

**FALL 2007 RAPTOR MIGRATION STUDIES IN THE
GOSHUTE MOUNTAINS OF NORTHEASTERN NEVADA**



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**HawkWatch International, Inc.
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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 the Intermountain Flyway (Hoffman et al. 2002, Hoffman and Smith 2003, Smith et al. 2008a). HWI and its organizational precursors have been studying the fall raptor migration in the Goshute Mountains since 1980, when HWI founder Steve Hoffman and colleagues first began banding at the site. Standardized counts began in 1983 and have continued each year since. This is one of the longest running standardized, raptor-migration monitoring efforts in western North America, with the 2007 season marking the 28th consecutive season of banding and 25th consecutive annual count at the site. Annual counts have ranged between ~12,000–25,000 migrants of up to 18 species, making this one of the largest concentrations in the western U.S. and Canada (Bildstein 2006). The Goshute project was 1 of 14 long-term, annual migration counts and 1 of 6 migration-banding studies conducted or co-sponsored by HWI in North America during 2007. The primary objective of these efforts is to track long-term population trends of diurnal raptors, emphasizing western North America and the Gulf Coast region (Hoffman and Smith 2003; Smith et al. 2008 a, b). HWI also conducted a third fourth-season of owl banding in the Goshutes during fall 2007, with effort focused on Flammulated Owls (*Otus flammeolus*) (see Smith 2008).

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 Elko Field Office of the Bureau of Land Management (40° 25.417' N, 114° 16.276' W; Figure 1). The project site is located near the south end of the Goshute range and is reached via a primitive road that begins near Ferguson Springs and then a primitive trail that ascends Christmas Tree Canyon from the east.

Before 2001, the main count site was located atop the highest point of the ridge in the project area at an elevation of 2,743 m (OP1 in Figure 1). This location provided an expansive 360° view of the surrounding landscape, but poor visibility at or below eye level on the east side. To compensate for the limited view to the east, in most years after 1983 when easterly winds prevailed, the observers commonly moved about 250 m north to a second observation post (OP2 in Figure 1) that provided an unobstructed view along the lower eastern flanks of the ridge. After considerable deliberation and for reasons described in detail in Vekasy and Smith (2002), HWI's Science Committee (which includes HWI staff and Board members, experienced HWI field observers, and outside experts) decided to adopt a new standard of using only OP2 throughout the season beginning in 2001.

In 2007, three banding stations were located 100–500 m to the north and southeast of the observation post. **North** station, established mid-season in 1989 and modified slightly in 1998, was located about 300 m north-northwest of OP2 on top of the ridge at 2,700 m elevation, and was the first station southbound migrants encountered. **West** station, established in 1980 and modified slightly in 1995 and 2000, was located about 100 m south and slightly west of OP2 on the west flank of the ridge at 2,720 m elevation. **Meadow** station, established in 1987 and modified in 1996, 1998, and 2000, was located about 500 m southeast of OP2 on the east flank of the ridge in a natural sagebrush meadow at 2,620 m elevation. West and Meadow station generally represent a west wind / east wind swapping situation, though at times both were operated simultaneously. **South** station, established in 1982 and modified in 1998, is typically located 700 m south and slightly east of the count site in a topographic saddle at 2,660 m elevation, but was not deployed in 2007. Over the years, the number of trapping stations operated in any one year has varied as high as six, but since 2000 only the four stations listed above have been considered active options.

METHODS

STANDARDIZED COUNTS

Weather permitting; variable teams of two primary observers conducted daily counts throughout the season at OP2. The team consisted of full-season observer Steve Seibel, with 5+ seasons of prior raptor migration counting experience at various sites with HWI; Greg Levandoski, who counted during the first half of the season and had 4 seasons of prior counting experience with HWI and elsewhere; and HWI Research Assistant, Adam Hutchins, with 5+ seasons of prior counting experience, who substituted during the first half of the season and served as the second full-time counter during the second half of the season (see Appendix A for a complete history of observer participation). Visitors and other crewmembers also occasionally assisted with spotting migrants and recording data.

Weather permitting, observations usually began between 0800 and 0900 H Mountain Standard Time (MST) and ended near sunset, usually between 1700 and 1900 H.

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 H MST.
3. Wind speed and direction, air temperature, percent cloud cover, predominant cloud type(s), presence or of 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 the mean number of observers present during each hour (included designated observers plus volunteers/visitors who actively contributed to the count [active scanning, pointing out birds, recording data, etc.] for more than 10 minutes in a given hour), recorded on the hour.
6. A subjective visitor-disturbance rating for each hour, recorded on the hour.
7. Daily start and end times for each official observer.

Calculation of “adjusted” (to standardize sampling periods and adjust for incompletely identified birds) passage rates (migrants counted per 100 hours of observation) and analysis of trends updated through 2007 follows Hoffman and Smith (2003). In comparing 2007 annual statistics against means and 95% confidence intervals for previous seasons, we equate significance with a 2007 value falling outside the bounds of the confidence interval for the associated mean.

TRAPPING AND BANDING

Weather permitting, rotating crews of 1–3 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 H MST. Capture devices included mist nets, dho-gaza nets, and remotely triggered bow nets. Trappers lured migrating raptors into the capture stations from camouflaged blinds using live, non-native avian lures attached to lines manipulated from the blinds. Unless already banded, all captured birds were fitted with a uniquely numbered USGS Biological Resources Division aluminum leg band. Data gathering and recording followed standardized protocols

used at all HWI migration-banding sites (Hoffman et al. 2002). All birds were released within 45 minutes of capture, usually much quicker.

RESULTS AND DISCUSSION

WEATHER

Inclement weather entirely precluded observations on 1 day and reduced observation time to ≤ 4 hours on a 2 other days in 2007 (see Appendix C for daily weather records). The 1997–2006 averages for the site are 3 and 1 days, respectively. Scattered thundershowers and rain were common, two extended periods of hazy conditions occurred, and cloud cover varied considerably during the first five weeks of the season. The first snowfall occurred on 22–23 September; a second larger storm occurred on 5–6 October and resulted in nearly two full days of missed observations. Two other significant and one minor snow events occurred through the remainder of the season, interspersed with periods of generally fair weather, and ending with a season close that was snow free and balmier than usual.

Generally fair skies prevailed on 49% of the active observation days, which was very similar to the 1997–2006 average of 48%; however, days with primarily mostly cloudy to overcast skies were more common than usual (19% vs. average of 15%), while days with transitional skies (i.e., changed from fair skies to mostly cloudy or overcast during the day, or vice versa) were less common than usual (32% vs. average of 37%). The prevalence of haze increased markedly from 2002 through 2005 (most likely reflecting the influence of widespread drought and the resulting dry, dusty, and fire-prone landscape), then dropped off again in 2006, and in 2007 the proportion of active days that featured periods of fog or haze settled back to a level (22%) slightly below the 1997–2006 average (23%; a high peak of 73% occurred in 2004). In contrast, the proportion of active days that featured periods of rain or snow was slightly higher than average in 2007 (22% vs. average of 18%).

Light winds (< 12 kph) prevailed on 66%, moderate winds (12–29 kph) on 28%, and strong winds (> 29 kph) on 6% of the active observation days. These values are very similar to the 1997–2006 averages of 67% light, 26% moderate, and 7% strong winds, but the prevalence of light winds was the lowest since 1999 when the drought began. In terms of wind directions, 2007 was atypical in showing markedly lower dominance of comparatively steady S-SW winds (15% of the active observation days; average 36%) and NE-E winds (2% vs. average of 14%) in favor of more variable mixes of SW-NW winds often interspersed with calm/variable periods (a combined total of 41% of the active days; average 6%) and NE-SE winds intermixed with calm/variable periods (11% vs. average of 3%).

Daily-average temperatures (averages of hourly readings) ranged from -2.0 – 24.1 °C, averaging 13.1 °C. Daily-average barometric pressure readings (averages of hourly readings) ranged from 29.76 to 30.83 inHg, averaging 30.33 inHg. These values fall within the ranges seen since 1997. Thermal lift was rated good-to-excellent on 34% of the active observation days, which is similar to the 1997–2006 average of 33%).

In summary, the weather during the 2007 season was average to slightly mild in most respects compared to the past decade; however, the winds were stronger and there was less haze than during the previous six years, and a marked shift in prevailing wind directions favored more variable SW-NW and NE-SE winds instead of steadier SW-W and NE-E winds.

OBSERVATION EFFORT

Counts occurred on 82 of 83 days between 15 August and 5 November 2007. The number of observation days was a significant 5% above the 1983–2006 average of $78 \pm 95\%$ CI of 2.2 days, and the number of observation hours (703.00) was a significant 5% above the long-term average of 667.60 ± 27.95 hours.

The 2007 average of 2.3 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) was a non-significant 9% below the 1990–2006 (period of full-time two-observer system) average of 2.5 ± 0.25 observers/hr. Having moved the main count site to OP2 is the primary reason for this decline, because most general visitor activity now occurs at OP1 away from the main counters, where our site educators provide interpretive guidance. However, although the number of recorded observers has declined slightly due to the reduction in guest observers, the loss of these extra eyes is normally offset by a reduction in visitor disturbance of the primary observers.

MIGRATION SUMMARY

The observers counted 14,941 migrant raptors of 17 species during the 2007 season (see Appendix D for daily count records). The count was a non-significant 3% above the 1983–2006 average (Table 1). This is the first time since 2001 that the overall count has been above average, and it contrasts markedly with the 13-year low recorded in 2006 (see Appendix E for annual summaries). The 2007 tally included a new record-high count of Turkey Vultures, but no other record low or high counts.

The 2007 flight was composed of 57% accipiters, 26% buteos, 8% falcons, 5% vultures, and about 1% each of harriers, eagles, Ospreys, and unidentified raptors. The proportion of vultures was significantly above average, whereas the proportions of falcons and eagles were significantly below average (Figure 2). The most commonly observed species were the Sharp-shinned Hawk (31% of the total count), Red-tailed Hawk (24%), Coopers' Hawk (23%), American Kestrel (8%), and Turkey Vulture (5%). No other species comprised more than 1.5% of the total count. It is noteworthy that this is the first year since 2001 that the count of Sharp-shinned Hawks once again substantially exceeded that of Red-tailed Hawks, at the same time that the Red-tailed Hawk count was significantly above average. Prior to this period, the only other year in which this was not true was the first year of the count in 1983 (Appendix E). This may finally signal the beginnings of either a population rebound for Intermountain Sharp-shinned Hawks, or perhaps simply a return to using the Intermountain Flyway after avoiding the region due to the extensive drought that began in 1999 (Hoffman and Smith 2003, Smith et al. 2008a). The count of Cooper's Hawks also rose again significantly in 2007 after having dropped off markedly between 1998 and 2003. Other species for which the 2007 count was significantly above average included Ospreys, Broad-winged Hawks, and Peregrine Falcons. In contrast, counts were significantly below average for Northern Goshawks, Ferruginous Hawks, Golden and Bald Eagles, American, Kestrels, and Prairie Falcons.

Passage Rates and Long-Term Trends

The same basic patterns shown by the counts apply to comparisons of adjusted passage rates, except that the passage rate of Red-tailed Hawks in 2007 was only non-significantly above average (Table 1). For many species, adjusted passage rates show a common pattern of increasing trends through the late-1990s, which correspond to a wet *El Nino* weather pattern during the early to mid-1990s, followed by either stabilizing patterns or more often sharp declines for a few to several years after 1998 when widespread drought began plaguing much of the interior West (Figures 3–7; Hoffman and Smith 2003, Smith et al. 2008a). For most such species, passage rates have now begun to creep back upward, likely in response to improved winter and spring moisture conditions throughout much of the northern Great Basin and Intermountain region since 2005. Nevertheless, hill-shaped quadratic (second-order polynomial) regressions (after Hoffman and Smith 2003) continue to provide significant fits to the data for 10 species (Figures 3–7). The same basic pattern also is evident for Peregrine Falcons; however, only an increasing linear trend provided a significant fit to these data (Figure 7). A significant quadratic regression also previously tracked the trend in Turkey Vulture passage rates, with counts of this species dropping markedly for four years after reaching a high point in 1998; however, passage rates of this species returned to new record-high levels again in both 2004 and 2007, and as a result the long-term trend for this species is again simply a highly significant, linear increasing trend. Other species that continue to

show significant, long-term increasing trends include Broad-winged, Red-tailed, and Swainson's Hawks (Figure 5). As has been the case throughout the history of the project, only Rough-legged Hawks (Figure 5) and Bald Eagles (Figure 6) show no significant long-term trends at this site. It is also important to note that, despite the high prevalence of declining trends since the late 1990s, the only species whose recent passage rates have been substantially below levels seen throughout earlier years of the project are the Northern Goshawk (Figure 4) and, to a lesser degree, Golden Eagle (Figure 6).

Smith et al. (2008a) present trend analyses of data collected through 2005 for most of the long-term, on-going, autumn migration studies in western North America, including the Goshutes. These analyses (hereafter called the Raptor Population Index or "RPI" analyses; see <http://www.rpi-project.org>) are based on a more sophisticated analytical approach (also see Farmer et al. 2007) than that represented in Hoffman and Smith (2003) and used herein to present analyses updated through 2007. Among other refinements, this new approach both fits complex polynomial trajectories to the complete series of annual count indices and allows for estimating rates of change between various periods, while also allowing for assessments of trend significance and precision. Note, however, that restrictions related to the mathematical assumptions behind the new approach precluded analyzing data for rare species, which in this case included Ferruginous and Rough-legged Hawks, Bald Eagle, and Peregrine Falcon. Otherwise, the overall patterns of change and derived trend estimates suggested by the new modeling technique generally yielded similar inferences as those derived using the simpler methodology of Hoffman and Smith (2003) and presented herein to provide trend assessments updated through 2007. The only substantive differences between the RPI results and those presented herein, which clearly relate to addition of two more years of data, are that near-record high passage rates in 2007 returned stabilizing quadratic trends to significant linear increasing trends for Turkey Vultures and Broad-winged Hawks.

Age Ratios

Immature : adult ratios were significantly below average in 2007 for 6 of 10 species with data suited to comparisons (Northern Harriers, Northern Goshawk, Broad-winged Hawk, Red-tailed Hawk, Bald Eagle, and Peregrine Falcon) and were significantly above average only for Golden Eagles (Table 2). For all species showing low age ratios, except Broad-winged Hawks, reduced abundance of identified immatures contributed to the low ratios, suggesting that low productivity in 2007 may have influenced the results. For Broad-winged Hawks, the numbers of both adults and immatures were well above average, but proportionally more so for adults; however, it is important to note here that the Broad-winged Hawk was one of four species (along with Cooper's Hawks, Ferruginous Hawks, and Bald Eagles) for which the proportion of unknown-age birds differed significantly from the long-term average, and hence results for these species should be considered with particular caution.. The high age ratio for Golden Eagles was due entirely to a well-below-average count of identified adults, which may be indicative of poor adult recruitment, but also may be indicative of reduced migratory activity among mostly sedentary Intermountain breeders in response to improving habitat quality. In fact, after having dropped for four years in a row to a record low in 2004, the counts and passage rates of immatures/subadults have now increased for two years in a row, returning to an average level in 2007. Over the past 25 years, substantial, multi-year increases in the abundance of immatures/subadults in the Goshutes typically have been preceded by reduced abundance of migrating adults, suggesting that increased productivity correlates with reduced movement among breeding adults in the Intermountain region (Hoffman and Smith 2003). Otherwise, the prevalence of improved overall counts for many species compared to the past five years or so, yet little evidence of high immature : adult ratios, suggests that the improved counts may reflect primarily increased use of the Goshute migration route (following an "avoidance" decline due to the drought) rather than actual population increases.

Seasonal Timing

The 2007 combined-species median passage date of 25 September matched the 1990–2006 average (Table 3). No distinct, overall early or late shift was evident in the combined-species seasonal distribution pattern, with significant variants occurring throughout the season (Figure 8). That said, similar to last year, an extended period of below-average activity occurred from 16–25 September, which in both years corresponded to occurrence of the first significant snow event during the third week of September, and reflected primarily below-average passage of Sharp-shinned and Cooper’s Hawks during this period.

At the species level, 8 of 17 species showed earlier than average median passage dates in 2007, with the differences significant for seven of these species (Northern Harrier, Cooper’s Hawk, Swainson’s Hawk, Red-tailed Hawk, Ferruginous Hawk, Golden Eagle, and American Kestrel), and 9 species showed later than average timing, with the differences significant for all but the Sharp-shinned Hawk (Table 3). Thus, there was little consistency in timing trends within primary species groups (e.g., accipiters, buteos, eagles, and falcons). Age-specific timing data revealed additional detail but no markedly different results, with one exception (Table 4). Although the species-level dates for Golden Eagles suggested significantly early timing, the age-specific dates revealed only non-significant early passage of identified immatures/subadults and significantly late passage of adults.

TRAPPING EFFORT

The crews operated one or more of the three available banding stations on 63 of 67 days between 20 August and 25 October 2007 (see Appendix F for daily capture records and Appendix G for annual summaries). The number of trapping days was 5% higher than the 1980–2006 average for the site, whereas the number of station hours (550) was 55% lower than average due to a purposefully reduced crew size.

TRAPPING SUMMARY

The 2007 capture total of 1,159 raptors included 9 species, 1,155 newly banded birds, three recaptures of birds previously banded in the Goshutes, and one “foreign” recapture of a bird originally banded elsewhere (Table 5, Appendix G). The 2007 effort raises the total number of birds captured since project inception to 55,853, including 93 Goshute recaptures and 40 foreign recaptures. Sharp-shinned Hawks accounted for 59% of the total captures, followed by Cooper’s Hawks (33%), Red-tailed Hawks (3%), American Kestrels (2%), and Northern Goshawks (2%). Each of the remaining species accounted for less than 1% of the total. This was the first year of the project that no Golden Eagle was captured. The only other species that is caught in most years but was not caught in 2007 was the Peregrine Falcon.

The 2007 combined-species capture total was 43% below the long-term average (Table 5), consistent with a 55% reduction in station hours. Capture totals were markedly below average for all species except Northern Harriers, reflecting the effects of both low flight volume and reduced trapping effort. Capture success also was substantially below average (48% combined) for all species except Northern Goshawks, because of the reduced effort (Table 5). In contrast, capture rates (e.g., birds captured per 100 station hours) were above average for most commonly captured species, indicating that trapping efficiency was generally good (Table 5).

At this site, compared to the counts, banding data yield unique and sufficient sex-age specific data only for the three accipiters and American Kestrels (Table 6). The count and capture data both indicated above-average immature : adult ratios for Sharp-shinned Hawks in 2007; however, the capture-based ratio (2.69) exceeded its average by 35%, whereas the count-based ratio (1.48) exceeded its average by only 10%. As is typical at this site, the capture age ratio was also almost twice as high as the count age ratio. Together these data suggest that in 2007 immature birds were relatively abundant (possibly due to

increased productivity) and were more susceptible to capture (hungrier) than adults, which is typical, but to a greater degree than usual. In contrast to the case for Sharp-shinned Hawks, the count and capture age ratios for Cooper's Hawks were both similarly below average (20 and 28%) and the estimates also were very similar (0.67 and 0.71). These data suggest that immature Cooper's Hawks were proportionately less abundant than usual in 2007 (possibly due to reduced productivity), but did not exhibit any significant variation in relative susceptibility to capture compared to adults. Both the count and capture age ratios were also substantially and similarly below average (62 and 58%) for Northern Goshawks. Similar to Sharp-shinned Hawks but unlike Cooper's Hawks, the count-based age ratio for goshawks was four times lower than the capture-based age ratio. These data suggest low relative abundance of immature birds (possibly due to reduced productivity) and greater susceptibility to capture than adults, but to a degree typical for the site.

The trapping data alone also indicated that female Sharp-shinned Hawks were captured roughly 50% more often than males (female : male ratio of 1.40), and that this sex ratio was 44% above average (Table 6). This suggests that, similar to 2006, female sharp-shins were either proportionately more abundant or considerably more susceptible to capture than usual in 2007 compared to males. Female Cooper's Hawks also were captured more often than males in 2007 (sex ratio 1.84), and this sex ratio also was well above average (25%). Conversely, the female : male capture ratio for Northern Goshawks was only 0.21 and 85% below average, suggesting that, unlike for the two smaller accipiters, female goshawks were either much less abundant or much less susceptible to capture than usual compared to males in 2007.

The sex ratio of kestrels captured in 2007 was 1.11 and 19% above average (Table 6). The count-based sex ratio was only slightly higher (1.23) and slightly more above average (27%). These data suggest that females were more abundant than usual in 2007 and slightly less susceptible to capture than usual. The count data do not yield age-specific data for American Kestrels, so the banding data for this species are particularly useful. Similar to the past two seasons, the 2007 banding data yielded an immature : adult ratio that was a significant 59% below average (Table 6). This suggests that young kestrels may have been relatively scarce during at least the past three years, which in turn suggests that reduced productivity may have been a key contributor to the declining population trends we have recorded for this species in the past decade (Figure 7). In fact, recent evidence from migration counts indicates that kestrels are declining across the continent (Farmer et al. 2008, Farmer and Smith in review). That said, in the past couple of years, due to a scarcity of appropriate lures, our kestrel trapping efficiency at the Goshutes has declined markedly, such that current comparisons of age and sex ratios may well be confounded by very low sample sizes compared to previous years.

ENCOUNTERS WITH PREVIOUSLY BANDED BIRDS

The 2007 captures included recaptures of 1 male and 2 female Cooper's Hawks originally banded in the Goshutes, and one female Cooper's Hawk originally banded at Idaho Bird Observatory's migration monitoring site on Boise Ridge in western Idaho (Table 7). The three Goshute recaptures all were banded as hatch-year (HY) birds, the male in 2002 and the females in 2004. These new recaptures raise the total number of Goshute recaptures since 1980 to 93 birds, all accipiters (Appendix G). The Boise Ridge bird was originally banded in 2005, and this new recapture raises the total number of "foreign" recaptures for the Goshute site since 1980 to 40, involving 5 species and including 18 recaptures of Sharp-shinned and Cooper's Hawks banded at Boise Ridge.

Ten raptors originally banded in the Goshutes were encountered elsewhere in 2007, which is slightly lower than the average annual total for the site (Table 8, Appendix G). This raises the total number of foreign encounters for the project since 1980 to 333. The 2007 encounters involved 4 Cooper's Hawks, 5 Sharp-shinned Hawks, and 1 Red-tailed Hawk. Nine of the encounters involved birds that were found dead of unknown causes. The remaining Cooper's Hawk was resighted in late may 2007 in British

Columbia, and the band apparently was read through a spotting scope. This bird, originally banded by us in 2000 as an after-second-year (ASY) adult is now at least 10 years old.

The five Sharp-shinned Hawks included one male banded as a HY bird in 2004 that was recovered during February ~1,483 km to the south in Sinaloa, Mexico; three females banded as HY birds in 2005 and 2006 that were recovered during January and June 623 and 688 km to the south in Arizona, and during March 296 km to the SE in Utah; and one female banded as an ASY adult in 2005 that was recovered during February 695 km to the south in Arizona.

All three of the remaining Cooper's Hawks were females, two banded as HY birds in 2004 and 2006 and one as an ASY adult in 2007. Both HY birds were recovered in Arizona during February (600 km) and April (494 km). The ASY bird was recovered during October 838 km to the south near Tucson, Arizona.

The Red-tailed Hawk was banded as a HY bird in 2003 and was recovered during December 686 km to the southwest near Riverside, California.

The new 2007 encounter locations all fall well within the expected ranges of Goshute birds (Hoffman et al. 2002).

SATELLITE TRACKING OF MIGRANTS

We did not deploy any new satellite transmitters in the Goshutes during the 2007 season. At the time we wrote our 2006 season report, we were still tracking two Golden Eagles outfitted at the site in 2004 and 2006, and one Red-tailed Hawk outfitted at the site in 2006. Unfortunately, since then all three birds have died. We were able to recover the transmitters from all three and thereby learned a bit more about their fates.

Golden Eagles

The young male eagle we had been tracking since 2004 had spent its time wandering around northern Utah and southern and central Idaho. Based on our tracking data, we had thought that this bird died near Hagerman, Idaho in late 2006. It turns out that it probably died sometime around early fall that year near Magic Reservoir, roughly 100 km farther north. Some folks recreating near the reservoir had discovered the dead bird (a pile of feathers and bones at that point), removed the transmitter, and took it home with them to Hagerman, expecting to turn the unit into the local game and fish agency. They forgot about the latter part, however, and so we ended up tracking the still operative transmitter to their house, luckily found the folks home and amiable, and eventually discovered the unit still under the front seat of their truck!

The other young male eagle that we outfitted in 2006 moved south-southeast for the winter to the Cedar Mountain Draw area of central Utah near Holden and Fillmore. This bird died in mid-March 2007 in a mixed agricultural and juniper/sagebrush/grassland area. The carcass was fairly decomposed by the time we got to it, but it appeared that it had essentially crawled into a sagebrush flat area and died. There were no obvious signs of trauma. There were, however, several other, possibly territorial Golden Eagles in the area, along with abundant signs of suitable prey such as jackrabbits.

Red-tailed Hawks

After release, the large, hatch-year female Red-tailed Hawk that we outfitted at the site in 2006 traveled south along the Utah–Nevada border, then veered southeast into Arizona and across the Grand Canyon on her way to a winter range on the northwest outskirts of Phoenix. It returned north in the spring beginning around 20 March, followed a more westerly path than during the fall back up through the center of Nevada, and by 6 April had traveled up into the northeast corner of Oregon. It then abruptly turned around and within a week had returned to an area just northwest of Boise, Idaho, where it had stopped for a couple of days on its way north. It died or was killed in this area two days later. The area

in which it died was a private ranch where it appeared that several families of Red-tailed and Swainson's Hawks were living, nesting/roosting in small stands of cottonwoods and foraging out across an extensive area of open sagebrush and grassland habitat. We found the bird upside down under a large cottonwood tree, with another second-year Red-tailed Hawk also dead nearby. Both carcasses were largely intact but already too decayed at the time of discovery to ascertain the cause of death. That said, the fact that the target bird was out in the open under the tree and upside down suggested that it either simply fell dead out of the tree or was killed on the ground struggling with an adversary of some kind. There was a red fox living in the immediate area; competition with the local resident hawks may have been an issue; there were spent shot gun shells in the immediate area; and hunting dogs were being trained in the immediate area—all possibilities as a source of mortality for the two birds, although starvation and/or disease also cannot be ruled out.

Tracking summaries and maps for all of HWI's satellite-tracked raptors can be found at www.hawkwatch.org.

RESIDENT RAPTORS

Up to 8 local Turkey Vultures were routinely recorded patrolling the project ridgeline until 10 September.

It appeared the Northern Goshawks that have nested in most years just below the project site were again productive this year in producing at least one fledgling. The observers recorded only one positive record of an apparently local adult in late August, but single juvenile birds were recorded routinely through mid-September, with a few other scattered records of possibly local birds through the remainder of the season. At least one adult and one immature Sharp-shinned Hawks were recorded as local birds early in the season. One record of an apparently local pair of adult Cooper's Hawks was recorded in mid-August, and sightings of one or more local juveniles occurred regularly until 7 September.

As usual, most likely one family group of Red-tailed Hawks occurred in the area. The records kept by the observers this year were not routinely specific about ages and color morphs, so the make-up of the family is a bit uncertain, but included at least one adult and two immature light morphs, and most likely another dark morph adult and a rufous morph juvenile. Three birds were seen in the area as late as 2 November, but no specificity as to ages and color morphs was recorded then. At least one adult light-morph bird was present the day before, but otherwise the last confirmed sighting of a local juvenile bird was on 18 September.

Beginning on 25 October, the observers recorded one dark morph and at least three light-morph Rough-legged Hawks moving north along the project ridgeline, suggesting the arrival of winter-resident birds.

The records of local Golden Eagle activity were a bit confusing this year. On only one occasion was a positive record of two full adults recorded by the observers, and an immature or first-year bird was positively recorded on only four occasions, whereas at least two subadult birds were recorded regularly and often doing territorial displays. This suggests that, as usual, there was at least one family group residing in the area, and that they probably produced one fledgling. It also is common for a subadult bird, possibly from a previous brood, to be hanging out in the territory of established adults, but to witness such subadult birds routinely doing territorial displays in such an area is less common. All of these eagles were present throughout the season

At least one male and one female American Kestrels frequented the project area until the end of August, but no confirmation of a family including fledglings was obtained. A pair of adult Peregrine Falcons and probably one immature bird were routinely observed in the area through late September, with one additional sighting of an apparently local adult recorded on 22 October.

This is a fairly typical resident assemblage for the site, except for limited sightings of American Kestrels, a lack of local Prairie Falcons, and the first evidence of a possible productive family group of Peregrine Falcons. The latter two details may well be related. By virtue of HWI's Great Basin Raptor Nest Survey (Smith and Hutchins 2008), we know that one of the first eyries to be documented in far northwest Utah in three decades is now located near Wendover about 40 km northeast of the Goshute project site. Although it is possible that the range of these birds extends to the project area, it seems much more likely that another new eyrie has recently arisen in the Goshute Mountains.

SITE VISITATION

In 2007, only 55 individuals signed the HWI Goshute visitor logs, a well-below average total. Recorded visitors originated in Nevada, Utah, Missouri, and California, and included one organized group of scouts from Utah. A primary reason for the low, apparent visitation total is that this year we were unable to staff the project with a full-time, on-site interpreter dedicated to facilitating visitor interactions and ensuring that as many visitors as possible were recorded on the logs. Due to the lack of a dedicated interpreter, we also purposefully limited our outreach to encourage other organized groups to visit.

In 2007, 738 hourly assessments by the official observers of visitor disturbance resulted in the following ratings: >99% none, <1% low, and 0% moderate or high.

ACKNOWLEDGMENTS

Primarily financial support for the 2007 project was provided by the USDI Bureau of Land Management – Elko Field Office, U.S. Fish and Wildlife Service – Neotropical Migratory Bird Conservation Act grant program, the Walbridge Fund, the Schaffner Family Foundation, and HWI private donors and members. The BLM Elko Field Office also provided helicopter-airlift and other essential logistical support; special thanks to Tamara Hawthorne for her assistance and oversight. We are also grateful for discounted hotel accommodations provided to our crewmembers on their days off by the Wendover Nugget; for the logistical support of the West Wendover Waste Water Treatment Plant and West Wendover Public Water Works; and for generous donations of supplies for the crew provided by Einstein's Bagels, Great Harvest Bread, and Salt Lake Roasting Company in Salt Lake City. We are also very grateful for the additional volunteer assistance provided by Leo Chidester, Art Sandack, Jason Bjork, Ian Anderson, William Blake, Gregor Yanega, and Adam Griebe. Lastly, special thanks to Paul Dutson, Orville Hayes, Neil Pace, John Muir, Roy Bouk, Arnold Frisbee, Barry Herbert, JoAn Ellsworth, and Brett Prevedal for their help in providing or helping us secure lure birds for the trapping operations.

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Table 1. Annual raptor migration counts and adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) annual passage rates by species in the Goshute Mountains, NV: 1983–2006 versus 2007.

SPECIES	COUNTS			RAPTORS/100 HOURS ¹		
	1983–2006 ²	2007	% CHANGE	1983–2006 ²	2007	% CHANGE
Turkey Vulture	340 ± 66.2	735	+116	61.5 ± 11.5	132.4	+115
Osprey	92 ± 17.5	113	+23	20.9 ± 3.5	26.2	+26
Northern Harrier	172 ± 29.0	186	+8	26.9 ± 4.0	26.8	0
Sharp-shinned Hawk	4,496 ± 802.1	4,635	+3	993.1 ± 145.0	1,002.2	+1
Cooper's Hawk	3,151 ± 571.4	3,422	+9	794.4 ± 118.5	847.8	+7
Northern Goshawk	103 ± 23.1	55	-47	17.2 ± 3.7	8.3	-51
Unknown small accipiter ³	232 ± 149.2	360	+55	–	–	–
Unknown large accipiter ³	9 ± 9.4	1	-89	–	–	–
Unknown accipiter	288 ± 91.0	5	-98	–	–	–
TOTAL ACCIPITERS	8,099 ± 1337.2	8,478	+5	–	–	–
Red-shouldered Hawk	0.3 ± 0.2	0	-100	–	–	–
Broad-winged Hawk	47 ± 14.5	122	+162	18.3 ± 5.5	50.7	+178
Swainson's Hawk	240 ± 85.4	163	-32	62.6 ± 22.2	37.3	-40
Red-tailed Hawk	3,100 ± 371.7	3,511	+13	515.1 ± 49.6	544.4	+6
Ferruginous Hawk	16 ± 2.7	11	-32	2.6 ± 0.4	1.6	-36
Rough-legged Hawk	14 ± 4.1	13	-5	6.3 ± 1.7	5.5	-11
Unidentified buteo	71 ± 19.5	44	-38	–	–	–
TOTAL BUTEOS	3,487 ± 425.5	3,864	+11	–	–	–
Golden Eagle	253 ± 27.9	218	-14	39.9 ± 4.1	30.7	-23
Bald Eagle	13 ± 2.6	10	-22	2.6 ± 0.5	1.9	-28
Unidentified eagle	1 ± 0.5	0	-100	–	–	–
TOTAL EAGLES	267 ± 29.2	228	-15	–	–	–
American Kestrel	1,917 ± 358.3	1,174	-39	403.4 ± 68.8	245.9	-39
Merlin	40 ± 10.3	34	-14	7.6 ± 2.0	6.5	-14
Prairie Falcon	26 ± 6.0	19	-28	4.5 ± 0.9	2.8	-37
Peregrine Falcon	11 ± 3.5	18	+59	2.1 ± 0.6	3.5	+69
Unknown small falcon ³	3.7 ± 3.7	3	-18	–	–	–
Unknown large falcon ³	3 ± 1.7	1	-63	–	–	–
Unknown falcon	6 ± 2.1	2	-69	–	–	–
TOTAL FALCONS	2002 ± 372.8	1,251	-38	–	–	–
Unidentified raptor	115 ± 37.3	86	-25	–	–	–
GRAND TOTAL	14574 ± 2046.2	14,941	+3	–	–	–

¹ Adjusted for incompletely identified birds and to standardized, species-specific sampling periods.

² Mean ± 95% confidence interval.

³ These categories represent new distinctions initiated as standard practice in 2001 (see Appendix B for classification details).

Table 2. Annual raptor migration counts by age classes and immature: adult ratios for selected species in the Goshute Mountains, NV: 1990–2006 versus 2007.

SPECIES	TOTAL AND AGE-CLASSIFIED COUNTS						% UNKNOWN AGE		IMMATURE : ADULT RATIO	
	1990–2006 AVERAGE			2007			1990–2006 ¹	2007	1990–2006 ¹	2007
	TOTAL	IMM.	ADULT	TOTAL	IMM.	ADULT				
Northern Harrier	198	63	57	186	33	71	41 ± 7.5	44	1.29 ± 0.275	0.46
Sharp-shinned Hawk	5,004	1763	1,359	4,635	1621	1,094	38 ± 5.4	41	1.34 ± 0.252	1.48
Cooper's Hawk	3,620	851	1,002	3,422	490	732	50 ± 4.8	64	0.83 ± 0.209	0.67
Northern Goshawk ²	103	51	33	55	22	26	17 ± 4.5	13	2.22 ± 0.659	0.85
Broad-winged Hawk	58	14	24	122	28	81	37 ± 9.0	11	0.68 ± 0.202	0.35
Red-tailed Hawk	3,536	729	2,023	3,511	405	2,305	22 ± 3.7	23	0.36 ± 0.058	0.18
Ferruginous Hawk	18	5	6	11	2	2	42 ± 9.6	64	1.08 ± 0.541	1.00
Golden Eagle ²	253	123	71	218	126	38	23 ± 5.0	25	2.06 ± 0.413	3.32
Bald Eagle	14	6	7	10	3	7	7 ± 4.7	0.0	1.13 ± 0.343	0.43
Peregrine Falcon	14	5	6	18	4	7	30 ± 11.5	39	0.90 ± 0.348	0.57

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 1983–2006.

Table 3. First and last observed, bulk passage, and median passage dates by species for migrating raptors in the Goshute Mountains, NV in 2007, with comparisons of 2007 and 1990–2006 average median passage dates.

SPECIES	2007				1990–2006
	FIRST OBSERVED	LAST OBSERVED	BULK PASSAGE DATES ¹	MEDIAN PASSAGE DATE ²	MEDIAN PASSAGE DATE ^{2,3}
Turkey Vulture	15-Aug	14-Oct	13-Sep – 4-Oct	25-Sep	23-Sep ± 1.4
Osprey	18-Aug	29-Oct	3-Sep – 1-Oct	19-Sep	14-Sep ± 1.5
Northern Harrier	15-Aug	29-Oct	19-Aug – 11-Oct	15-Sep	25-Sep ± 3.3
Sharp-shinned Hawk	15-Aug	5-Nov	9-Sep – 15-Oct	27-Sep	26-Sep ± 2.2
Cooper's Hawk	15-Aug	1-Nov	8-Sep – 8-Oct	20-Sep	23-Sep ± 1.6
Northern Goshawk	17-Aug	5-Nov	2-Sep – 3-Nov	15-Oct	04-Oct ± 2.7
Broad-winged Hawk	10-Sep	7-Oct	15-Sep – 28-Sep	26-Sep	23-Sep ± 1.5
Swainson's Hawk	15-Aug	4-Oct	20-Aug – 21-Sep	6-Sep	20-Sep ± 3.4
Red-tailed Hawk	15-Aug	5-Nov	31-Aug – 27-Oct	30-Sep	06-Oct ± 2.4
Ferruginous Hawk	22-Aug	22-Oct	31-Aug – 10-Oct	10-Sep	29-Sep ± 3.8
Rough-legged Hawk	15-Oct	3-Nov	21-Oct – 2-Nov	29-Oct	22-Oct ± 1.9
Golden Eagle	15-Aug	5-Nov	27-Aug – 2-Nov	6-Oct	09-Oct ± 1.9
Bald Eagle	7-Sep	4-Nov	7-Sep – 4-Nov	3-Nov	20-Oct ± 4.9
American Kestrel	15-Aug	29-Oct	28-Aug – 27-Sep	12-Sep	16-Sep ± 1.8
Merlin	8-Sep	1-Nov	14-Sep – 27-Oct	11-Oct	01-Oct ± 2.1
Prairie Falcon	17-Aug	1-Nov	2-Sep – 29-Oct	26-Sep	14-Sep ± 3.8
Peregrine Falcon	29-Aug	15-Oct	1-Sep – 10-Oct	20-Sep	21-Sep ± 4.4
Total	15-Aug	5-Nov	7-Sep – 15-Oct	25-Sep	25-Sep ± 1.4

¹ Dates between which the central 80% of the flight passed the lookout.

² Date by which 50% of the flight had passed the lookout.

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

Table 4. Median passage dates by age classes for selected species of migrating raptors in the Goshute Mountains, NV: 1990–2006 versus 2007.

SPECIES	ADULT		IMMATURE / SUBADULT	
	1990–2006 ¹	2007	1990–2006 ¹	2007
Northern Harrier	29-Sep ± 4.5	15-Sep	22-Sep ± 5.4	15-Sep
Sharp-shinned Hawk	07-Oct ± 1.6	8-Oct	16-Sep ± 1.1	17-Sep
Cooper's Hawk	26-Sep ± 1.8	26-Sep	18-Sep ± 1.2	17-Sep
Northern Goshawk ²	12-Oct ± 4.3	28-Oct	29-Sep ± 3.4	11-Oct
Broad-winged Hawk	23-Sep ± 1.6	26-Sep	25-Sep ± 2.5	26-Sep
Red-tailed Hawk	09-Oct ± 2.0	7-Oct	18-Sep ± 4.4	15-Sep
Golden Eagle ²	14-Oct ± 2.5	29-Oct	04-Oct ± 3.6	3-Oct
Bald Eagle	21-Oct ± 4.2	3-Nov	26-Oct ± 2.4	–
Peregrine Falcon	22-Sep ± 6.9	22-Sep	22-Sep ± 2.8	–

Note: Median passage dates are dates by which 50% of the flight had passed the lookout; values were calculated based only on counts of ≥5 birds per year.

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

² Average for 1983–2006.

Table 5. Capture totals, rates, and successes for migrating raptors in the Goshute Mountains, NV: 1985–2005 versus 2007.

SPECIES	CAPTURE TOTAL		CAPTURE RATE ¹		CAPTURE SUCCESS (%) ²	
	1985–2006 ³	2007	1985–2006 ³	2007	1985–2006 ³	2007
Northern Harrier	6 ± 2.0	6	0.5 ± 0.1	1.1	4.0 ± 1.2	3.2
Sharp-shinned Hawk	1,370 ± 248.7	683	95.6 ± 7.4	124.3	27.8 ± 4.0	14.1
Cooper's Hawk	684 ± 131.5	383	47.7 ± 4.2	69.7	19.7 ± 2.6	10.7
Northern Goshawk	30 ± 9.0	18	2.2 ± 0.6	3.3	32.1 ± 6.3	32.7
Broad-winged Hawk	1 ± 0.4	2	0.1 ± 0.0	0.4	2.9 ± 1.3	1.6
Swainson's Hawk	0.2 ± 0.2	0	0.0 ± 0.0	0.0	0.1 ± 0.1	0.0
Red-tailed Hawk	71 ± 12.4	39	5.2 ± 0.7	7.1	2.2 ± 0.3	1.1
Rough-legged Hawk	0.1 ± 0.2	0	0.0 ± 0.0	0.0	0.4 ± 0.8	0.0
Golden Eagle	5 ± 1.3	0	0.4 ± 0.1	0.0	1.7 ± 0.5	0.0
American Kestrel	158 ± 46.6	19	9.8 ± 2.0	3.5	7.3 ± 1.9	1.6
Merlin	10 ± 2.8	6	0.7 ± 0.2	1.1	21.3 ± 5.3	17.6
Prairie Falcon	5 ± 1.4	3	0.4 ± 0.1	0.5	21.5 ± 4.3	15.8
Peregrine Falcon	1 ± 0.5	0	0.1 ± 0.0	0.0	8.7 ± 4.4	0.0
All Species	2341 ± 428.0	1,159	162.5 ± 11.4	210.9	16.0 ± 2.2	8.4

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 (HY = hatching year; AHY = after hatching year), female : male capture ratios, and immature : adult capture ratios for selected species of migrating raptors in the Goshute Mountains, NV: 1991–2006 averages versus 2007.

	FEMALE			MALE			FEMALE : MALE	HY : AHY
	AHY	HY	UNK.	AHY	HY	UNK.	RATIO ¹	RATIO ¹
Sharp-shinned Hawk								
1991–2006 mean	276	448	–	225	543	–	0.97	1.97
2007	143	255	–	42	243	–	1.40	2.69
Cooper's Hawk								
1991–2006 mean	247	194	–	135	179	–	1.47	0.98
2007	158	90	–	66	69	–	1.84	0.71
Northern Goshawk								
1991–2006 mean	5	11	–	2	13	–	1.43	8.29
2007	0	3	–	3	11	–	0.21	3.50
American Kestrel								
1991–2006 mean	8	64	21	23	72	2	0.93	5.46
2007	0	4	6	4	5	0	1.11	2.25

¹ Long-term mean ratios are averages of annual ratios and may differ from values obtained by dividing long-term average numbers of relevant sex or age classes. Discrepancies between the two values reflect high annual variability in the observed age ratio.

Table 7. Recaptures of previously banded raptors in the Goshute Mountains, NV during fall 2007.

SPECIES	SEX	BAND #	BANDING SITE	BANDING DATE	BANDING AGE	RECAPTURE DATE	RECAPTURE AGE
Cooper's Hawk	F	1035-04834	Boise Ridge, ID	28-Aug-05	unknown	25-Sep-07	ASY
Cooper's Hawk	M	0804-22848	Goshutes	25-Sep-02	HY	26-Sep-07	6 th yr
Cooper's Hawk	F	1005-24195	Goshutes	28-Sep-04	HY	04-Oct-07	4 th yr
Cooper's Hawk	F	1005-24609	Goshutes	01-Oct-04	HY	20-Sep-07	4 th yr

¹ HY = hatching year; SY = second year; TY = third year.

Table 8. Foreign encounters in 2007 with raptors banded in the Goshute Mountains, NV.

SPECIES	SEX	BAND #	BANDING DATE	BANDING AGE	ENCOUNTER DATE	ENCOUNTER AGE	ENCOUNTER LOCATION	DISTANCE (km)	STATUS
Sharp-shinned Hawk	F	1593-53086	22-Sep-05	HY	11-Jan-07	TY	Quartzite, AZ	623	found dead
Sharp-shinned Hawk	M	1212-97418	08-Sep-04	HY	1-Feb-07	4 th yr	Sinaloa, Mexico	1,483	found dead
Sharp-shinned Hawk	F	1593-94526	02-Nov-05	ASY	12-Feb-07	≥5 th yr	Tempe, AZ	695	found dead
Cooper's Hawk	F	1005-24622	11-Oct-04	HY	24-Feb-07	4 th yr	Camp Verde, AZ	600	found dead
Sharp-shinned Hawk	F	1593-34676	08-Oct-04	HY	16-Mar-07	4 th yr	Spring Lake, UT	296	found dead
Cooper's Hawk	F	1005-24772	29-Sep-06	HY	3-Apr-07	SY	Seligman, AZ	494	found dead
Cooper's Hawk	F	1005-01842	06-Oct-00	ASY	26-May-07	≥10 th yr	McLeese Lake, BC, Canada	1,358	resighted
Sharp-shinned Hawk	F	1593-53365	09-Oct-06	HY	18-Jun-07	SY	Phoenix, AZ	688	found dead
Cooper's Hawk	F	1075-00249	19-Sep-07	ASY	23-Oct-07	ASY	Tucson, AZ	838	found dead
Red-tailed Hawk	U	1807-93723	05-Sep-03	HY	17-Dec-07	5 th yr	Riverside, CA	686	found dead

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

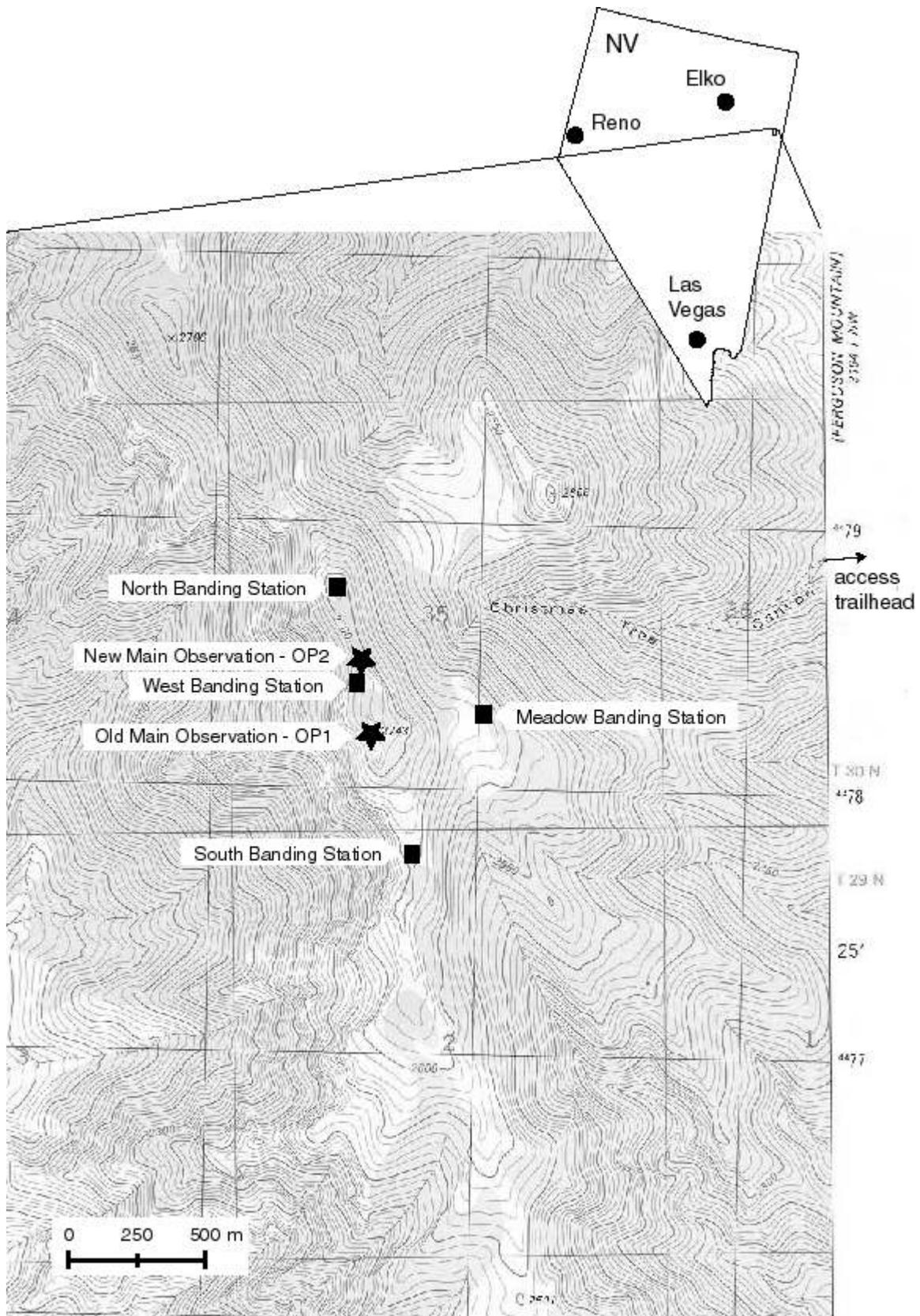


Figure 1. Location of the Goshute Mountains Raptor Migration Project study site.

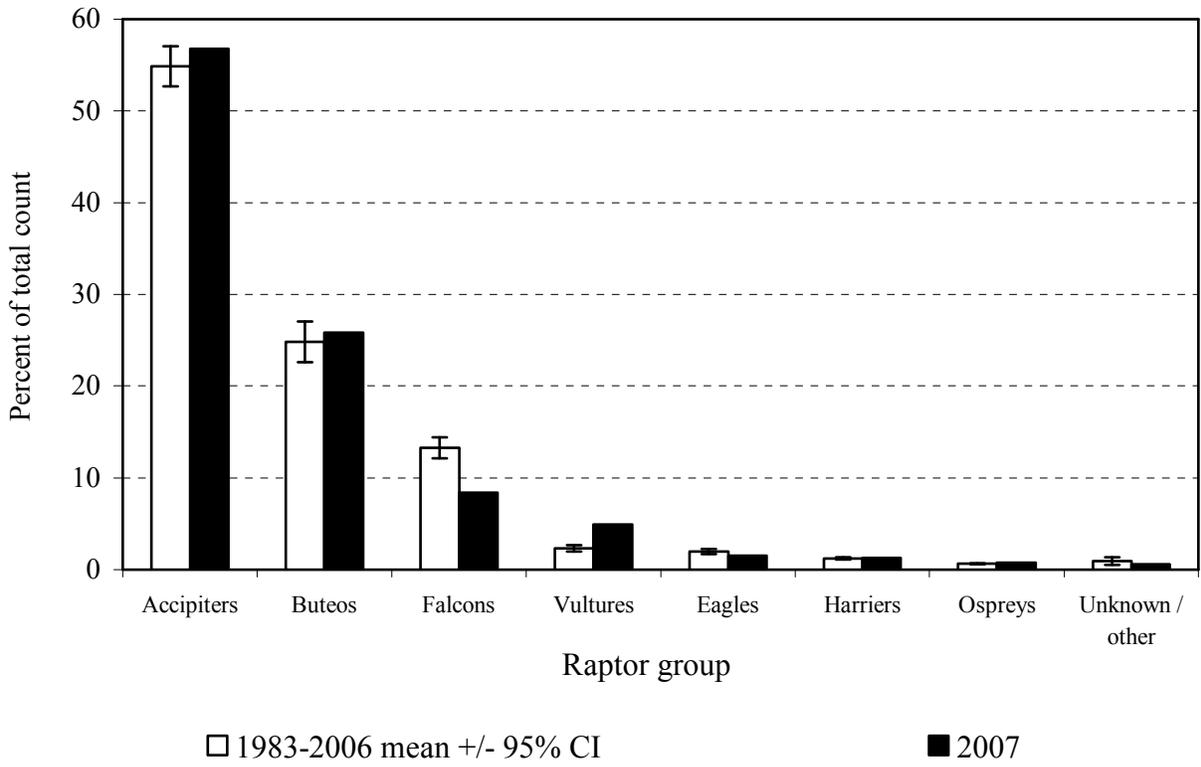


Figure 2. Fall migration flight composition by major species groups in the Goshute Mountains, Nevada: 1983–2006 versus 2007.

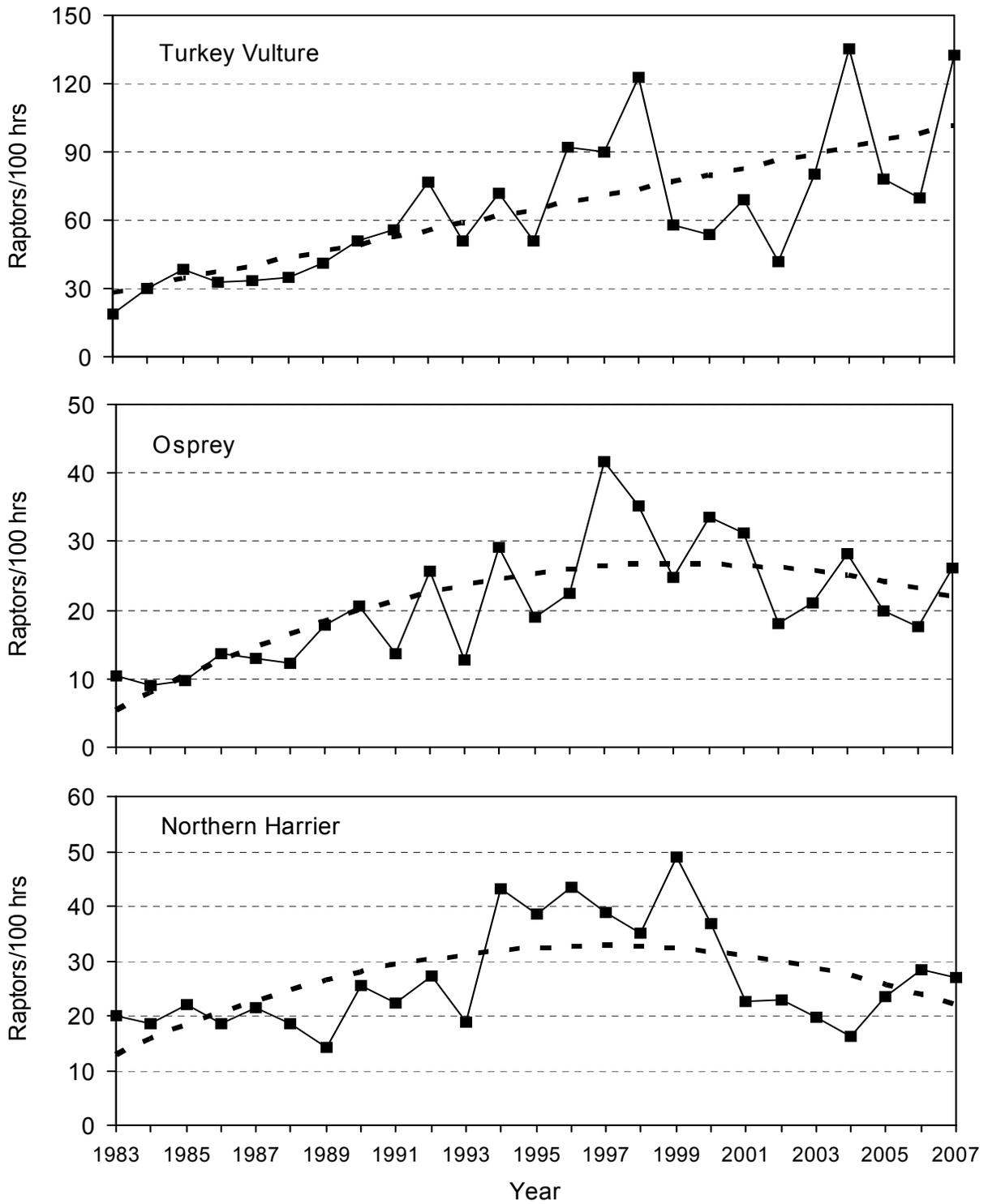


Figure 3. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for Turkey Vultures, Ospreys, and Northern Harriers: 1983–2007. Dashed lines indicate significant linear or quadratic regressions.

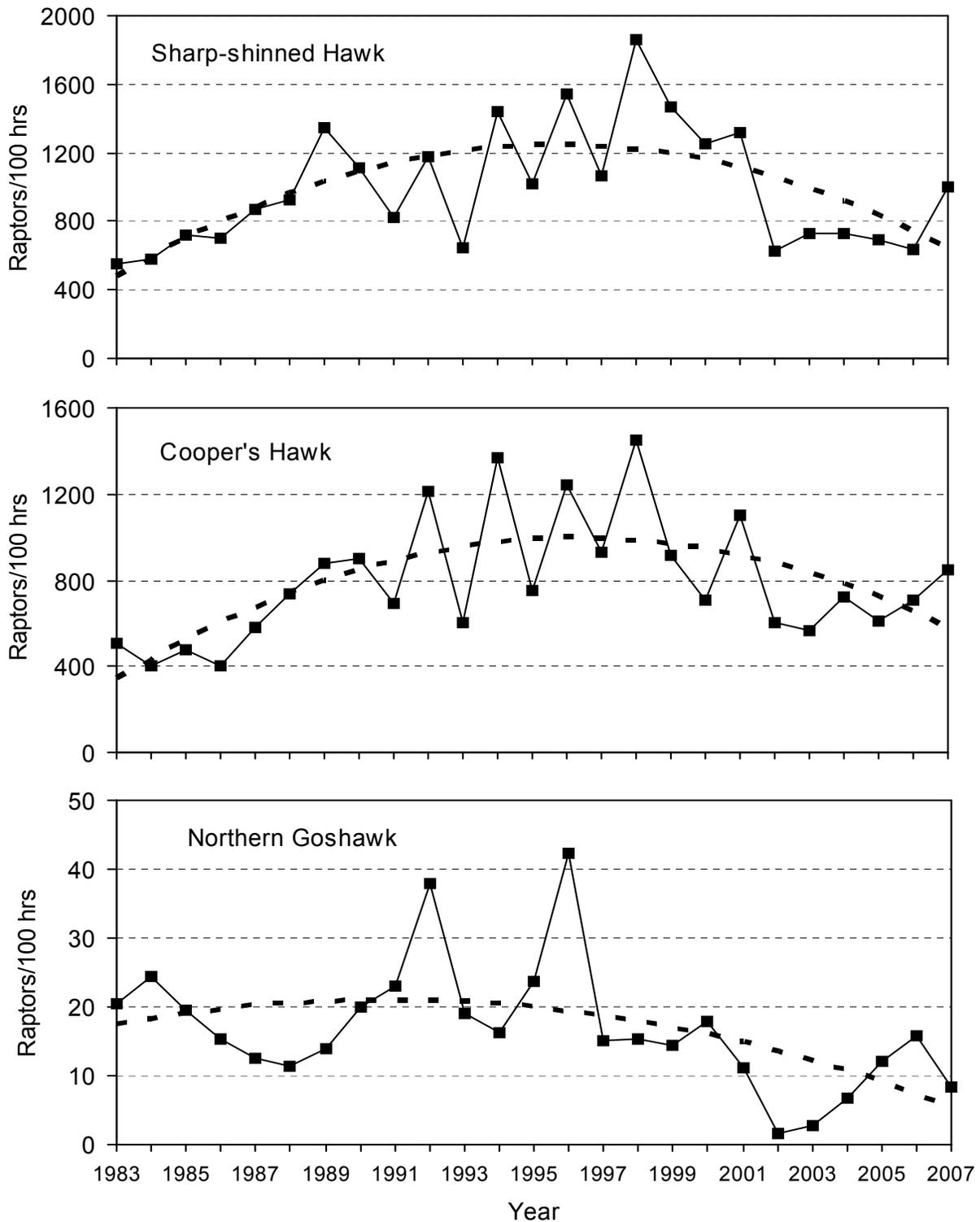


Figure 4. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks: 1983–2007. Dashed lines indicate significant linear or quadratic regressions.

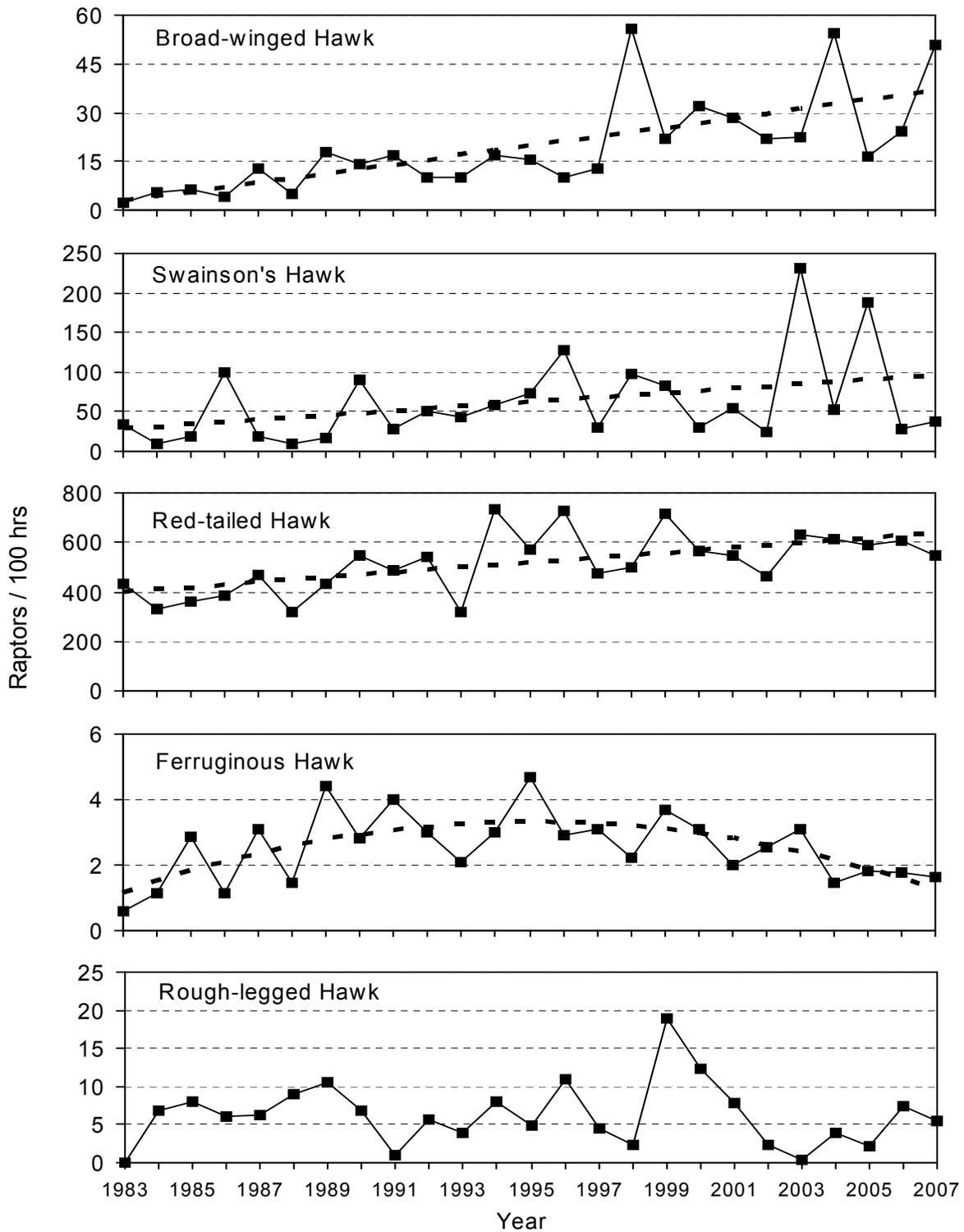


Figure 5. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for Broad-winged, Swainson's, Red-tailed, Ferruginous, and Rough-legged Hawks: 1983–2007. Dashed lines indicate significant linear or quadratic regressions.

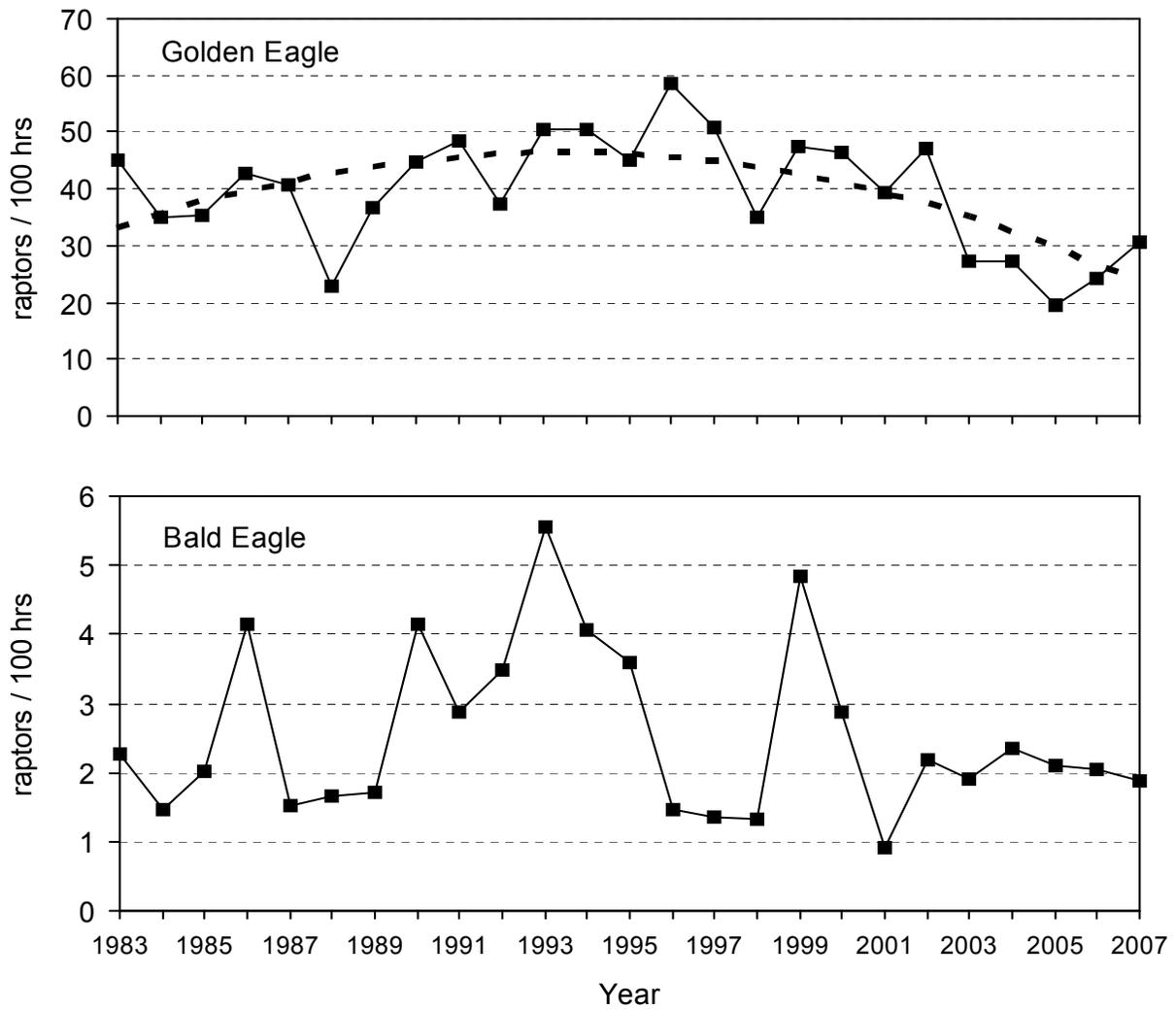


Figure 6. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for Golden and Bald Eagles: 1983–2007. Dashed lines indicate significant linear or quadratic regressions.

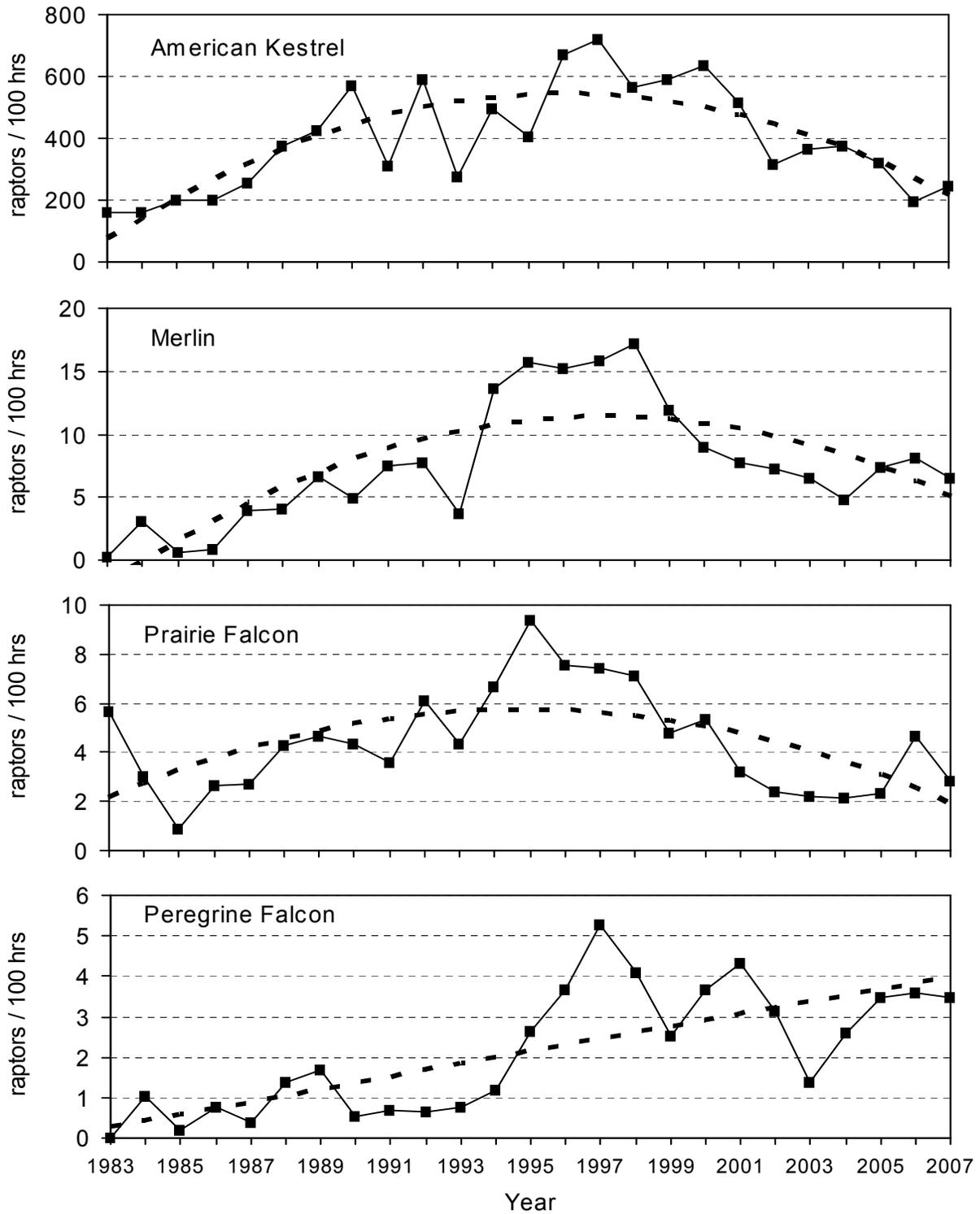


Figure 7. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons: 1983–2007. Dashed lines indicate significant linear or quadratic regressions.

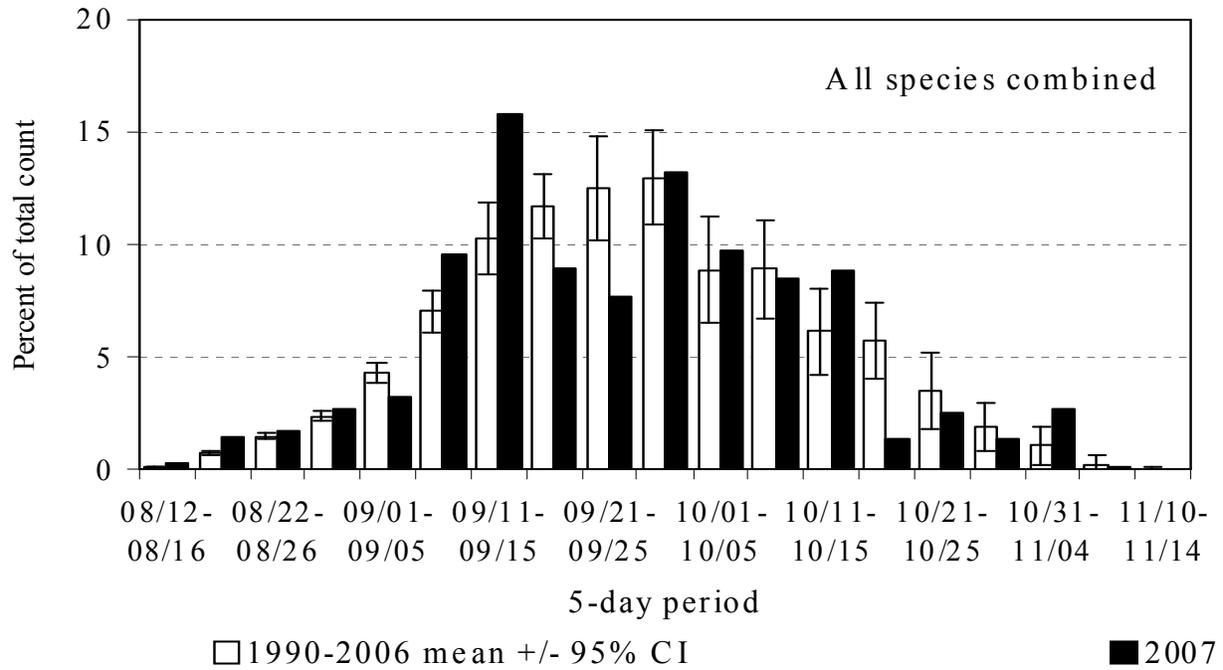


Figure 8. Combined-species passage volume by five-day periods: 1990–2005 versus 2007.

Appendix A. History of official observer participation on the Goshute Mountains Raptor Migration Project.

1983-1986: Single observer throughout with occasional scribe. Principal observers: 1983, David Sherman (0)¹; 1984, Jim Daly (0), Jeff Smith (0), and Fred Tilly (14); 1985, Jim Daly (1) and Fred Tilly (15); 1986, John Lower (0).

1987-1989: Single observer throughout, two observers during the peak month. Principal observers: 1987, Victor Fazio (2) and Fred Tilly (16); 1988, Brian Mongi (2) and Fred Tilly (17); 1989, Brian Mongi (3) and Fred Tilly (19).

1990: Two observers throughout with two teams of two for a comparison count during the peak month. 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. 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 observers 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. Jerry Liguori (14) and Mike Lanzone (0).

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

2000: Two observers throughout. Jerry Liguori (16), Jeff Maurer (3), Nathan McNett (4), and Aaron Barna (5).

2001: Two observers throughout. Jerry Liguori (17) and Nathan McNett (5).

2002: Two observers throughout. Nathan McNett (6) and Greg Levandoski (2).

2003: Four observers throughout rotating duties at two sites for comparison count. Nathan McNett (7), Adam Hutchins (4), Allison Cebula (3), Eric Hallingstad (2).

2004: Two observers throughout. Allison Cebula (4), Ricardo Perez (1+), and Nathan McNett (8).

2005: Two observers throughout. Ken McEnaney (1), Chris Jager (+), Allison Cebula (5).

2006: Two observers throughout. Christian Nunes (+), John Bell (1), and Jeremy Russell (+).

2007: Two observers throughout. Steve Seibel (5+), Greg Levandoski (4), and Adam Hutchins (5).

¹ Numbers in parentheses indicate the number of seasons of previous experience conducting migratory raptor counts (+ indicates less concentrated previous exposure).

Appendix B. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications for all migrant raptors seen in the Goshute Mountains, Nevada.

COMMON NAME	SCIENTIFIC NAME	SPECIES CODE	AGE ¹	SEX ²	COLOR 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 small accipiter	<i>A. striatus</i> or <i>cooperii</i>	SA	U	U	NA
Unknown large accipiter	<i>A. cooperii</i> or <i>gentilis</i>	LA	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	I, S, NA, A, U ⁴	U	NA
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BE	I, S1, S2, NA, A, 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 small falcon	<i>F. sparverius</i> or <i>columbarius</i>	SF	U	U	NA
Unknown large falcon	<i>F. mexicanus</i> or <i>peregrinus</i>	LF	U	U	NA
Unknown falcon	<i>Falco</i> spp.	UF	U	U	NA
Unknown raptor	Falconiformes	UU	U	U	NA

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

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

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

⁴ Golden Eagle age codes: I = Immature: juvenile or first-year bird, bold white wing patch visible below, bold white in tail, no molt; S = Subadult: white wing patch variable or absent, obvious white in tail and molt or tawny bar visible on upper wing; NA = Not adult: unknown age immature/subadult; A = Adult: no white in wings or tail; U = Unknown.

⁵ Bald Eagle age codes: I = Immature: juvenile or first-year bird, dark breast and tawny belly; S1 = young Subadult: Basic I and II plumages, light belly, upside-down triangle on back; S2 = older Subadult: Basic III plumage, head mostly white with osprey-like dark eye line and dark band on tail; NA = Not adult: unknown age immature/subadult; A = Adult: includes near adult with dark flecks in head and dark tail tip, and adult with white head and tail; U = Unknown.

Appendix C. Daily observation effort, visitor disturbance ratings, weather records, and flight summaries: 2007.

DATE	OBS. HOURS	OBSRVR / HOUR ¹	MEDIAN VISITOR DISTURB ²	PREDOMINANT WEATHER ³	WIND SPEED (KPH) ¹	WIND DIRECTION	TEMP (°C) ¹	BAROM. PRESS. (IN HG) ¹	MEDIAN THERMAL LIFT ⁴	VISIB. WEST (KM) ¹	VISIB. EAST (KM) ¹	MEDIAN FLIGHT DISTANCE ⁵ / HOUR	BIRDS / HOUR
15-Aug	8.25	1.9	0	pc-ovc		w-wnw, var	23.0		2	100	90	2	3.6
16-Aug	8.00	1.2	0	pc-ovc, AM haze		ws-w-wnw, e	22.3		3	88	75	2	2.3
17-Aug	7.50	2.1	0	pc-ovc, haze, PM rain		ws-w-w	20.8		3	62	66	3	6.4
18-Aug	8.50	3.7	0	pc-ovc, haze		w	20.3		4	58	45	2	9.1
19-Aug	8.00	2.7	0	clr-pc, haze	23.6	w	22.6	30.25	4	28	24	2	2.8
20-Aug	8.00	2.2	0	clr	12.0	ws-w-wnw	20.2	30.45	2	58	78	2	4.9
21-Aug	8.00	1.8	0	clr	5.5	ws-w-w, ne/var	20.8	30.45	1	100	100	2	3.9
22-Aug	8.25	2.1	0	pc-ovc, scat rain	10.7	wnw/var	22.4	30.26	2	89	90	2	6.4
23-Aug	9.00	4.4	0	pc-ovc	4.2	var, ne	19.9	30.26	1	94	93	2	9.1
24-Aug	8.00	2.1	0	clr-pc	6.3	sw-wnw, calm/var	20.4	30.42	1	98	97	2	6.6
25-Aug	8.00	1.5	0	clr-pc	5.1	ws-w-wnw, ne	23.6	30.42	1	90	88	2	5.3
26-Aug	5.25	2.0	0	pc-ovc, PM ts/rain	6.4	sw-wnw, ene	22.5	30.42	4	54	61	1	6.1
27-Aug	8.00	2.1	0	clr-mc, scat rain	5.0	ne/var	21.8	30.37	2	88	96	3	12.5
28-Aug	8.00	2.3	0	clr-mc	3.7	ne-e/var	21.6	30.50	2	80	100	2	13.8
29-Aug	8.00	1.7	0	pc-mc, scat ts	2.7	ne, var	24.1	30.58	2	90	88	1	8.4
30-Aug	8.00	2.0	0	clr-ovc, scat ts/rain	11.7	sw-wnw/var	22.6	30.60	3	100	85	2	5.9
31-Aug	9.50	2.0	0	clr-mc	6.9	w-wnw, ne/var	20.6	30.55	1	100	100	2	9.1
1-Sep	8.50	2.2	0	pc-mc	4.3	ws-w, var, ne	22.3	30.54	2	100	100	2	13.3
2-Sep	8.00	2.4	0	pc-ovc, PM ts/train	10.5	w, calm/var, w	22.5	30.52	3	92	96	2	11.8
3-Sep	8.00	2.2	0	clr-mc, scat ts	4.9	ws-w-nw, n-ene	23.6	30.51	2	100	100	2	13.0
4-Sep	6.75	2.2	0	pc-ovc, PM rain	20.5	ws-w-wnw	20.5	30.23	4	99	76	1	18.5
5-Sep	8.50	2.3	0	mc-ovc	4.1	ene/var	17.6	30.17	4	73	53	2	6.0
6-Sep	9.50	1.9	0	clr-mc, haze	3.0	nne-ne/var	15.9	30.39	2	44	29	1	6.8
7-Sep	10.50	2.0	0	clr, haze	11.1	ws-w-wnw	17.7	30.45	3	16	19	2	43.4
8-Sep	9.25	2.4	0	clr-pc, haze	5.0	sw-wnw, ne	18.7	30.44	2	70	66	2	47.2
9-Sep	9.50	2.1	0	clr-pc, haze	9.5	ws-w-nw	16.9	30.41	3	55	45	2	30.8
10-Sep	8.50	2.2	0	clr, AM haze	6.0	ne-ene	12.6	30.58	3	77	52	2	20.5
11-Sep	9.50	2.2	0	clr, haze	10.0	sw-wnw	16.3	30.52	3	59	34	2	28.2
12-Sep	10.00	2.1	0	clr-pc, haze	8.5	sw-wnw	19.7	30.42	2	64	60	2	39.4
13-Sep	10.60	2.4	0	pc-mc	5.3	ws-w-wnw, ene-se	20.0	30.34	3	100	96	1	28.5
14-Sep	10.17	2.7	0	clr	21.6	ws-w-wnw	18.2	30.26	4	100	98	3	73.4
15-Sep	10.90	4.0	0	ovc-clr	9.3	ws-w-wnw/var	16.2	30.34	3	90	100	2	58.9
16-Sep	10.00	2.8	0	clr-pc	7.5	ws-w-nw, ne	14.6	30.25	3	93	95	2	42.1
17-Sep	9.50	2.6	0	mc-ovc	13.7	sw-nw	13.5	30.19	4	94	85	2	13.9
18-Sep	9.83	3.0	0	clr-ovc	9.8	ws-w-wnw	11.3	30.23	3	100	100	2	19.4
19-Sep	9.00	2.0	0	pc-ovc	17.0	sw-wnw	14.1	30.01	4	90	78	2	20.4
20-Sep	10.50	2.3	0	clr	15.3	sw-w	14.6	30.19	3	93	100	2	38.3
21-Sep	9.00	3.1	0	clr-pc	7.4	w, ne	15.1	30.38	3	100	100	2	40.8
22-Sep	7.00	3.4	0	ovc, AM fog, scat rain	14.2	sw-wnw, ene	11.0	30.11	4	45	49	1	17.9
23-Sep	4.92	2.9	0	ovc, fog/snow	27.8	ws-w-w	6.8	30.00	4	70	64	3	7.7
24-Sep	9.50	2.1	0	pc	7.6	ws-w-wnw, calm/var	4.2	30.32	4	100	100	2	5.4
25-Sep	10.00	1.9	0	clr	3.5	var	6.6	30.41	1	100	100	2	57.4
26-Sep	10.25	1.9	0	clr	3.9	ne-e/var	9.4	30.49	1	100	100	3	75.5
27-Sep	9.00	2.2	0	clr-pc	3.4	var, ne-ene	12.3	30.35	2	100	100	2	42.3
28-Sep	9.67	2.5	0	pc-ovc	31.5	sw-wnw	13.0	29.94	4	99	88	2	66.1
29-Sep	8.00	2.0	0	ovc-clr, AM fog	30.3	ws-w-wnw	0.0	30.54	4	80	80	1	5.1
30-Sep	9.50	3.1	0	clr	9.2	w	7.9	30.36	3	100	98	2	14.7
1-Oct	9.50	3.0	0	mc-ovc	28.2	ws-w-wnw	8.1	30.22	4	100	68	2	36.2
2-Oct	9.50	2.4	0	clr	11.5	ws-w-w	7.2	30.40	2	100	100	1	20.0
3-Oct	10.08	2.2	0	clr-pc	27.8	ws-w-wnw	13.0	30.11	4	100	94	2	41.8

Appendix C. continued

DATE	OBS. HOURS	OBSRVR / HOUR ¹	MEDIAN VISITOR DISTURB ²	PREDOMINANT WEATHER ³	WIND SPEED (KPH) ¹	WIND DIRECTION	TEMP (°C) ¹	BAROM. PRESS. (IN HG) ¹	MEDIAN THERMAL LIFT ⁴	VISIB. WEST (KM) ¹	VISIB. EAST (KM) ¹	MEDIAN FLIGHT DISTANCE ⁵	BIRDS / HOUR
4-Oct	10.00	2.4	0	clr-ovc	11.7	sw-w	10.8	29.86	3	100	96	2	50.7
5-Oct	0.00			Weather Day									
6-Oct	2.67	2.4	0	mc-pc, scat snow	24.8	sw-wnw	-2.0	30.17	4	100	65	2	11.6
7-Oct	10.00	2.0	0	clr-pc	5.9	nw/var, w	2.2	30.34	3	100	100	2	37.0
8-Oct	9.50	3.7	0	clr-pc	9.7	sw-nw	9.3	30.36	3	100	100	1	34.5
9-Oct	9.50	2.3	0	clr	9.9	ssw-w	12.3	30.31	4	100	100	1	33.2
10-Oct	9.00	2.7	0	clr-pc	30.0	wsw-nw	10.0	30.12	4	73	68	2	24.7
11-Oct	9.00	2.1	0	clr-pc	6.4	e, w-wnw	8.0	30.22	3	75	75	2	25.1
12-Oct	9.17	2.3	0	ovc, scat snow	21.8	sw-w	7.2	29.93	4	54	54	2	32.2
13-Oct	9.00	2.9	0	ovc-mc, snow	4.8	var	6.5	30.07	4	60	42	1	5.7
14-Oct	9.50	2.3	0	clr-mc	2.2	ne-e	7.7	30.26	1	100	93	2	33.4
15-Oct	9.25	2.1	0	clr-mc	6.5	wsw-wnw, var	9.0	30.10	3	100	100	2	47.6
16-Oct	5.50	1.5	0	ovc, snow	7.9	sw-wnw	7.9	29.76	4	46	63	1	4.7
17-Oct	4.50	1.6	0	ovc, snow	24.0	wsw-wnw	0.8	29.83	4	43	32	1	2.7
18-Oct	9.25	2.0	0	pc-ovc, scat fog/snow	17.5	w	2.5	30.19	4	71	62	1	2.7
19-Oct	9.33	2.0	0	clr-pc	27.2	w-wnw	9.8	30.18	4	100	100	2	15.5
20-Oct	2.92	1.0	0	mc-ovc	36.2	w	2.0	29.91	4	48	68	-	0.0
21-Oct	8.50	2.0	0	clr-pc	4.5	nne-ne/var	-0.1	30.52	3	100	100	2	1.1
22-Oct	8.83	1.7	0	clr	7.2	ne, wsw	5.6	30.79	2	98	91	2	18.0
23-Oct	8.50	2.1	0	clr	4.8	e/calm/var	10.0	30.83	2	100	100	2	13.1
24-Oct	8.75	1.8	0	clr	12.4	sw-w	13.4	30.62	2	88	96	1	3.4
25-Oct	8.50	1.9	0	clr-pc	13.3	wsw-wnw	13.5	30.35	2	90	90	1	8.1
26-Oct	8.83	2.2	0	clr, PM haze	2.3	wsw-wnw/var	8.4	30.34	3	86	80	1	3.5
27-Oct	8.50	2.3	0	ovc, haze	7.0	wsw-wnw	11.8	30.55	4	31	27	1	2.9
28-Oct	8.75	2.1	0	clr-ovc, haze	4.2	w-nw	12.7	30.66	3	74	72	1	4.6
29-Oct	9.00	2.5	0	clr, ovc	11.9	wsw-nw	11.3	30.45	3	100	100	2	11.2
30-Oct	8.50	1.8	0	mc-ovc, AM fog, PM rain/snow	13.7	wsw-nw	6.6	30.27	4	92	62	1	1.8
31-Oct	8.50	1.9	0	clr	0.8	ne/calm/var	3.6	30.46	3	100	92	1	11.9
1-Nov	9.75	2.1	0	clr-pc	10.7	wsw-wnw	5.8	30.35	3	100	100	2	11.5
2-Nov	8.25	2.3	0	clr-pc	4.3	nne, calm, sw-w	5.6	30.48	2	100	93	1	7.3
3-Nov	8.25	2.4	0	clr-pc	4.2	calm/var, w-wnw	7.9	30.60	2	100	88	2	12.0
4-Nov	8.00	2.0	0	clr	12.0	w-wnw	9.6	30.49	3	100	98	1	4.4
5-Nov	6.33	1.9	0	clr	0.9	var	10.3	30.48	2	100	100	2	2.8

¹ Average of hourly records.

² Median hourly visitor-disturbance rating (subjective assessment by observers): 0 = none, 1 = low, 2 = moderate, 3 = high.

³ Predominant sky condition during day: clr = clear (0-15% cloud cover); pc = partly cloudy (16-50% cover); mc = mostly cloudy (51-75% cover); ovc = overcast (76-100% cover); ts = thunderstorms.

⁴ Median hourly rating concerning prevalence of lift-generating thermals, based on subjective assessments of solar intensity, wind speeds, and migrant behavior: 1 = excellent, 2 = good, 3 = fair, 4 = poor.

⁵ Median hourly rating concerning line-of-sight distance of flight from observation site: 1 = close, detection and identification possible with naked eye; 2 = moderate, detection possible with naked eye, but binoculars needed for identification; 3 = far, binoculars needed for both detection and identification; 4 = distant, birds detected and identified only with excellent binoculars or spotting scope and by experienced observers.

Appendix D. Daily unadjusted raptor counts by species: 2007.

DATE	HOURS	SPECIES ¹																								BIRDS				
		TV	OS	NH	SS	CH	NG	SA	LA	UA	RS	BW	SW	RT	FH	RL	UB	GE	BE	UE	AK	ML	PR	PG	SF	LF	UF	UU	TOTAL	/HOUR
15-Aug	8.25	1	0	3	2	3	0	1	0	0	0	0	1	7	0	0	0	1	0	0	11	0	0	0	0	0	0	0	30	3.6
16-Aug	8.00	0	0	1	2	2	0	0	0	0	0	0	3	7	0	0	0	1	0	0	2	0	0	0	0	0	0	18	2.3	
17-Aug	7.50	1	0	1	0	5	1	0	0	0	0	0	2	29	0	0	0	4	0	0	4	0	1	0	0	0	0	48	6.4	
18-Aug	8.50	3	1	12	2	9	0	0	0	0	0	0	9	28	0	0	0	0	0	0	13	0	0	0	0	0	0	77	9.1	
19-Aug	8.00	0	0	2	0	2	0	0	0	0	0	0	1	9	0	0	0	4	0	0	4	0	0	0	0	0	0	22	2.8	
20-Aug	8.00	1	0	1	2	6	0	4	0	0	0	0	1	9	0	0	0	3	0	0	12	0	0	0	0	0	0	39	4.9	
21-Aug	8.00	1	0	2	0	1	1	3	0	0	0	0	1	11	0	0	0	1	0	0	8	0	0	0	0	0	2	31	3.9	
22-Aug	8.25	0	1	4	4	13	0	1	0	0	0	0	0	18	1	0	0	2	0	0	9	0	0	0	0	0	0	53	6.4	
23-Aug	9.00	2	1	3	4	20	0	0	0	0	0	0	5	38	0	0	1	3	0	0	1	0	0	0	0	0	4	82	9.1	
24-Aug	8.00	1	0	6	3	3	0	1	0	0	0	0	4	24	0	0	2	1	0	0	5	0	0	0	0	0	3	53	6.6	
25-Aug	8.00	1	1	3	0	6	1	1	0	0	0	0	3	22	0	0	1	0	0	0	3	0	0	0	0	0	0	42	5.3	
26-Aug	5.25	1	0	1	3	9	0	0	0	0	0	0	0	12	0	0	0	1	0	0	4	0	0	0	0	0	1	32	6.1	
27-Aug	8.00	1	2	6	0	14	1	0	0	0	0	0	14	41	0	0	2	1	0	0	18	0	0	0	0	0	0	100	12.5	
28-Aug	8.00	4	1	6	6	2	1	4	0	0	0	0	9	22	0	0	1	6	0	0	46	0	0	0	0	0	2	110	13.8	
29-Aug	8.00	0	0	1	8	14	0	2	0	0	0	0	5	19	0	0	2	1	0	0	14	0	0	1	0	0	0	67	8.4	
30-Aug	8.00	0	0	4	1	10	0	3	0	0	0	0	2	26	0	0	0	1	0	0	0	0	0	0	0	0	0	47	5.9	
31-Aug	9.50	4	2	3	8	10	0	3	0	0	0	0	9	32	2	0	0	1	0	0	10	0	0	0	0	0	2	86	9.1	
01-Sep	8.50	1	1	2	15	18	0	2	0	0	0	0	2	39	1	0	1	1	0	0	25	0	0	1	0	0	4	113	13.3	
02-Sep	8.00	2	1	3	27	14	1	1	0	0	0	0	7	11	0	0	2	5	0	0	18	0	1	0	0	0	1	94	11.8	
03-Sep	8.00	2	1	2	32	24	0	2	0	0	0	0	0	11	0	0	2	4	0	0	19	0	1	0	0	0	4	104	13.0	
04-Sep	6.75	0	3	2	44	37	1	3	0	0	0	0	1	11	0	0	0	1	0	0	21	0	0	0	0	0	1	125	18.5	
05-Sep	8.50	0	3	1	13	12	0	5	0	0	0	0	2	7	0	0	2	0	0	0	6	0	0	0	0	0	0	51	6.0	
06-Sep	9.50	1	0	1	22	12	0	1	0	0	0	0	5	7	0	0	0	2	0	0	14	0	0	0	0	0	0	65	6.8	
07-Sep	10.50	2	1	3	94	93	0	16	0	0	0	0	7	53	0	0	2	2	1	0	173	0	2	1	0	0	6	456	43.4	
08-Sep	9.25	16	12	2	131	101	0	38	0	0	0	0	5	65	0	0	2	1	0	0	62	1	0	0	0	0	1	437	47.2	
09-Sep	9.50	9	2	1	96	92	0	13	0	0	0	0	3	49	0	0	0	3	0	0	22	2	0	0	0	0	1	293	30.8	
10-Sep	8.50	3	0	3	40	47	1	9	0	0	0	1	3	57	2	0	1	2	0	0	3	0	0	0	0	0	2	174	20.5	
11-Sep	9.50	4	1	2	99	80	0	23	0	0	0	1	4	38	0	0	0	1	0	0	14	0	0	1	0	0	0	268	28.2	
12-Sep	10.00	12	3	1	141	111	1	14	0	0	0	4	2	50	0	0	2	7	0	0	46	0	0	0	0	0	0	394	39.4	
13-Sep	10.60	6	4	3	132	85	1	5	0	0	0	1	2	45	0	0	0	4	0	0	11	0	0	2	0	0	1	302	28.5	
14-Sep	10.17	20	4	4	182	298	0	2	0	0	0	1	13	48	0	0	1	5	0	0	164	1	2	0	0	0	1	746	73.4	

Appendix D. continued

DATE	HOURS	SPECIES ¹																							BIRDS				
		TV	OS	NH	SS	CH	NG	SA	LA	UA	RS	BW	SW	RT	FH	RL	UB	GE	BE	UE	AK	ML	PR	PG	SF	LF	UF	UU	TOTAL
15-Sep	10.90	40	5	11	213	190	0	9	0	0	5	2	50	0	0	0	2	0	0	106	2	1	1	0	0	0	5	642	58.9
16-Sep	10.00	3	3	7	190	131	0	11	0	0	5	0	15	0	0	0	2	0	0	53	1	0	0	0	0	0	421	42.1	
17-Sep	9.50	3	0	2	35	53	0	1	0	0	3	0	29	0	0	0	0	0	0	6	0	0	0	0	0	0	132	13.9	
18-Sep	9.83	17	1	3	53	51	0	4	0	0	4	7	38	0	0	0	2	0	0	10	0	1	0	0	0	0	191	19.4	
19-Sep	9.00	13	5	3	62	56	0	1	0	0	0	4	34	0	0	0	0	0	0	5	0	0	0	1	0	0	184	20.4	
20-Sep	10.50	79	14	5	97	114	0	0	0	0	4	5	43	0	0	0	1	0	0	35	0	0	2	0	0	3	402	38.3	
21-Sep	9.00	16	9	12	118	133	0	5	0	0	4	6	27	0	0	0	1	0	0	33	0	0	1	0	0	2	367	40.8	
22-Sep	7.00	1	3	1	70	33	0	1	0	0	1	1	11	0	0	0	1	0	0	0	0	0	1	0	0	1	125	17.9	
23-Sep	4.92	1	1	0	5	16	1	3	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	1	38	7.7	
24-Sep	9.50	15	0	3	7	12	0	3	0	0	0	0	8	1	0	1	0	0	0	1	0	0	0	0	0	0	51	5.4	
25-Sep	10.00	169	3	3	114	100	0	5	0	0	16	3	139	0	0	2	0	0	0	19	0	0	0	0	0	1	574	57.4	
26-Sep	10.25	43	4	2	190	207	2	33	0	0	41	4	195	2	0	7	6	0	0	23	1	1	1	0	0	1	11	774	75.5
27-Sep	9.00	2	1	3	147	110	1	18	0	0	10	1	61	0	0	1	2	0	0	19	0	0	1	0	0	4	381	42.3	
28-Sep	9.67	24	6	0	158	190	0	8	0	1	0	9	2	221	0	0	0	3	0	0	16	0	0	0	0	0	1	639	66.1
29-Sep	8.00	26	0	0	1	3	0	1	0	0	0	0	7	0	0	1	2	0	0	0	0	0	0	0	0	0	41	5.1	
30-Sep	9.50	9	1	2	42	19	1	3	0	0	0	0	57	0	0	0	1	0	0	3	0	0	1	0	0	1	140	14.7	
01-Oct	9.50	34	1	5	98	109	2	11	0	0	0	0	64	0	0	2	4	0	0	4	1	0	1	2	0	6	344	36.2	
02-Oct	9.50	25	1	0	81	40	0	3	0	0	3	0	29	0	0	0	0	0	0	7	0	1	0	0	0	0	190	20.0	
03-Oct	10.08	42	3	2	120	155	3	4	0	0	2	1	61	0	0	0	6	0	0	14	2	2	0	0	0	4	421	41.8	
04-Oct	10.00	13	2	3	256	146	2	1	0	0	1	2	58	0	0	0	4	0	0	16	1	2	0	0	0	0	507	50.7	
05-Oct	0.00																												
06-Oct	2.67	0	0	0	0	0	0	0	0	0	0	0	28	0	0	0	3	0	0	0	0	0	0	0	0	0	31	11.6	
07-Oct	10.00	26	1	2	27	14	0	3	1	0	6	0	286	0	0	0	1	0	0	2	0	0	1	0	0	0	370	37.0	
08-Oct	9.50	0	0	2	184	66	1	5	0	0	0	0	59	0	0	0	3	0	0	6	2	0	0	0	0	0	328	34.5	
09-Oct	9.50	3	1	3	185	77	1	11	0	0	0	0	20	0	0	0	6	0	0	7	0	0	0	0	0	1	315	33.2	
10-Oct	9.00	4	0	3	103	53	0	22	0	1	0	0	23	1	0	1	3	0	0	6	0	0	1	0	0	1	222	24.7	
11-Oct	9.00	3	0	2	116	36	2	10	0	0	0	0	43	0	0	0	1	0	0	7	3	0	0	0	1	2	226	25.1	
12-Oct	9.17	0	0	2	174	45	1	7	0	0	0	0	56	0	0	1	4	0	0	1	4	0	0	0	0	0	295	32.2	
13-Oct	9.00	15	0	0	10	4	0	3	0	0	0	0	13	0	0	1	4	0	0	1	0	0	0	0	0	0	51	5.7	
14-Oct	9.50	10	0	3	80	37	0	5	0	1	0	0	166	0	0	2	7	2	0	2	1	0	0	0	1	0	317	33.4	
15-Oct	9.25	0	0	3	202	22	2	2	0	0	0	0	193	0	1	1	7	0	0	4	2	0	1	0	0	0	440	47.6	

Appendix D. continued

DATE	HOURS	SPECIES ¹																								BIRDS				
		TV	OS	NH	SS	CH	NG	SA	LA	UA	RS	BW	SW	RT	FH	RL	UB	GE	BE	UE	AK	ML	PR	PG	SF	LF	UF	UU	TOTAL	/HOUR
16-Oct	5.50	0	0	0	14	5	0	4	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	26	4.7
17-Oct	4.50	0	0	1	4	1	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	12	2.7	
18-Oct	9.25	0	0	0	12	1	0	0	0	0	0	0	9	0	0	0	2	0	0	0	1	0	0	0	0	0	25	2.7		
19-Oct	9.33	0	0	0	78	24	2	1	0	0	0	0	25	0	0	0	11	0	0	1	2	1	0	0	0	0	145	15.5		
20-Oct	2.92	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
21-Oct	8.50	0	0	0	1	0	0	0	0	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	9	1.1		
22-Oct	8.83	0	0	0	23	6	1	0	0	0	0	0	123	1	0	0	3	0	0	1	1	0	0	0	0	0	159	18.0		
23-Oct	8.50	0	0	0	48	0	1	3	0	1	0	0	51	0	0	0	3	0	0	0	0	0	0	0	0	4	111	13.1		
24-Oct	8.75	0	0	0	8	1	1	0	0	0	0	0	18	0	1	0	1	0	0	0	0	0	0	0	0	0	30	3.4		
25-Oct	8.50	0	1	2	37	2	1	0	0	0	0	0	19	0	1	0	2	0	0	1	2	1	0	0	0	0	69	8.1		
26-Oct	8.83	0	0	0	19	2	0	0	0	0	0	0	7	0	1	0	1	0	0	1	0	0	0	0	0	0	31	3.5		
27-Oct	8.50	0	0	1	12	0	0	0	0	0	0	0	10	0	1	0	0	0	0	0	1	0	0	0	0	0	25	2.9		
28-Oct	8.75	0	0	1	14	0	1	0	0	0	0	0	21	0	0	0	2	0	0	1	0	0	0	0	0	0	40	4.6		
29-Oct	9.00	0	2	5	53	2	2	0	0	0	0	0	24	0	1	0	8	0	0	1	2	1	0	0	0	0	101	11.2		
30-Oct	8.50	0	0	0	2	0	2	0	0	0	0	0	7	0	2	0	2	0	0	0	0	0	0	0	0	0	15	1.8		
31-Oct	8.50	0	0	0	8	1	2	0	0	0	0	0	85	0	0	0	5	0	0	0	0	0	0	0	0	0	101	11.9		
01-Nov	9.75	0	0	0	14	2	1	2	0	0	0	0	83	0	1	0	7	0	0	0	1	1	0	0	0	0	112	11.5		
02-Nov	8.25	0	0	0	11	0	2	0	0	0	0	0	35	0	2	0	9	1	0	0	0	0	0	0	0	0	60	7.3		
03-Nov	8.25	0	0	0	15	0	5	0	0	0	0	0	67	0	1	0	5	4	0	0	0	0	0	0	0	2	99	12.0		
04-Nov	8.00	0	0	0	7	0	4	0	0	0	0	0	17	0	0	0	5	2	0	0	0	0	0	0	0	0	35	4.4		
05-Nov	6.33	0	0	0	4	0	1	0	0	0	0	0	7	0	0	0	6	0	0	0	0	0	0	0	0	0	18	2.8		
Total	703.00	735	113	186	4,635	3,422	55	360	1	5	0	122	163	3,511	11	13	44	218	10	0	1,174	34	19	18	3	1	2	86	14,941	21.3

¹ See Appendix B for explanation of species codes.

Appendix E. Annual summaries of observation effort and unadjusted raptor counts by species: 1983–2007.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
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
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
Observation days	68	83	76	67	66	85	76	78	79	85	80	78	83
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
Raptors / 100 hours	1,517	1,130	1,427	1435	1,921	1,704	2,397	2,527	1,879	2,703	1,510	3,122	2,276
SPECIES	RAPTOR COUNTS												
Turkey Vulture	92	141	211	131	165	198	200	278	314	473	270	418	289
Osprey	41	39	40	43	51	54	65	80	62	119	54	130	92
Northern Harrier	109	105	139	89	120	125	77	147	152	184	116	291	252
Sharp-shinned Hawk	2,021	2,067	3,177	2,233	3,537	4,405	5,404	3,994	3,677	5,931	2,838	6,835	4,752
Cooper's Hawk	1,698	1,378	1,741	1,149	2,042	3,012	3,074	2,945	2,728	5,071	2,298	5,576	3,252
Northern Goshawk	105	146	119	65	65	74	80	84	144	259	120	106	150
Unknown small accipiter ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown large accipiter ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown accipiter	562	362	311	251	710	295	204	402	647	639	348	522	416
TOTAL ACCIPITERS	4,386	3,953	5,348	3,698	6,354	7,786	8,762	7,425	7,196	11,900	5,604	13,039	8,570
Red-shouldered Hawk	0	0	0	1	1	0	0	1	0	0	0	0	0
Broad-winged Hawk	6	13	15	7	30	16	37	34	44	26	27	41	40
Swainson's Hawk	116	34	78	276	69	43	60	238	105	208	159	244	287
Red-tailed Hawk	2,105	1,765	2,132	1,663	2,317	2,048	2,263	3,147	2,992	3,489	1,827	4,663	3,572
Ferruginous Hawk	3	6	17	5	15	9	23	21	27	19	15	20	29
Rough-legged Hawk	0	17	17	10	9	23	21	13	4	13	7	17	11
Unidentified buteo	185	74	65	42	156	44	47	33	149	70	128	110	69
TOTAL BUTEOS	2,415	1,909	2,324	2,004	2,597	2,183	2,451	3,487	3,321	3,825	2,163	5,095	4,008
Golden Eagle	239	206	230	196	221	154	203	275	334	263	317	338	299
Bald Eagle	8	10	9	13	7	8	9	19	16	21	26	19	17
Unidentified eagle	2	0	0	1	0	0	0	1	5	1	1	1	1
TOTAL EAGLES	249	216	239	210	228	162	212	295	355	285	344	358	317
American Kestrel	731	697	934	708	1,099	1,844	1,669	2,279	1,562	2,982	1,234	2,461	1,964
Merlin	4	14	3	3	17	20	33	28	37	43	19	72	86
Prairie Falcon	31	16	5	11	15	27	24	12	20	40	26	45	58
Peregrine Falcon	0	5	1	3	2	8	9	2	6	4	4	7	15
Unknown small falcon ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown large falcon ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
Unidentified falcon	6	7	2	8	6	7	5	12	14	4	6	9	18
TOTAL FALCONS	772	739	945	733	1,139	1,906	1,740	2,333	1,639	3,073	1,289	2,594	2,141
Unidentified raptor	446	113	94	53	186	107	96	101	192	234	117	229	149
GRAND TOTAL	8,510	7,215	9,340	6,961	10,840	12,521	13,603	14,146	13,231	20,093	9,957	22,154	15,818

¹ Designations used consistently beginning in 2002.

Appendix E. continued

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	MEAN
Start Date	15-Aug	14-Aug											
End Date	4-Nov	5-Nov	31-Oct	5-Nov	3-Nov								
Observation days	74	79	71	82	78	83	81	79	76	83	82	82	78
Observation hours	620.17	673.58	719.50	748.08	681.50	787.30	725.67	688.21	642.75	695.30	652.58	703.00	669.02
Raptors / 100 hours	3,514	2,541	3,515	3,003	2,542	2,662	1,564	2,001	2,038	1,849	1,658	2,125	2,158
Turkey Vulture	486	482	732	349	297	441	243	466	685	445	355	735	356
Osprey	99	187	176	110	152	152	83	96	120	83	68	113	92
Northern Harrier	255	255	247	356	233	178	154	127	96	153	177	186	173
Sharp-shinned Hawk	6,773	4,677	9,598	7,236	6,071	7,429	3,009	3,460	3,073	2,973	2,745	4,635	4,502
Cooper's Hawk	5,075	3,848	6,736	3,689	3,022	5,110	2,369	2,281	2,736	2,260	2,541	3,422	3,162
Northern Goshawk	241	97	99	84	123	80	11	16	41	74	95	55	101
Unknown small accipiter ¹	-	-	-	-	-	-	246	268	299	521	57	360	292
Unknown large accipiter ¹	-	-	-	-	-	-	4	3	11	32	6	1	10
Unknown accipiter	464	368	75	132	87	56	7	0	8	37	9	5	277
TOTAL ACCIPITERS	12,553	8,990	16,508	11,141	9,303	12,675	5,646	6,028	6,168	5,897	5,453	8,478	8,114
Red-shouldered Hawk	2	0	0	0	1	0	0	0	0	0	0	0	0.2
Broad-winged Hawk	27	37	160	59	87	79	58	58	122	36	57	122	50
Swainson's Hawk	498	143	507	334	132	251	91	908	197	664	109	163	237
Red-tailed Hawk	3,990	2,922	3,329	5,137	3,446	3,926	3,008	3,903	3,589	3,678	3,492	3,511	3,117
Ferruginous Hawk	16	18	16	25	19	14	20	20	8	12	10	11	16
Rough-legged Hawk	17	10	6	50	24	23	6	1	7	6	17	13	14
Unidentified buteo	62	77	5	24	21	13	42	57	117	97	13	44	70
TOTAL BUTEOS	4,612	3,207	4,023	5,629	3,730	4,306	3,225	4,947	4,040	4,493	3,698	3,864	3,502
Golden Eagle	344	329	235	341	305	295	330	181	160	130	152	218	252
Bald Eagle	6	6	6	31	14	8	12	9	12	11	9	10	13
Unidentified eagle	1	0	0	0	0	0	0	0	4	0	0	0	1
TOTAL EAGLES	351	335	241	372	319	303	342	190	176	141	161	228	265
American Kestrel	3,199	3,394	3,169	2,887	3,149	2,774	1,503	1,768	1,709	1,468	820	1,174	1,887
Merlin	71	78	91	59	49	51	39	33	22	40	40	34	39
Prairie Falcon	44	48	50	30	37	23	12	14	11	9	26	19	26
Peregrine Falcon	21	29	26	14	21	29	15	9	11	14	17	18	12
Unknown small falcon ¹	-	-	-	-	-	-	0	10	9	1	2	3	4
Unknown large falcon ¹	-	-	-	-	-	-	4	1	3	6	2	1	3
Unidentified falcon	21	7	2	7	3	2	2	2	0	4	0	2	6
TOTAL FALCONS	3,356	3,556	3,338	2,997	3,259	2,879	1,575	1,837	1,765	1,542	907	1,251	1,972
Unidentified raptor	83	102	25	57	34	26	81	79	51	104	3	86	114
GRAND TOTAL	21,795	17,114	25,290	21,011	17,327	20,960	11,349	13,770	13,101	12,858	10,822	14,941	14,589

¹ Designations used consistently beginning in 2002.

Appendix F. Daily trapping effort and captures by species: 2007.

DATE	STATION	SPECIES ¹													CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	RL	GE	AK	ML	PR	PG	TOTAL	/STN HR
20-Aug	2.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
21-Aug	7.50	0	1	0	1	0	0	0	0	0	0	0	0	0	2	0.3
22-Aug	8.00	0	5	1	0	0	0	2	0	0	0	0	0	0	8	1.0
23-Aug	7.00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
24-Aug	5.75	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.2
25-Aug	9.00	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
26-Aug	5.00	0	1	1	0	0	0	0	0	0	0	0	0	0	2	0.4
27-Aug	0.00															
28-Aug	0.00															
29-Aug	6.50	0	0	2	0	0	0	1	0	0	1	0	0	0	4	0.6
30-Aug	7.50	0	3	1	0	0	0	0	0	0	0	0	0	0	4	0.5
31-Aug	8.50	0	3	2	0	0	0	2	0	0	0	0	0	0	7	0.8
1-Sep	8.00	0	6	1	0	0	0	0	0	0	0	0	0	0	7	0.9
2-Sep	7.50	0	4	1	0	0	0	1	0	0	1	0	0	0	7	0.9
3-Sep	6.00	0	4	3	0	0	0	0	0	0	0	0	0	0	7	1.2
4-Sep	5.50	0	13	0	0	0	0	1	0	0	0	0	0	0	14	2.5
5-Sep	7.25	0	5	2	0	0	0	1	0	0	0	0	0	0	8	1.1
6-Sep	8.00	0	8	0	0	0	0	3	0	0	1	0	0	0	12	1.5
7-Sep	8.50	0	16	14	1	0	0	1	0	0	3	0	1	0	36	4.2
8-Sep	7.50	0	8	8	1	0	0	1	0	0	2	0	0	0	20	2.7
9-Sep	7.50	0	13	6	1	0	0	0	0	0	3	1	0	0	24	3.2
10-Sep	8.00	0	1	14	0	0	0	2	0	0	0	0	0	0	17	2.1
11-Sep	15.25	0	32	15	0	0	0	2	0	0	1	0	0	0	50	3.3
12-Sep	7.75	0	21	12	0	0	0	1	0	0	0	0	0	0	34	4.4
13-Sep	8.25	2	17	14	0	0	0	0	0	0	0	0	0	0	33	4.0
14-Sep	7.75	0	12	14	0	0	0	1	0	0	1	0	0	0	28	3.6
15-Sep	8.25	0	26	14	0	0	0	1	0	0	0	0	0	0	41	5.0
16-Sep	8.00	1	23	11	1	0	0	0	0	0	0	0	0	0	36	4.5
17-Sep	6.75	0	9	5	0	0	0	0	0	0	0	0	0	0	14	2.1
18-Sep	16.00	0	12	15	1	0	0	0	0	0	0	0	0	0	28	1.8
19-Sep	14.00	0	11	20	0	0	0	0	0	0	0	0	0	0	31	2.2
20-Sep	15.50	0	38	18	0	0	0	2	0	0	0	0	0	0	58	3.7
21-Sep	8.50	1	15	16	0	0	0	0	0	0	1	0	0	0	33	3.9
22-Sep	6.00	0	11	3	0	0	0	0	0	0	0	0	0	0	14	2.3
23-Sep	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
24-Sep	8.00	0	2	1	1	0	0	0	0	0	0	0	0	0	4	0.5
25-Sep	8.25	0	15	13	0	1	0	0	0	0	1	1	0	0	31	3.8
26-Sep	15.75	0	35	31	1	0	0	2	0	0	0	0	0	0	69	4.4
27-Sep	7.75	1	17	12	0	0	0	0	0	0	0	0	0	0	30	3.9
28-Sep	7.50	0	9	3	2	1	0	0	0	0	0	0	0	0	15	2.0
29-Sep	4.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
30-Sep	14.75	1	16	7	1	0	0	0	0	0	1	0	0	0	26	1.8

Appendix F. continued

DATE	STATION	SPECIES ¹													CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	RL	GE	AK	ML	PR	PG	TOTAL	/STN HR
1-Oct	15.75	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
2-Oct	22.00	0	45	13	0	0	0	1	0	0	0	0	0	0	59	2.7
3-Oct	16.50	0	6	4	0	0	0	2	0	0	0	1	1	0	14	0.8
4-Oct	18.50	0	60	33	3	0	0	1	0	0	0	0	0	0	97	5.2
5-Oct	5.50	0	2	1	0	0	0	0	0	0	0	0	0	0	3	0.5
6-Oct	0.00															
7-Oct	15.75	0	4	8	0	0	0	2	0	0	0	0	0	0	14	0.9
8-Oct	7.50	0	14	6	1	0	0	0	0	0	0	1	0	0	22	2.9
9-Oct	7.50	0	27	10	2	0	0	0	0	0	0	0	0	0	39	5.2
10-Oct	7.75	0	11	3	0	0	0	0	0	0	0	1	0	0	15	1.9
11-Oct	7.50	0	20	5	0	0	0	0	0	0	1	0	0	0	26	3.5
12-Oct	7.50	0	32	3	0	0	0	2	0	0	0	0	0	0	37	4.9
13-Oct	4.50	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0.7
14-Oct	8.00	0	4	4	0	0	0	0	0	0	0	0	0	0	8	1.0
15-Oct	7.50	0	26	8	0	0	0	1	0	0	1	0	0	0	36	4.8
16-Oct	5.50	0	1	2	0	0	0	0	0	0	0	0	0	0	3	0.5
17-Oct	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
18-Oct	7.00	0	3	0	0	0	0	1	0	0	0	0	0	0	4	0.6
19-Oct	14.50	0	0	1	0	0	0	0	0	0	1	0	1	0	3	0.2
20-Oct	0.00															
21-Oct	6.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
22-Oct	5.00	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0.6
23-Oct	1.75	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.6
24-Oct	7.00	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0.3
25-Oct	15.25	0	8	0	1	0	0	2	0	0	0	1	0	0	12	0.8
Total	549.50	6	683	383	18	2	0	39	0	0	19	6	3	0	1,159	2.1

¹ See Appendix B for explanation of species codes.

Appendix G. Annual summaries of banding effort and capture totals by species: 1980–2007.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
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
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
Blinds in operation	1	1	2	2	2	3	3	3	4	4	4	4	5	5
Trapping days	21	37	27	55	69	?	?	?	?	?	66	64	74	59
Station days	21	37	?	66	104	?	?	?	?	159	205	240	296	254
Station hours	149	227	159	443	622	654	483.8	833	1,085	1,203	1,454	1,899	2,316	1971
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
SPECIES	RAPTOR CAPTURES													
Northern Harrier	0	2	0	8	3	6	2	4	10	9	4	9	10	4
Sharp-shinned Hawk	62	376	186	571	548	705	410	886	1,177	1,527	1,583	1,694	2,036	1,526
Cooper's Hawk	36	300	129	306	261	366	164	395	553	652	821	909	1,220	822
Northern Goshawk	6	11	3	32	40	42	5	27	22	29	44	33	104	27
Broad-winged Hawk	0	0	0	0	2	0	1	1	1	1	1	2	0	2
Swainson's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Red-tailed Hawk	14	26	13	43	31	51	15	43	37	66	99	93	97	53
Rough-legged Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Eagle	1	1	1	1	5	6	2	4	7	6	10	3	3	2
Bald Eagle	0	0	0	1	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
Merlin	0	1	1	0	2	0	0	1	5	8	2	9	10	8
Prairie Falcon	0	0	0	6	5	2	1	3	7	5	7	7	8	1
Peregrine Falcon	0	0	0	0	1	0	0	0	0	2	1	1	0	1
All Species	126	775	341	1,019	926	1,212	617	1,401	1,904	2,366	2,762	3,026	3,855	2,671
Recaptures ¹	0	0	0	0	0	0	0	0	0	0	4	4	7	9
Foreign Recaptures ²	0	0	1	0	0	0	0	0	0	2	0	0	1	1
Foreign Encounters ³	0	1	5	3	9	12	5	7	11	12	15	18	14	21

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.

Appendix G. continued

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	MEAN
Start date	19 Aug	22 Aug	19 Aug	18 Aug	18 Aug	21 Aug	21 Aug	22-Aug	24-Aug	24-Aug	27-Aug	23-Aug	22-Aug	20-Aug	24-Aug
End date	29 Oct	25 Oct	23 Oct	22 Oct	22 Oct	3 Nov	28 Oct	4-Nov	5-Nov	28-Oct	22-Oct	1-Nov	5-Nov	25-Oct	26-Oct
Blinds in operation	5	6	5	5	5	3	4	4	4	4	3	4	3	3	3.6
Trapping days	65	63	61	62	63	72	62	72	68	66	53	69	72	63	60.0
Station days	278	312	270	264	236	131	174	210	188	163	105	150	128	81	175.5
Station hours	2,290	2,382	2,061	2,087	1,690	939	1,286	1,666	1,474	1276	807	1073	888	550	1,206.5
Captures /100 stn hrs	205.1	120.1	160.7	147.0	202.3	163.6	167.0	173.0	159.9	114.7	158.2	153.8	112.1	210.9	171.6
SPECIES	RAPTOR CAPTURES														
Northern Harrier	7	2	1	18	4	0	17	11	8	7	2	3	2	6	5.7
Sharp-shinned Hawk	2,686	1,823	2,091	1,783	2,131	897	1,235	1,608	1283	825	791	902	503	683	1,163.0
Cooper's Hawk	1,473	695	737	767	1,006	438	504	975	791	460	342	562	356	383	587.8
Northern Goshawk	35	27	68	20	20	20	24	23	7	9	28	21	26	18	27.7
Broad-winged Hawk	1	3	0	0	1	0	3	1	0	2	1	2	1	2	1.0
Swainson's Hawk	1	0	0	0	0	0	0	1	0	0	0	1	1	0	0.2
Red-tailed Hawk	158	93	84	67	69	49	58	76	109	63	61	67	56	39	61.9
Rough-legged Hawk	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0.1
Golden Eagle	11	4	7	5	4	8	2	1	9	1	2	1	1	0	3.9
Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
American Kestrel	285	193	290	351	149	97	285	168	127	88	35	76	38	19	129.9
Merlin	21	13	18	26	13	16	11	12	15	5	11	11	5	6	8.2
Prairie Falcon	7	3	7	17	7	3	8	3	4	3	4	3	5	3	4.6
Peregrine Falcon	0	1	1	4	0	1	1	1	3	0	0	2	2	0	0.8
All Species	4,685	2,857	3,304	3,058	3,404	1,529	2,148	2,882	2,356	1,463	1,277	1,651	995	1,159	1,994.8
Recaptures ¹	10	3	3	7	9	4	6	9	7	2	2	2	2	3	3.3
Foreign Recaptures ²	2	1	4	3	5	2	3	4	3	1	2	4	0	1	1.4
Foreign Encounters ³	19	16	9	18	15	10	19	10	28	12	16	10	8	10	11.9

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.