawk	17	4	4	17	10	5	52 ± 14.8	12	1.47 ± 0.927	2.00
Golden Eagle ²	256	127	77	290	180	58	19 ± 4.0	18	1.99 ± 0.493	3.10
Bald Eagle	15	7	7	13	7	6	4 ± 4.5	0.0	1.14 ± 0.547	1.17
Peregrine Falcon	15	4	6	21	6	11	37 ± 18.8	19	0.75 ± 0.539	0.55

¹ Mean ± 95% confidence interval. For age ratios, note that long-term mean immature : adult ratios are averages of annual ratios and may differ from values obtained by dividing average numbers of immatures and adults. Discrepancies in the two values reflect high annual variability in the observed age ratio.

² Long-term averages based on data for 1983–1999.

Table 3. First and last observed, bulk-passage, and median-passage dates by species for 2000, with a comparison of 2000 and 1983–1999 average median passage dates.

SPECIES	2000				1983–1999
	FIRST OBSERVED	LAST OBSERVED	BULK PASSAGE DATES ¹	MEDIAN PASSAGE DATE ²	MEDIAN PASSAGE DATE ^{2,3}
Turkey Vulture	28-Aug	8-Oct	9-Sep – 30-Sep	20-Sep	21-Sep ± 2.1
Osprey	21-Aug	25-Oct	2-Sep – 21-Sep	14-Sep	14-Sep ± 1.7
Northern Harrier	15-Aug	4-Nov	29-Aug – 16-Oct	17-Sep	25-Sep ± 3.6
Sharp-shinned Hawk	16-Aug	4-Nov	10-Sep – 18-Oct	28-Sep	24-Sep ± 2.4
Cooper's Hawk	15-Aug	28-Oct	7-Sep – 3-Oct	17-Sep	21-Sep ± 1.6
Northern Goshawk	17-Aug	5-Nov	28-Aug – 1-Nov	4-Oct	6-Oct ± 4.0
Red-shouldered Hawk	9-Sep	9-Sep	–	–	–
Broad-winged Hawk	5-Sep	5-Oct	17-Sep – 26-Sep	24-Sep	23-Sep ± 2.0
Swainson's Hawk	15-Aug	8-Oct	31-Aug – 28-Sep	15-Sep	18-Sep ± 3.5
Red-tailed Hawk	15-Aug	5-Nov	5-Sep – 20-Oct	3-Oct	3-Oct ± 2.9
Ferruginous Hawk	17-Aug	28-Oct	2-Sep – 20-Oct	22-Sep	26-Sep ± 2.6
Rough-legged Hawk	4-Oct	4-Nov	18-Oct – 3-Nov	23-Oct	21-Oct ± 2.0
Golden Eagle	17-Aug	5-Nov	5-Sep – 28-Oct	5-Oct	7-Oct ± 2.0
Bald Eagle	21-Sep	5-Nov	24-Sep – 2-Nov	19-Oct	21-Oct ± 4.6
American Kestrel	15-Aug	28-Oct	29-Aug – 30-Sep	16-Sep	15-Sep ± 1.9
Merlin	31-Aug	1-Nov	14-Sep – 21-Oct	4-Oct	1-Oct ± 2.6
Prairie Falcon	15-Aug	3-Nov	20-Aug – 19-Oct	15-Sep	12-Sep ± 3.2
Peregrine Falcon	2-Sep	7-Oct	9-Sep – 1-Oct	21-Sep	24-Sep ± 4.0
Total	15-Aug	5-Nov	7-Sep – 18-Oct	21-Sep	23-Sep ± 1.8

¹ Dates between which the central 80% of the flight passed the lookout (based on adjusted counts).

² Date by which 50% of the flight had passed the lookout (based on adjusted counts).

³ Mean ± 95% confidence interval in days; calculated using only data for years when counts ≥ 5 birds.

Table 4. Median passage dates by age for selected species: 1992–1999 versus 2000.

SPECIES	ADULT		IMMATURE / SUBADULT	
	1992–1999 ¹	2000	1992–1999 ¹	2000
Northern Harrier	29-Sep ± 7.7	16-Sep	17-Sep ± 10.0	16-Sep
Sharp-shinned Hawk	6-Oct ± 2.3	9-Oct	15-Sep ± 2.3	16-Sep
Cooper's Hawk	25-Sep ± 3.3	21-Sep	17-Sep ± 2.1	15-Sep
Northern Goshawk ²	14-Oct ± 4.5	20-Oct	3-Oct ± 4.6	3-Oct
Broad-winged Hawk	22-Sep ± 3.0	24-Sep	23-Sep ± 5.3	24-Sep
Red-tailed Hawk	9-Oct ± 2.2	5-Oct	14-Sep ± 4.8	10-Sep
Ferruginous Hawk	12-Oct ± 11.8	15-Oct ³	2-Oct ± 15.3	12-Sep
Golden Eagle ²	11-Oct ± 3.1	18-Oct	6-Oct ± 2.9	5-Oct
Bald Eagle	24-Oct ± 2.8	17-Oct	23-Oct ± 4.7	19-Oct
Peregrine Falcon	29-Sep ± 2.7	16-Sep	22-Sep ± 5.6	21-Sep

Note: Median passage dates are dates by which 50% of the flight had passed the lookout (based on adjusted counts); values are calculated only for species and years with counts ≥5 birds.

¹ Mean ± 95% confidence interval in days; unless otherwise indicated, values were calculated only for species with ≥3 years of counts ≥5 birds.

² Average for 1983–1999.

³ Average for 1998–1999 only.

Table 5. Capture totals, rates, and successes: 1987–1999 versus 2000.

SPECIES	CAPTURE TOTAL		CAPTURE RATE ¹		CAPTURE SUCCESS (%) ²	
	1987–1999 ³	2000	1987–1999 ³	2000	1987–1999 ³	2000
Northern Harrier	6 ± 2.7	17	0.4 ± 0.16	1.3	4.0 ± 1.81	7.3
Sharp-shinned Hawk	1683 ± 277.0	1235	100.7 ± 9.15	96.0	30.6 ± 5.54	20.2
Cooper's Hawk	809 ± 163.6	504	48.1 ± 5.47	39.2	20.4 ± 3.48	16.5
Northern Goshawk	37 ± 13.2	24	2.2 ± 0.58	1.9	28.6 ± 4.56	19.5
Broad-winged Hawk	1 ± 0.5	3	0.06 ± 0.026	0.2	2.7 ± 1.43	3.4
Swainson's Hawk	0.2 ± 0.33	0	0.01 ± 0.016	0.0	0.1 ± 0.18	0.0
Red-tailed Hawk	78 ± 17.5	58	4.6 ± 0.70	4.5	2.4 ± 0.35	1.7
Golden Eagle	6 ± 1.5	2	0.4 ± 0.13	0.2	2.1 ± 0.61	0.7
American Kestrel	200 ± 59.6	285	11.0 ± 2.14	22.2	8.8 ± 2.73	9.0
Merlin	12 ± 4.0	11	0.7 ± 0.24	0.9	21.5 ± 5.42	22.4
Prairie Falcon	6 ± 2.1	8	0.4 ± 0.11	0.6	19.5 ± 5.48	21.6
Peregrine Falcon	1 ± 0.7	1	0.06 ± 0.042	0.1	10.5 ± 6.61	4.8
All Species	2839 ± 497.3	2148	168.5 ± 13.82	167.0	18.0 ± 2.92	12.9

¹ Captures / 100 station hours.

² Number of birds captured / number of birds observed * 100, with birds identified only to the generic group level (i.e., unknown accipiter, buteo, falcon, or eagle) allocated to relevant species in proportion to their occurrence. For calculating the “all species” values, non-trappable species and distant birds not identified at least to the generic group level were excluded.

³ Mean of annual values ± 95% confidence interval. Limited to years when at least three trapping blinds were operated.

Table 6. Capture totals by sex and age for selected species: 1992–1999 versus 2000.

	FEMALE			MALE			FEMALE : MALE	HY : AHY
	AHY	HY	UNK	AHY	HY	UNK	RATIO	RATIO
Sharp-shinned Hawk								
1992–1999 average	333	569	–	271	682	–	0.96	2.08
2000	124	420	–	118	573	–	0.79	4.10
Cooper's Hawk								
1992–1999 average	289	233	–	162	215	–	1.39	0.99
2000	179	148	–	74	103	–	1.85	0.99
Northern Goshawk								
1992–1999 average	6	14	–	3	17	–	1.04	8.43
2000	0	11	–	1	12	–	0.85	23.00
American Kestrel								
1992–1999 average	6	87	29	31	93	2	0.98	6.57
2000	33	100	13	40	93	6	1.05	2.64

Table 7. Recaptures of previously banded birds in the Goshute Mountains during 2000.

SPECIES	SEX	BAND #	BANDING SITE	BANDING DATE	BANDING AGE ¹	RECAPTURE DATE	RECAPTURE AGE ¹	DISTANCE (KM)
RECAPTURES								
Cooper's Hawk	F	2206 – 28219	Goshute Mts., NV	2-Oct-95	ASY	15-Sep-00	≥8 th yr	–
Cooper's Hawk	F	1705 – 26788	Goshute Mts., NV	12-Sep-94	HY	21-Sep-00	7 th yr	–
Cooper's Hawk	M	0614 – 21494	Goshute Mts., NV	28-Sep-98	HY	27-Sep-00	TY	–
Cooper's Hawk	F	1005 – 05253	Goshute Mts., NV	5-Oct-99	ASY	28-Sep-00	≥4 th yr	–
Cooper's Hawk	F	0745 – 96245	Goshute Mts., NV	25-Sep-95	SY	30-Sep-00	7 th yr	–
Cooper's Hawk	F	0745 – 92460	Goshute Mts., NV	16-Sep-94	AHY	05-Oct-00	≥8 th yr	–
FOREIGN RECAPTURES								
Northern Goshawk	F	1807 – 70486	Independence Mts., NV	Summer 2000	L	04-Oct-00	HY	206
Sharp-shinned Hawk	F	1523 – 60811	Lucky Peak, ID	12-Sep-98	HY	16-Oct-00	TY	365
Sharp-shinned Hawk	M	1162 – 35350	Idaho City, ID	18-Oct-99	AHY	20-Oct-00	ASY	339

¹ L = local or nestling; HY = hatching year; SY = second year; TY = third year; AHY = after hatching year; ASY = after second year; otherwise self-explanatory.

Table 8. Foreign encounters during 2000 with birds banded in the Goshute Mountains.

SPECIES	SEX	BAND #	BANDING DATE	BANDING AGE	ENCOUNTER DATE	ENCOUNTER AGE ¹	ENCOUNTER LOCATION	DISTANCE (KM)	STATUS
CH	F	1705 – 40461	19-Sep-98	HY	20-Jan-00	TY	Brewster, WA	927	car kill
SS	F	1523 – 88727	20-Sep-99	HY	23-Jan-00	SY	Artesia, NM	1,306	found dead
SS	F	2003 – 76077	30-Sep-96	AHY	02-Mar-00	≥6 th yr	Yuma, AZ	695	found dead
CH	F	1705 – 28583	18-Aug-97	ASY	14-Mar-00	≥5 th yr	Tecoman, Colima, MX	2,230	shot
RT	U	1177 – 02004	24-Sep-98	HY	22-Mar-00	TY	Payson, UT	290	found dead
SS	F	1523 – 51120	06-Oct-97	ASY	05-May-00	≥5 th yr	Rutland, BC, Canada	751	found dead
CH	F	0745 – 61912	02-Oct-98	SY	05-May-00	4 th yr	Sandpoint, ID	1,029	found dead
SS	F	1162 – 34164	19-Sep-98	HY	03-May-00	TY	Kelowna, BC, Canada	1,035	found dead
RT	U	1177 – 06606	09-Oct-99	HY	14-May-00	SY	Carmangay, AB, Canada	883	found dead
SS	F	1523 – 88990	18-Sep-99	HY	21-May-00	SY	Silverdale, WA	1,150	collision kill
CH	F	1705 – 40477	28-Sep-98	ASY	13-Jun-00	≥5 th yr	Livingston River, AB, Canada	907	starved
CH	F	0745 – 92418	16-Sep-94	ASY	18-Jul-00	≥9 th yr	Darby, MT	503	found dead
CH	F	1705 – 24044	17-Sep-98	HY	15-Sep-00	TY	Lucky Peak, ID	339	trapped/released
CH	M	1204 – 56565	24-Sep-97	HY	25-Sep-00	4 th yr	Waittes Lake, WA	804	found dead
CH	F	1705 – 12508	22-Sep-91	ASY	13-Oct-00	≥12 th yr	Phoenix, AZ	688	hand caught/died
RT	U	1807 – 81512	24-Sep-00	HY	Nov-00	HY	need BBL report		
SS	F	2003 – 23154	15-Sep-92	HY	02-Dec-00	9 th yr	La Mesa, CA	763	collision kill
SS	M	1152 – 24654	02-Oct-96	HY	04-Dec-00	5 th yr	Boise, ID	350	found dead
CH	F	1005 – 01701	21-Sep-99	HY	Dec-00	HY	Guadalajara, Jalisco, MX	2,164	found dead

¹ HY = hatching year; SY = second year; TY = third year; otherwise self-explanatory.

Figure 1. Location of the Goshute Mountains study site.

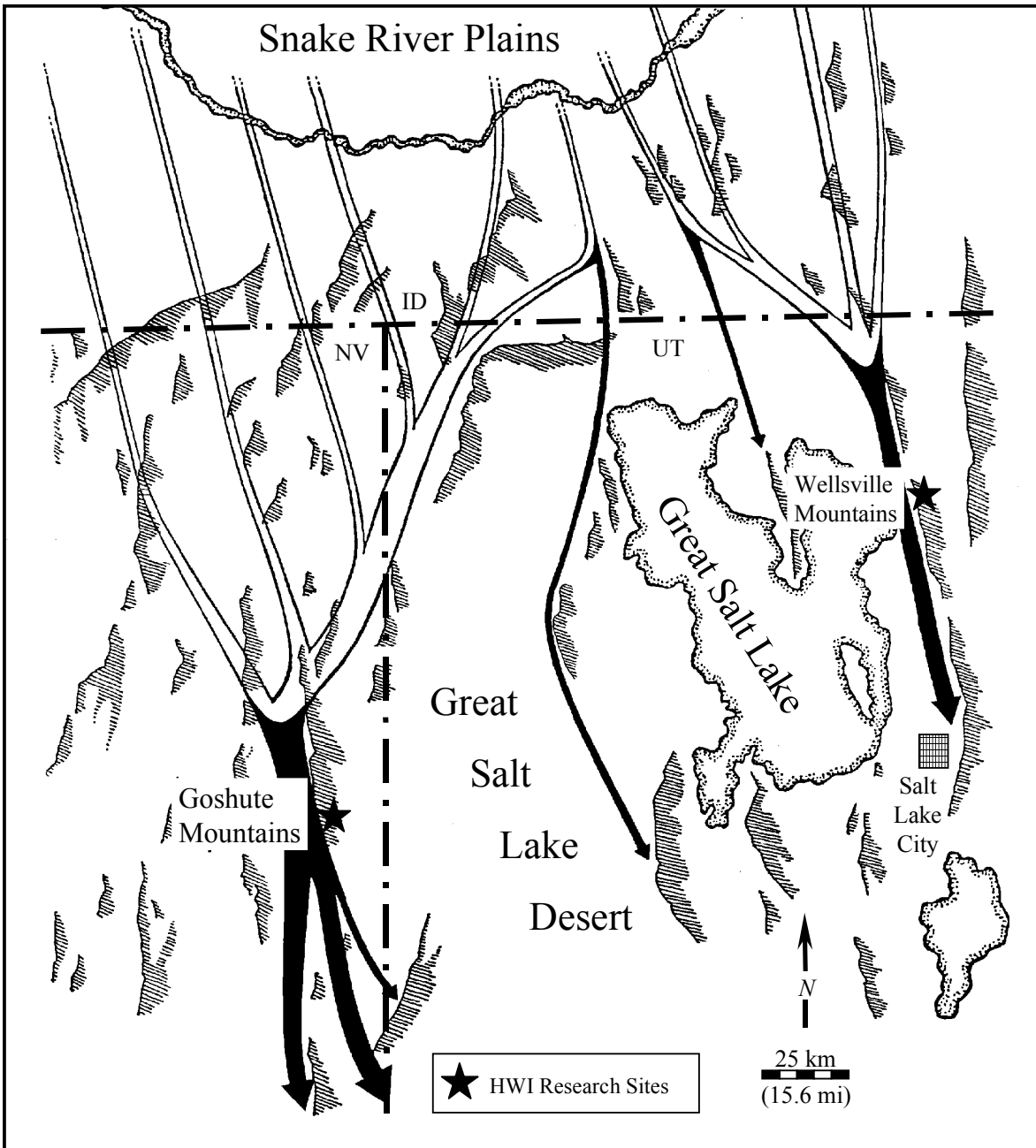


Figure 2. Location of the Goshute Mountains study site in relation to regional raptor flyways and the Great Salt Desert.

Figure 3. Flight composition by major species groups: 1983–1998 versus 2000.

Figure 4. Adjusted annual passage rates for Turkey Vultures, Ospreys, and Northern Harriers: 1983–2000.

Figure 5. Adjusted annual passage rates for Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks: 1983–2000.

Figure 6. Adjusted annual passage rates for Broad-winged and Swainson's Hawks: 1983–2000.

Figure 7. Adjusted annual passage rates for Red-tailed Hawks, Ferruginous Hawks, and Rough-legged Hawks: 1983–2000.

Figure 8. Adjusted annual passage rates for Golden Eagles and Bald Eagles: 1983–2000.

Figure 9. Adjusted annual passage rates for American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons: 1983–2000.

Figure 10. Combined-species passage volume by five-day periods: 1983–1999 versus 2000.

Appendix A. History of official observer participation.

1983: Single observer throughout. David Sherman (0)¹.

1984: Single observer throughout and an occasional scribe. Three principal observers: Jim Daly (0), Jeff Smith (0), and Fred Tilly (14).

1985: Single observer throughout with an occasional scribe. Two principal observers: Jim Daly (1) and Fred Tilly (15).

1986: Single observer with an occasional scribe. Principal observer: John Lower (0).

1987: Single observer throughout, two observers during the peak month. Two principal observers: Victor Fazio (2) and Fred Tilly (16).

1988: Single observer throughout, two observers during the peak month, with a scribe throughout. Two principal observers: Brian Mongi (2) and Fred Tilly (17).

1989: Single observer throughout, two observers during the peak month, with a scribe throughout. Brian Mongi (3) and Fred Tilly (19).

1990: Two observers throughout with two teams of two for a comparison count during the peak month. Four principal observers: John Martin (1), LisaBeth Daly (2), Fred Tilly (21), and Cathy Tilly (1).

1991: Two observers throughout except 30 October - 5 November, with a scribe throughout. Principal observers: Steve Engel (1) and Dale Payne (0).

1992: Two observers throughout, three observers during the peak month, with a scribe throughout. Three principal observers: Steve Engel (2), Maureen O'Mara (0), and Fred Tilly (24).

1993: Two observers throughout with a scribe throughout. Principal observers: Emily Teachout (1) and Jeff Maurer (0).

1994: Two observers throughout, three observers during the peak month, with a scribe throughout. Principal observers: Steve Engel (3), Jeff Maurer (1), and Fred Tilly (27).

1995: Two observers throughout with a scribe through 17 October. Principal observers: Robert Clemens (3) and Susan Salafsky (2).

1996: Two observer throughout except 27 October- 4 November, three observers for the peak month with a scribe until 27 October. Principal observers: Fred Tilly (29), Cathy Tilly (4), Robert Clemens (4), and Aaron Barna (1).

1997: Two observers throughout with a scribe from 10 September - 15 October. Principal observers: Jessie Jewell (9) and Neils Maumenee (2).

1998: Two observers throughout. Principal observers: Jerry Liguori (14) and Mike Lanzone (0).

1999: Two observers throughout. Principal observers: Jerry Liguori (15) and Aaron Barna (4).

2000: Two observers throughout. Principle observers: Jerry Liguori (16), Jeff Maurer (3), Nathan McNett (2), and Aaron Barna (5).

¹ Numbers in parentheses indicate the number of years of previous experience conducting season-long migratory raptor counts.

Appendix B. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications.

Common Name	Scientific Name	Species			Color
		Code	Age ¹	Sex ²	Morph ³
Turkey Vulture	<i>Cathartes aura</i>	TV	U	U	NA
Osprey	<i>Pandion haliaetus</i>	OS	U	U	NA
Northern Harrier	<i>Circus cyaneus</i>	NH	A I Br U	M F U	NA
Sharp-shinned Hawk	<i>Accipiter striatus</i>	SS	A I U	U	NA
Cooper's Hawk	<i>Accipiter cooperii</i>	CH	A I U	U	NA
Northern Goshawk	<i>Accipiter gentilis</i>	NG	A I U	U	NA
Unknown accipiter	<i>Accipiter</i> spp.	UA	U	U	NA
Red-shouldered Hawk	<i>Buteo lineatus</i>	RS	A I U	U	NA
Broad-winged Hawk	<i>Buteo platypterus</i>	BW	A I U	U	D L U
Swanson's Hawk	<i>Buteo swainsoni</i>	SW	U	U	D L U
Red-tailed Hawk	<i>Buteo jamaicensis</i>	RT	A I U	U	D L U
Ferruginous Hawk	<i>Buteo regalis</i>	FH	A I U	U	D L U
Rough-legged Hawk	<i>Buteo lagopus</i>	RL	U	U	D L U
Unknown buteo	<i>Buteo</i> spp.	UB	U	U	D L U
Golden Eagle	<i>Aquila chrysaetos</i>	GE	A 2 1 I/S U ⁴	U	NA
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BE	A 3 2 1 I/S U ⁵	U	NA
Unknown eagle	<i>Aquila</i> or <i>Haliaeetus</i> spp.	UE	U	U	NA
American Kestrel	<i>Falco sparverius</i>	AK	U	M F U	NA
Merlin	<i>Falco columbarius</i>	ML	AM Br	AM U	NA
Prairie Falcon	<i>Falco mexicanus</i>	PR	U	U	NA
Peregrine Falcon	<i>Falco peregrinus</i>	PG	A I U	U	NA
Unknown falcon	<i>Falco</i> spp.	UF	U	U	NA
Unknown raptor	Falconiformes	UU	U	U	NA

¹ Age classification codes: A = adult, I = immature (HY), Br = brown (adult female or immature), U – unknown age.

² Sex classification codes: M = male, F = female, U = unknown.

³ Color morph classification codes: D = dark or rufous, L = light, U – unknown, NA = not applicable.

⁴ Golden Eagle age codes: A = adult - no white in wings or tail; 2 = plumage class 2 - no white patch in wings, obvious white in tail; 1 = plumage class 1 - white wing patch visible below, small wing patch may be visible above, bold white in tail; I/S = unknown age immature or subadult - obvious white in tail, wings not adequately observed

⁵ Bald Eagle age codes: A = adult - completely white head and tail; 3 = plumage class 3 - head mostly white, with osprey-like dark eyeline; 2 = plumage class 2 - dark head, light belly, and/or upside-down white triangle on back; 1 = plumage class 1 - dark head, breast, and belly; I/S = unknown age immature or subadult - dark or mottled head, other plumage features not adequately observed.

Appendix C. Daily observation effort, weather, and flight summaries: 2000.

DATE	OBS. HOURS	OBSRVR / HOUR	VISITOR / HOUR	PREDOMINANT WEATHER ¹	WIND SPEED ²	WIND DIRECTION	TEMP (°C) ³	BAROM.		VISIB.		FLIGHT DISTANCE ⁵ / HOUR	BIRDS / HOUR
								PRESS. (IN HG)	THERMAL LIFT ⁴	WEST (KM)	EAST (KM)		
15-Aug	6.00	2.1	0.1	ovc, scat rain	4	sw	–	–	2	90	80	2	3.0
16-Aug	8.00	1.9	0.0	mc-ovc, rain PM	1	e	–	–	2	97	97	2	2.3
17-Aug	7.00	3.0	0.0	clr-ovc, rain PM	1	ne, w, e	25.5	21.76	2	100	100	3	6.7
18-Aug	7.25	3.0	0.0	clr	2	w	21.8	21.68	2	100	100	2	0.7
19-Aug	9.50	3.0	0.0	clr	3	sw	24.0	21.67	2	100	100	3	5.8
20-Aug	9.50	4.2	0.0	clr	1	var, nne-e	20.0	21.73	2	70	70	2	4.8
21-Aug	9.50	3.7	0.0	clr	1	ene	20.6	21.76	2	69	69	3	2.4
22-Aug	9.00	1.9	0.0	clr-pc	2	sw, ne, e	20.3	21.78	1	100	100	3	3.4
23-Aug	4.50	2.0	0.0	ovc/rain	3	w	20.3	21.82	4	100	100	2	0.2
24-Aug	8.50	1.9	0.0	clr-mc	3	w	19.1	21.85	2	100	100	2	1.8
25-Aug	8.00	2.0	0.0	ovc, rain PM	1	nne	20.4	21.86	3	100	100	3	4.6
26-Aug	8.50	2.0	0.0	ovc	3	sw	18.7	21.69	4	100	100	3	1.8
27-Aug	11.00	1.8	0.9	clr-mc	2	w, ne	19.1	21.64	3	100	100	3	6.3
28-Aug	10.00	1.9	0.0	pc	1	e-ne	21.0	21.73	2	100	100	2	21.8
29-Aug	9.50	2.0	0.0	pc	2	ne	–	–	2	100	100	3	14.8
30-Aug	0.00			rain									
31-Aug	7.00	1.9	0.0	mc-ovc, rain AM	4	sw	14.9	21.56	4	100	100	3	14.1
1-Sep	8.75	1.7	0.0	pc-mc, ts-rain PM	5	sw	14.2	21.49	4	100	100	1	5.5
2-Sep	11.00	2.0	0.0	clr-mc	5	sw	12.1	21.51	4	100	100	3	10.3
3-Sep	11.00	1.9	0.7	clr-mc	2	sw	10.1	21.57	3	100	100	2	10.8
4-Sep	11.00	1.9	0.9	clr-pc	5	sw	18.6	21.62	4	100	100	2	20.9
5-Sep	9.50	3.4	0.0	clr-pc	1	var, nnw-ne	11.9	21.63	3	105	91	2	21.1
6-Sep	10.50	2.0	0.0	clr	1	e	11.5	21.71	2	100	100	3	10.0
7-Sep	10.50	1.8	0.0	clr	1	w	16.5	21.70	3	100	95	2	20.7
8-Sep	9.50	2.0	1.4	mc-ovc	5	ssw	17.6	21.50	4	100	100	3	24.9
9-Sep	9.50	2.0	1.4	pc-mc	2	sw	17.1	21.53	3	90	90	3	44.5
10-Sep	11.00	2.0	2.5	clr	4	ssw	19.5	21.62	4	100	100	3	45.7
11-Sep	9.50	2.3	0.1	pc-mc	3	ssw, ne	16.1	21.73	2	100	100	3	38.9
12-Sep	9.50	2.0	0.9	clr	1	s, var, ne	16.5	21.81	2	100	100	3	24.3
13-Sep	9.00	2.3	0.2	pc	1	ese-e	18.0	21.85	2	100	100	3	40.4
14-Sep	9.75	2.0	0.0	clr	2	ssw, ne	19.7	21.84	4	100	100		23.0
15-Sep	11.75	2.6	2.3	clr	3	wsw	23.4	21.76	3	88	91	2	77.0
16-Sep	12.00	3.4	1.8	clr	5	sw	21.2	21.71	4	100	100	3	134.6
17-Sep	11.00	2.7	2.5	clr	3	wsw	19.7	21.68	3	80	100	var	87.0
18-Sep	11.00	3.0	1.2	clr-ovc	2	ne, ssw	19.2	21.80	3	80	90	2	18.8
19-Sep	10.00	2.7	0.9	pc-mc	5	w	16.0	21.67	3	100	100	3	11.5
20-Sep	11.00	2.8	0.2	clr	1	ene	11.6	21.62	2	100	100	2	30.5
21-Sep	10.50	3.3	1.7	pc-ovc/ts/rain	2	wsw	14.4	21.31	3	53	58	2	71.3
22-Sep	5.00	2.9	2.0	ovc/fog	0	var	8.2	21.31	4	24	30	3	24.2
23-Sep	4.25	1.8	1.2	ovc/fog, snow AM	2	nw-w	–	–	4	60	48	3	3.5
24-Sep	9.00	1.9	3.0	clr	1	ne	3.2	21.78	2	120	100	3	30.0
25-Sep	10.50	1.9	0.0	clr	1	sw	7.5	21.77	3	100	100	2	30.0
26-Sep	9.50	2.0	3.9	clr	1	w-sw	12.4	21.73	2	100	100	3	28.6
27-Sep	9.50	2.0	1.9	clr-mc	1	s-se, ene	15.1	21.80	2	100	100	3	22.0
28-Sep	10.00	2.0	0.2	pc-ovc	2	sw, ene	17.0	21.73	2	100	100	var	42.6
29-Sep	9.50	2.9	0.9	clr-pc	1	ene-ne, var	15.2	21.73	2	100	100	3	48.4
30-Sep	11.00	2.0	3.0	pc	1	e	16.6	21.73	3	95	95	3	75.8

Appendix C. continued

DATE	OBS. HOURS	OBSRVR / HOUR	VISITOR / HOUR	PREDOMINANT WEATHER ¹	WIND SPEED ²	WIND DIRECTION	TEMP (°C) ³	BAROM. PRESS. (IN HG)	THERMAL LIFT ⁴	VISIB. WEST (KM)	VISIB. EAST (KM)	FLIGHT DISTANCE ⁵ / HOUR	BIRDS / HOUR
1-Oct	10.50	1.6	3.1	pc	3	w	16.9	21.58	3	80	80	3	33.0
2-Oct	10.00	2.0	2.0	clr-pc	3	w	15.0	21.58	3	90	90	3	17.2
3-Oct	9.50	2.0	0.4	mc-clr	2	w, ne	11.2	21.62	2	98	100	3	22.9
4-Oct	10.75	1.9	1.3	clr	1	w	12.6	21.62	2	100	100	3	35.9
5-Oct	10.00	2.2	0.7	clr	1	wsw-sw	8.6	21.69	3	95	100	2	44.7
6-Oct	10.25	2.0	0.0	clr	1	e	9.4	21.73	2	100	100	3	30.5
7-Oct	9.00	2.0	0.0	clr	2	e	11.4	21.73	4	100	100	3	11.2
8-Oct	8.00	2.0	0.0	clr	0	e	11.3	21.73	3	98	100	3	6.6
9-Oct	9.25	1.9	2.0	pc-mc	2	sw	15.5	21.52	3	97	100	2	34.8
10-Oct	0.00			snow									
11-Oct	3.00	1.0	0.0	snow AM, ovc	2	wsw	3.0	21.43	3	60	40	var	6.0
12-Oct	8.75	2.4	0.3	pc-ovc, snow PM	2	wsw	4.1	21.50	4	100	100	2	8.0
13-Oct	1.00	1.0	0.0	ovc/snow	3	wsw	1.0	21.57	4	60	60	2	2.0
14-Oct	9.00	2.0	4.4	pc-ovc	0	ene	5.4	21.67	4	80	80	2	8.4
15-Oct	9.00	3.1	2.0	clr-mc	2	wsw	6.1	21.60	3	100	100	3	32.9
16-Oct	9.50	2.0	0.0	ovc	1	wsw	6.8	21.74	3	100	100	3	30.6
17-Oct	9.75	2.0	0.0	clr	1	var	9.9	21.80	2	80	100	3	19.6
18-Oct	10.00	2.0	0.0	mc	3	sw	11.0	21.70	3	100	100	3	40.4
19-Oct	10.00	2.0	0.0	pc-ovc	2	wsw	11.9	21.67	2	100	100	3	11.2
20-Oct	10.00	2.0	0.0	pc-mc	4	sw	14.2	21.56	4	100	100	3	104.3
21-Oct	9.75	1.9	0.0	pc-ovc	4	nw	3.9	21.39	4	100	100	3	6.9
22-Oct	4.50	2.0	0.0	mc-ovc, snow PM	3	ne	-0.6	21.57	4	100	100	2	4.9
23-Oct	6.00	2.0	0.0	pc	2	nne	4.8	21.65	4	70	90	2	2.8
24-Oct	0.00			snow									
25-Oct	8.00	2.0	0.0	mc-ovc/fog	1	w	6.8	21.56	4	50	60	2	5.0
26-Oct	4.50	2.0	0.0	ovc/fog/snow	2	se	6.8	21.38	4	0	24		0.0
27-Oct	0.00			fog/snow									
28-Oct	5.50	2.0	0.7	ovc	5	w	3.0	21.42	4	100	100	3	13.6
29-Oct	5.25	1.2	0.0	mc-ovc	4	sw	1.8	21.37	4	64	41	2	10.5
30-Oct	0.00			snow									
31-Oct	4.25	1.3	0.0	ovc	2	ne	1.8	21.43	4	72	19	2	0.7
1-Nov	8.00	2.0	0.0	mc/fog	2	w	-0.3	21.56	4	93	88	3	2.1
2-Nov	7.00	2.3	0.0	clr-mc	1	ne, var	0.5	21.57	3	100	100	2	11.1
3-Nov	8.50	2.5	0.0	clr	2	ese	-3.9	21.65	3	100	100	3	5.1
4-Nov	9.25	2.3	1.6	clr-mc	2	var, sw	0.4	21.51	4	100	100	3	1.6
5-Nov	5.50	2.2	0.3	ovc	3	nw	-3.5	21.33	4	100	80	2	1.3

¹ Predominant weather codes: clr = clear, ovc = overcast; mc = mostly cloudy; pc = partly cloudy; ts = thundershowers.

² Average wind speeds: 0 = <1 kph; 1 = 1–5 kph; 2 = 6–11 kph; 3 = 12–19 kph; 4 = 20–28 kph; 5 = 29–38 kph; 6 = 39–49 kph; 7 = 50–61 kph.

³ Average of hourly readings.

⁴ Average thermal lift conditions: 1 = excellent – sunny and little or no wind; 2 = good – sunny and light to moderate winds; 3 = fair – sunny but windy; 4 = poor – cloudy and windy.

⁵ Average flight distances: 1 = close – birds identifiable with naked eye; 2 = moderate – birds easily seen with naked eye but binoculars required for identification; 3 = far – binoculars required for sighting and identification; 4 = distant - birds seen only as small dots in binoculars.

Appendix D. Daily records of unadjusted raptor counts: 2000.

DATE	HOURS	SPECIES ¹																			TOTAL	BIRDS/HR	
		TV	OS	NH	SS	CH	NG	UA	BW	SW	RT	FH	RL	UB	GE	BE	AK	ML	PR	PG			UF
15-Aug	6.00	0	0	2	0	2	0	0	0	1	6	0	0	0	0	6	0	1	0	0	0	18	3.0
16-Aug	8.00	0	0	1	2	1	0	0	0	0	4	0	0	0	0	9	0	1	0	0	0	18	2.3
17-Aug	7.00	0	0	1	0	1	1	0	0	1	17	1	0	0	6	0	19	0	0	0	0	47	6.7
18-Aug	7.25	0	0	0	0	1	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	5	0.7
19-Aug	9.50	0	0	5	2	1	2	0	0	3	9	0	0	1	2	0	30	0	0	0	0	55	5.8
20-Aug	9.50	0	0	1	7	1	1	1	0	1	15	0	0	0	0	0	16	0	2	0	0	46	4.8
21-Aug	9.50	0	1	1	2	3	1	0	0	1	3	0	0	0	0	0	11	0	0	0	0	23	2.4
22-Aug	9.00	0	0	0	5	2	3	0	0	0	11	0	0	0	0	0	10	0	0	0	0	31	3.4
23-Aug	4.50	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.2
24-Aug	8.50	0	1	0	2	2	0	0	0	0	8	0	0	0	0	0	1	0	1	0	0	15	1.8
25-Aug	8.00	0	0	5	6	2	0	0	0	1	19	0	0	1	0	0	3	0	0	0	0	37	4.6
26-Aug	8.50	0	0	0	3	4	0	1	0	0	7	0	0	0	0	0	0	0	0	0	0	15	1.8
27-Aug	11.00	0	3	2	14	1	1	0	0	2	18	0	0	0	4	0	24	0	0	0	0	69	6.3
28-Aug	10.00	1	5	5	7	19	4	0	0	0	32	0	0	0	4	0	141	0	0	0	0	218	21.8
29-Aug	9.50	0	1	1	33	18	3	0	0	1	8	0	0	0	0	0	76	0	0	0	0	141	14.8
30-Aug	0.00																						
31-Aug	7.00	0	4	3	8	14	0	0	0	5	52	0	0	0	5	0	4	2	1	0	0	99	14.1
1-Sep	8.75	0	0	2	13	7	0	0	0	1	21	0	0	0	3	0	1	0	0	0	0	48	5.5
2-Sep	11.00	1	2	4	17	33	2	1	0	2	31	1	0	0	3	0	15	0	0	1	0	113	10.3
3-Sep	11.00	0	2	3	35	43	0	2	0	3	17	1	0	0	2	0	11	0	0	0	0	119	10.8
4-Sep	11.00	4	14	6	46	60	1	4	0	20	51	0	0	0	1	0	21	0	2	0	0	230	20.9
5-Sep	9.50	3	10	6	53	36	3	1	2	3	35	2	0	1	1	0	43	0	0	0	0	200	21.1
6-Sep	10.50	1	0	3	27	17	0	1	0	0	28	0	0	0	1	0	27	0	0	0	0	105	10.0
7-Sep	10.50	3	4	1	61	50	0	0	0	2	44	0	0	1	3	0	47	0	1	0	0	217	20.7
8-Sep	9.50	1	0	3	75	54	3	2	0	3	26	0	0	0	1	0	62	0	5	0	0	237	24.9
9-Sep	9.50	27	3	14	80	115	1	3	0	1	79	1	0	1	6	0	85	0	0	2	1	423	44.5
10-Sep	11.00	15	1	2	183	62	2	4	0	4	59	0	0	2	2	0	161	1	1	2	0	503	45.7
11-Sep	9.50	14	2	2	106	71	0	2	0	1	33	0	0	0	0	0	135	1	1	0	0	370	38.9
12-Sep	9.50	3	3	2	65	29	0	2	0	0	20	2	0	0	2	0	100	0	0	0	0	231	24.3
13-Sep	9.00	22	18	4	105	82	2	1	1	4	44	0	0	1	1	0	74	0	2	2	0	364	40.4
14-Sep	9.75	4	5	4	63	42	0	1	0	1	19	0	0	3	1	0	79	2	0	0	0	224	23.0

Appendix D. continued

DATE	HOURS	SPECIES ¹																				TOTAL	BIRDS/HR		
		TV	OS	NH	SS	CH	NG	UA	BW	SW	RT	FH	RL	UB	GE	BE	AK	ML	PR	PG	UF			UU	
15-Sep	11.75	5	11	9	314	206	3	2	2	6	39	0	0	1	3	0	292	3	5	0	1	3	905	77.0	
16-Sep	12.00	16	21	22	402	439	1	9	2	8	89	0	0	1	7	0	586	2	5	2	0	3	1615	134.6	
17-Sep	11.00	14	9	12	318	195	2	4	2	11	34	0	0	1	7	0	340	5	0	0	0	3	957	87.0	
18-Sep	11.00	5	4	0	71	39	3	2	4	2	31	0	0	1	4	0	41	0	0	0	0	0	207	18.8	
19-Sep	10.00	2	1	2	51	29	0	4	0	0	5	0	0	0	1	0	20	0	0	0	0	0	115	11.5	
20-Sep	11.00	76	9	5	63	48	0	1	3	6	55	1	0	0	3	0	62	2	0	0	0	1	335	30.5	
21-Sep	10.50	13	5	2	260	236	0	6	17	15	157	0	0	2	8	1	24	0	0	3	0	0	749	71.3	
22-Sep	5.00	0	0	0	55	43	0	1	10	1	8	1	0	0	1	0	1	0	0	0	0	0	121	24.2	
23-Sep	4.25	0	0	0	1	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	1	15	3.5	
24-Sep	9.00	10	0	1	69	48	0	0	16	1	118	0	0	0	0	1	5	0	0	1	0	0	270	30.0	
25-Sep	10.50	16	1	3	105	84	0	0	15	1	73	0	0	0	1	0	15	0	0	1	0	0	315	30.0	
26-Sep	9.50	3	0	3	116	98	1	1	6	2	26	1	0	0	4	0	11	0	0	0	0	0	272	28.6	
27-Sep	9.50	3	0	4	91	66	3	1	1	1	16	0	0	1	4	0	16	1	0	0	1	0	209	22.0	
28-Sep	10.00	0	1	4	216	97	3	3	4	2	24	0	0	0	13	0	56	1	2	0	0	0	426	42.6	
29-Sep	9.50	2	2	5	218	91	1	5	0	2	27	0	0	0	3	0	101	1	0	0	0	2	460	48.4	
30-Sep	11.00	17	2	14	371	133	1	4	1	2	174	1	0	0	11	0	99	0	1	2	0	1	834	75.8	
1-Oct	10.50	1	0	6	195	62	1	1	0	1	23	0	0	0	4	0	46	1	0	3	0	2	346	33.0	
2-Oct	10.00	4	1	2	81	23	0	2	0	5	31	0	0	0	1	0	22	0	0	0	0	0	172	17.2	
3-Oct	9.50	8	3	3	80	23	1	0	0	2	77	0	0	0	6	0	13	2	0	0	0	0	218	22.9	
4-Oct	10.75	0	1	5	130	38	10	2	0	0	137	1	1	1	14	0	43	2	1	0	0	0	386	35.9	
5-Oct	10.00	2	0	2	142	70	2	5	1	0	193	0	0	0	10	0	18	2	0	0	0	0	447	44.7	
6-Oct	10.25	0	0	7	146	53	5	0	0	0	79	0	0	0	9	0	12	1	0	1	0	0	313	30.5	
7-Oct	9.00	0	0	1	57	13	2	1	0	0	21	0	0	0	3	0	2	0	0	1	0	0	101	11.2	
8-Oct	8.00	1	0	0	25	7	1	1	0	1	12	0	0	0	2	0	2	1	0	0	0	0	53	6.6	
9-Oct	9.25	0	0	3	212	19	6	0	0	0	42	0	0	0	2	0	37	1	0	0	0	0	322	34.8	
10-Oct	0.00																								
11-Oct	3.00	0	0	0	6	2	0	0	0	0	8	0	0	0	2	0	0	0	0	0	0	0	18	6.0	
12-Oct	8.75	0	0	1	41	4	0	0	0	0	8	0	0	0	5	0	11	0	0	0	0	0	70	8.0	
13-Oct	1.00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	2	2.0	
14-Oct	9.00	0	0	2	48	5	1	2	0	0	12	0	0	0	1	0	3	1	1	0	0	0	76	8.4	
15-Oct	9.00	0	0	2	162	13	2	1	0	0	98	1	1	0	6	2	5	1	0	0	0	2	296	32.9	
16-Oct	9.50	0	0	7	132	11	4	1	0	0	114	1	0	0	13	0	5	3	0	0	0	0	291	30.6	
17-Oct	9.75	0	1	3	84	7	1	0	0	0	73	0	0	1	11	2	5	3	0	0	0	0	191	19.6	

Appendix D. continued

DATE	HOURS	SPECIES ¹																				TOTAL	BIRDS/HR	
		TV	OS	NH	SS	CH	NG	UA	BW	SW	RT	FH	RL	UB	GE	BE	AK	ML	PR	PG	UF			UU
18-Oct	10.00	0	0	6	195	10	0	1	0	0	147	1	2	0	16	0	22	4	0	0	0	0	404	40.4
19-Oct	10.00	0	0	2	47	0	1	0	0	0	47	1	1	0	6	1	5	0	1	0	0	0	112	11.2
20-Oct	10.00	0	0	8	436	36	5	1	0	0	513	1	5	1	20	0	16	1	0	0	0	0	1043	104.3
21-Oct	9.75	0	0	1	21	0	3	0	0	0	34	0	0	0	7	0	0	1	0	0	0	0	67	6.9
22-Oct	4.50	0	0	0	5	0	1	0	0	0	10	0	1	0	5	0	0	0	0	0	0	0	22	4.9
23-Oct	6.00	0	0	1	7	0	2	0	0	0	2	0	2	0	1	0	0	2	0	0	0	0	17	2.8
24-Oct	0.00																							
25-Oct	8.00	0	1	0	21	0	1	0	0	0	14	0	0	0	2	0	0	0	1	0	0	0	40	5.0
26-Oct	4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
27-Oct	0.00																							
28-Oct	5.50	0	0	1	31	1	1	0	0	0	19	1	2	0	14	3	1	0	1	0	0	0	75	13.6
29-Oct	5.25	0	0	0	17	0	1	0	0	0	34	0	1	0	2	0	0	0	0	0	0	0	55	10.5
30-Oct	0.00																							
31-Oct	4.25	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0.7
1-Nov	8.00	0	0	0	0	0	5	0	0	0	5	0	1	0	3	1	0	2	0	0	0	0	17	2.1
2-Nov	7.00	0	0	0	2	0	4	0	0	0	54	0	2	0	14	2	0	0	0	0	0	0	78	11.1
3-Nov	8.50	0	0	0	4	0	7	0	0	0	25	0	3	0	3	0	0	0	1	0	0	0	43	5.1
4-Nov	9.25	0	0	1	1	0	4	0	0	0	6	0	1	0	2	0	0	0	0	0	0	0	15	1.6
5-Nov	5.50	0	0	0	0	0	2	0	0	0	2	0	0	0	2	1	0	0	0	0	0	0	7	1.3
Total	681.50	297	152	233	6071	3022	123	87	87	132	3446	19	24	21	305	14	3149	49	37	21	3	34	17327	25.4

¹ See Appendix B for explanation of species codes.

Appendix E. Annual summaries of observation effort and unadjusted raptor counts by species: 1983–2000.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	MEAN
Start Date	15-Aug	16-Aug	20-Aug	16-Aug	17-Aug	17-Aug	18-Aug	15-Aug	16-Aug	16-Aug	16-Aug	16-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug
End Date	23-Oct	17-Nov	5-Nov	31-Oct	27-Oct	9-Nov	4-Nov	31-Oct	5-Nov	10-Nov	5-Nov	5-Nov	5-Nov	4-Nov	5-Nov	31-Oct	5-Nov	5-Nov	3-Nov
Observation days	68	83	76	67	66	85	76	78	79	85	80	78	83	74	79	71	82	78	77
Observation hours	561.08	638.66	654.50	485.00	564.25	734.66	567.50	667.00	707.67	743.42	659.50	709.58	694.92	620.17	673.58	719.50	748.08	681.50	657.25
Raptors / 100 hours	1517	1130	1427	1435	1921	1704	2397	2527	1879	2703	1510	3122	2276	3514	2541	3515	3003	2542	2259
SPECIES	COUNTS																		
Turkey Vulture	92	141	211	131	165	198	200	285	327	473	270	418	289	486	482	732	349	297	308
Osprey	41	39	40	43	51	54	65	86	62	119	54	130	92	99	187	176	110	152	89
Northern Harrier	109	105	139	89	120	125	77	161	152	184	116	292	252	255	255	247	356	233	182
Sharp-shinned Hawk	2021	2067	3177	2233	3537	4405	5404	5275	3702	5931	2838	6835	4752	6773	4677	9598	8094	6071	4855
Cooper's Hawk	1698	1378	1741	1149	2042	3012	3074	3647	2779	5071	2298	5576	3252	5075	3848	6736	4109	3022	3306
Northern Goshawk	105	146	119	65	65	74	80	123	146	259	120	105	150	241	97	99	103	123	123
Unidentified accipiter	562	362	311	251	710	295	204	374	648	639	348	522	416	464	368	75	132	87	376
TOTAL ACCIPITERS	4386	3953	5348	3698	6354	7786	8762	9419	7275	11900	5604	13038	8570	12553	8990	16508	12438	9303	8660
Red-shouldered Hawk	0	0	0	1	1	0	0	1	0	0	0	0	0	2	0	0	0	1	0.3
Broad-winged Hawk	6	13	15	7	30	16	37	35	44	26	27	41	40	27	37	160	59	87	39
Swainson's Hawk	116	34	78	276	69	43	60	351	108	208	159	244	287	498	143	507	334	132	203
Red-tailed Hawk	2105	1765	2132	1663	2317	2048	2263	3336	2976	3489	1827	4663	3572	3990	2922	3329	5183	3446	2946
Ferruginous Hawk	3	6	17	5	15	9	23	17	26	19	15	20	29	16	18	16	25	19	17
Rough-legged Hawk	0	17	17	10	9	23	21	14	3	13	7	17	11	17	10	6	50	24	15
Unidentified buteo	185	74	65	42	156	44	47	36	147	70	128	110	69	62	77	5	24	21	76
TOTAL BUTEOS	2415	1909	2324	2004	2597	2183	2451	3790	3304	3825	2163	5095	4008	4612	3207	4023	5675	3730	3295
Golden Eagle	239	206	230	196	221	154	203	290	324	263	317	338	299	344	329	235	348	305	269
Bald Eagle	8	10	9	13	7	8	9	19	16	21	26	19	17	6	6	6	31	14	14
Unidentified eagle	2	0	0	1	0	0	0	2	6	1	1	1	1	1	0	0	0	0	1
TOTAL EAGLES	249	216	239	210	228	162	212	311	346	285	344	358	317	351	335	241	379	319	283
American Kestrel	731	697	934	708	1099	1844	1669	2634	1564	2982	1234	2461	1964	3199	3394	3169	2974	3149	2023
Merlin	4	14	3	3	17	20	33	25	37	43	19	72	86	71	78	91	74	49	41
Prairie Falcon	31	16	5	11	15	27	24	26	23	40	26	45	58	44	48	50	33	37	31
Peregrine Falcon	0	5	1	3	2	8	9	3	5	4	4	7	15	21	29	26	15	21	10
Unidentified falcon	6	7	2	8	6	7	5	10	11	4	6	9	18	21	7	2	7	3	8
TOTAL FALCONS	772	739	945	733	1139	1906	1740	2698	1640	3073	1289	2594	2141	3356	3556	3338	3103	3259	2112
Unidentified Raptor	446	113	94	53	186	107	96	106	193	234	117	229	149	83	102	25	57	34	135
GRAND TOTAL	8510	7215	9340	6961	10840	12521	13603	16856	13299	20093	9957	22154	15818	21795	17114	25290	22467	17327	15064

Appendix F. Daily trapping effort and captures by species.

DATE	STATION	SPECIES												CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	GE	AK	ML	PR	PG	TOTAL	/STN HR
21-Aug	7.75	0	0	1	0	0	0	0	0	3	0	0	0	4	0.5
22-Aug	0.00														
23-Aug	2.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
24-Aug	7.00	0	0	3	0	0	0	0	0	0	0	1	0	4	0.6
25-Aug	15.50	0	4	1	0	0	0	1	0	1	0	0	0	7	0.5
26-Aug	21.50	0	2	1	0	0	0	0	0	0	0	0	0	3	0.1
27-Aug	24.75	0	6	0	1	0	0	1	0	5	0	0	0	13	0.5
28-Aug	18.25	0	4	2	0	0	0	1	0	19	0	0	0	26	1.4
29-Aug	16.75	1	18	6	1	0	0	2	0	16	0	0	0	44	2.6
30-Aug	0.00														
31-Aug	8.50	0	3	1	0	0	0	3	0	0	0	0	0	7	0.8
1-Sep	13.75	0	6	5	0	0	0	1	0	0	0	0	0	12	0.9
2-Sep	15.00	0	4	3	0	0	0	0	1	1	0	0	0	9	0.6
3-Sep	12.00	0	10	6	0	0	0	2	0	3	0	0	0	21	1.8
4-Sep	23.50	1	14	15	0	0	0	6	0	3	0	0	0	39	1.7
5-Sep	22.00	0	13	7	0	0	0	2	0	3	0	0	0	25	1.1
6-Sep	20.75	0	13	4	0	0	0	1	0	0	0	0	0	18	0.9
7-Sep	18.50	0	22	11	0	0	0	5	0	8	0	0	0	46	2.5
8-Sep	19.25	0	21	2	0	0	0	0	0	7	0	0	0	30	1.6
9-Sep	17.50	0	25	7	0	0	0	1	0	11	0	0	0	44	2.5
10-Sep	26.00	0	56	12	1	0	0	3	0	8	0	0	0	80	3.1
11-Sep	31.50	0	41	17	1	0	0	0	0	21	0	1	0	81	2.6
12-Sep	33.00	1	20	10	0	0	0	0	0	24	0	0	0	55	1.7
13-Sep	24.00	0	37	12	0	0	0	0	0	4	0	1	0	54	2.3
14-Sep	31.50	0	40	15	0	0	0	4	0	12	2	0	0	73	2.3
15-Sep	26.50	1	83	37	0	0	0	2	0	31	0	3	0	157	5.9
16-Sep	31.50	2	73	35	0	0	0	3	0	33	0	0	0	146	4.6
17-Sep	30.50	0	53	23	0	0	0	2	0	15	0	0	0	93	3.0
18-Sep	35.75	0	31	11	1	0	0	1	0	9	1	0	0	54	1.5
19-Sep	25.75	0	13	2	0	0	0	0	0	4	0	0	0	19	0.7
20-Sep	34.75	1	17	12	0	0	0	0	0	8	0	0	0	38	1.1
21-Sep	27.50	0	30	26	0	0	0	3	0	0	0	0	0	59	2.1
22-Sep	16.00	0	11	11	0	0	0	0	0	0	0	0	0	22	1.4
23-Sep	4.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
24-Sep	21.00	0	16	11	0	1	0	2	0	1	0	0	0	31	1.5
25-Sep	17.50	1	15	16	0	0	0	0	0	2	0	0	1	35	2.0
26-Sep	23.00	0	29	14	0	2	0	0	0	0	0	0	0	45	2.0
27-Sep	30.00	0	28	28	0	0	0	1	0	2	0	0	0	59	2.0
28-Sep	27.75	0	51	29	1	0	0	0	0	4	1	0	0	86	3.1
29-Sep	35.00	0	45	21	0	0	0	0	0	2	0	0	0	68	1.9
30-Sep	24.00	0	33	15	0	0	0	0	0	3	0	0	0	51	2.1

Appendix F. continued

DATE	STATION	SPECIES											CAPTURES		
	HOURS	NH	SS	CH	NG	BW	SW	RT	GE	AK	ML	PR	PG	TOTAL	/STN HR
1-Oct	22.00	0	11	6	0	0	0	0	0	0	0	0	0	17	0.8
2-Oct	21.00	1	7	4	0	0	0	0	0	0	0	0	0	12	0.6
3-Oct	19.00	0	14	3	1	0	0	0	0	2	0	0	0	20	1.1
4-Oct	26.00	0	13	9	4	0	0	1	0	3	0	0	0	30	1.2
5-Oct	29.25	0	25	12	1	0	0	4	0	2	1	0	0	45	1.5
6-Oct	34.00	2	28	13	4	0	0	0	0	3	0	0	0	50	1.5
7-Oct	28.50	0	21	6	0	0	0	0	0	0	0	0	0	27	0.9
8-Oct	26.00	0	11	2	0	0	0	0	0	0	1	0	0	14	0.5
9-Oct	24.50	1	57	2	2	0	0	1	0	4	1	0	0	68	2.8
10-Oct	0.00														
11-Oct	0.00														
12-Oct	13.00	0	4	1	0	0	0	1	0	1	0	0	0	7	0.5
13-Oct	0.00														
14-Oct	21.50	1	8	0	1	0	0	0	0	1	0	1	0	12	0.6
15-Oct	16.50	0	16	1	0	0	0	0	0	0	1	0	0	18	1.1
16-Oct	23.50	1	12	2	1	0	0	0	0	0	0	0	0	16	0.7
17-Oct	23.50	0	16	3	1	0	0	2	0	0	2	0	0	24	1.0
18-Oct	17.50	1	17	1	0	0	0	0	0	2	1	0	0	22	1.3
19-Oct	21.50	1	5	0	1	0	0	1	1	0	0	0	0	9	0.4
20-Oct	17.00	0	75	7	0	0	0	1	0	4	0	0	0	87	5.1
21-Oct	15.50	1	0	0	1	0	0	0	0	0	0	0	0	2	0.1
22-Oct	9.50	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
23-Oct	6.75	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
24-Oct	0.00														
25-Oct	14.75	0	4	0	1	0	0	0	0	0	0	0	0	5	0.3
26-Oct	12.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
27-Oct	0.00														
28-Oct	2.50	0	2	0	0	0	0	0	0	0	0	1	0	3	1.2
Total	1286.25	17	1235	504	24	3	0	58	2	285	11	8	1	2148	90.9

¹ See Appendix B for explanation of species codes.

Appendix G. Annual summaries of banding effort and capture totals by species: 1980–2000.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	MEAN
Start date	23-Sep	2-Sep	8-Sep	25-Aug	28-Aug	2-Sep	27-Aug	30-Aug	28-Aug	30-Aug	24-Aug	21-Aug	19-Aug	22-Aug	19-Aug	22-Aug	19-Aug	18-Aug	18-Aug	21-Aug	21-Aug	
End date	19-Oct	10-Oct	16-Oct	22-Oct	17-Nov	8-Nov	10-Oct	27-Oct	23-Oct	24-Oct	31-Oct	26-Oct	7-Nov	22-Oct	29-Oct	25-Oct	23-Oct	22-Oct	22-Oct	3-Nov	28-Oct	
Blinds in operation	1	1	2	2	2	3	3	3	4	4	4	4	5	5	5	6	5	5	5	3	4	
Trapping days	21	37	27	55	69	?	?	?	?	?	66	64	74	59	65	63	61	62	63	72	62	57
Station days	21	37	?	66	104	?	?	?	?	159	205	240	296	254	278	312	270	264	236	131	174	192
Station hours	149	227	159	443	622	654	483.8	833	1085	1203	1454	1899	2316	1971	2290	2382	2061	2087	1690	939	1286	1250
Captures / 100 stn hrs	84.5	341.0	215.1	228.9	149.1	185.2	127.5	168.2	175.4	196.9	190.3	159.8	166.8	136.0	205.1	120.1	160.7	147.0	202.3	163.6	167.0	175.7
SPECIES	COUNTS																					
Northern Harrier	0	2	0	8	3	6	2	4	10	9	4	9	10	4	7	2	1	18	4	0	17	6
Sharp-shinned Hawk	62	376	186	571	548	705	410	886	1177	1527	1583	1694	2036	1526	2686	1823	2091	1783	2131	897	1235	1237
Cooper's Hawk	36	300	129	306	261	366	164	395	553	652	821	909	1220	822	1473	695	737	767	1006	438	504	599
Northern Goshawk	6	11	3	32	40	42	5	27	22	29	44	33	104	27	35	27	68	20	20	20	24	31
Broad-winged Hawk	0	0	0	0	2	0	1	1	1	1	1	2	0	2	1	3	0	0	1	0	3	1
Swainson's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0
Red-tailed Hawk	14	26	13	43	31	51	15	43	37	66	99	93	97	53	158	93	84	67	69	49	58	60
Golden Eagle	1	1	1	1	5	6	2	4	7	6	10	3	3	2	11	4	7	5	4	8	2	4
Bald Eagle	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Kestrel	7	58	8	51	28	34	17	37	85	61	190	266	367	223	285	193	290	351	149	97	285	147
Merlin	0	1	1	0	2	0	0	1	5	8	2	9	10	8	21	13	18	26	13	16	11	8
Prairie Falcon	0	0	0	6	5	2	1	3	7	5	7	7	8	1	7	3	7	17	7	3	8	5
Peregrine Falcon	0	0	0	0	1	0	0	0	0	2	1	1	0	1	0	1	1	4	0	1	1	1
All Species	126	775	341	1019	926	1212	617	1401	1904	2366	2762	3026	3855	2671	4685	2857	3304	3058	3404	1529	2148	2099
Recaptures	0	0	0	0	0	0	0	0	0	0	2	4	7	9	10	3	3	7	9	4	6	3
Foreign Recaptures ²	0	0	1	0	0	0	0	0	0	2	0	0	1	1	2	1	4	3	5	2	3	1
Foreign Encounters ³	0	1	5	3	9	12	5	7	11	12	15	18	14	21	19	16	9	14	10	19	19	11

¹ Recaptures in the Goshutes of birds originally banded in the Goshutes.

² Recaptures in the Goshutes of birds originally banded elsewhere.

³ Birds originally banded in the Goshutes and subsequently encountered elsewhere.