

**FALL 2008 RAPTOR MIGRATION STUDIES IN THE  
GOSHUTE MOUNTAINS OF NORTHEASTERN NEVADA**



**HawkWatch International, Inc.  
Salt Lake City, Utah**

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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 2008 season marking the 29<sup>th</sup> consecutive season of banding and 26<sup>th</sup> 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 5 migration-banding studies conducted or co-sponsored by HWI in North America during 2008. The primary objective of these efforts is to track long-term population trends of diurnal raptors in western North America and around the Gulf Coast region (Hoffman and Smith 2003; Smith et al. 2008 a, b). Raptors serve as important biological indicators of ecosystem health (Bildstein 2001) and long-term migration counts are one of the most cost effective and efficient methods for monitoring the regional status and trends of multiple raptor species (Zalles and Bildstein 2000, Bildstein et al. 2008).

The intensive counting and banding operations, along with related research activities such as satellite tracking of migrants, also provide valuable information about species' ranges, migratory routes and behaviors, and population demographics (e.g., Hoffman et al. 2002, Lott and Smith 2006, Goodrich and Smith 2008). This information helps us understand the life histories, ecology, status, and conservation needs of raptor populations in North America. HWI also conducted a fifth-season of owl banding in the Goshutes during fall 2008, with effort focused on Flammulated Owls (*Otus flammeolus*) (see Smith 2009). 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 all HWI migration projects.

## 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 2008, two 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. Over the years, the number of trapping stations operated in any one year has varied as high as six, but since 2000 only four stations have been considered active options, and more recently HWI has purposefully downsized the operation to primarily the two stations described above to accommodate both resource limitations and a reduced need for extensive banding operations now that we have accumulated nearly 30 years of band-return data.

## 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 6+ seasons of prior raptor migration counting experience at various HWI sites (one previous season at the Goshutes) and Jeremy Russell, with 2 seasons of prior counting experience (one with HWI at the Goshutes and one with Idaho Bird Observatory; 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 2008 follows Hoffman and Smith (2003). In comparing 2008 annual statistics against means and 95% confidence intervals for previous seasons, we equate significance with a 2008 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 one day of potential observations and reduced observation time to  $\leq 4$  hours on two other days in 2008 (see Appendix C for daily weather records). The 1997–2007 averages for the site are 3 and 1 days, respectively. Scattered thundershowers and rain were relatively uncommon this season, and overall mild and clear conditions prevailed. The first snowfall did not occur until 11 October, marking the only full day of missed observations. Clear skies prevailed for the remainder of the season, except on 19 and 28 October, and the season ended almost snow free and balmy than usual.

Generally fair skies prevailed on a record-high 62% of the active observation days (1997–2007 average of 48%), whereas days with primarily transitional skies (i.e., changed from fair skies to mostly cloudy or overcast during the day, or vice versa; 24% vs. average of 33%) and mostly cloudy to overcast skies (13% vs. average of 19%) were less common than usual. 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 2007. In 2008, the proportion of active days that featured periods of fog or haze dropped back to the lowest levels in a decade (5%), dramatically below the 1997–2007 average (23%; a high peak of 73% occurred in 2004). The proportion of active days that featured periods of rain or snow also was below average in 2008 (13% vs. average of 18%).

Light winds ( $< 12$  kph) prevailed on 77%, moderate winds (12–29 kph) on 22%, and strong winds ( $> 29$  kph) on 1% of the active observation days. These values reflect calmer conditions than usual compared to the 1997–2007 averages of 67% light, 26% moderate, and 7% strong winds. In terms of wind directions, the 2008 season differed from the average pattern of the past 11 seasons in showing a markedly above average prevalence of comparatively steady NE–E winds (21% of the active observation days vs. average of 13%), a record-high proportion of days where a mix of SW–W and NE–E winds prevailed (9% vs. average of 2%), and an above average proportion of days where relatively steady SW–W winds prevailed (44% vs. average of 34%). In contrast, days featuring a mix of SW–W and calm/variable winds were completely absent in 2008 (average of 6%), whereas the second most common pattern, days with a mix of SW–NW and NE–SE winds, prevailed on an average proportion of the active days in 2008 (17% vs. average of 18%).

Daily-average temperatures (averages of hourly readings) ranged from  $-2.0$ – $27.5^{\circ}\text{C}$ , averaging a record high  $15.3^{\circ}\text{C}$ . Daily-average barometric pressure readings (averages of hourly readings) ranged from 29.78 to 30.69 inHg, averaging 30.36 inHg. The pressure values all fall within the ranges seen since 1997, but rank on the high side. Thermal lift was rated good-to-excellent on 49% of the active

observation days, which is the second highest proportion recorded since 1997 (1997–2007 average of 33%).

In summary, the weather during the 2008 season was among the mildest to date. The winds were lighter, the temperatures were warmer, and there was less cloud cover, fog/haze, and rain/snow than during the previous 11 seasons. The pattern of wind directions also varied from the norm of the past 11 seasons in generally being less variable than usual and with both SW–W and NE–E winds, which typically rank first and third most abundant, respectively, both more common than usual.

### **OBSERVATION EFFORT**

Counts occurred on 82 of 83 days between 15 August and 5 November 2008. The number of observation days was a significant 5% above the 1983–2007 average of  $78 \pm 95\%$  CI of 2.1 days, and the number of observation hours (698.53) was a significant 4% above the long-term average of  $668.75 \pm 26.96$  hours. The 2008 average of 2.0 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 9.9% below the 1983–2007 average of  $2.21 \pm 0.25$  observers/hr.

### **MIGRATION SUMMARY**

The observers counted 12,277 migrant raptors of 17 species during the 2008 season (see Appendix D for daily count records). The count was a significant 16% below the 1983–2007 average (Table 1). This is similar to most counts since 2001, but contrasts with the slightly above-average count recorded in 2007 (see Appendix E for annual summaries). The 2008 tally of six Bald Eagles matched the previous low for the site (three years in a row from 1996–1998), but no record low or high counts occurred in 2008.

The 2008 flight was composed of 58% accipiters, 23% buteos, 9% falcons, 5% vultures, 2% eagles, 1% harriers, and <1% Ospreys and unidentified raptors. The proportions of accipiters, vultures, and Ospreys were significantly above average, whereas the proportions of falcons and unidentified raptors were significantly below average (Figure 2). The most commonly observed species were the Sharp-shinned Hawk (41% of the total count), Red-tailed Hawk (20%), Cooper's Hawk (16%), American Kestrel (8%), and Turkey Vulture (5%). No other species comprised more than 2% of the total count. It is noteworthy that the count of Sharp-shinned Hawks was the highest since 2001 and that this was only the second time (two years in a row) since then where the count of Sharp-shinned Hawks substantially exceeded that of Red-tailed Hawks, whereas there as only one prior season (1983) when the sharp-shin count did not exceed that of red-tails by a wide margin (Appendix E). This may 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). In contrast, the count of Cooper's Hawks decreased in 2008 to the lowest level since 1986, after having increased ~30% in 2007 compared to the previous five seasons. Species for which the 2008 count was significantly above average included Turkey Vulture, Broad-winged Hawk, Merlin, and Peregrine Falcon. Species for which the 2008 counts were significantly below average included Cooper's Hawk, Northern Goshawk, Red-tailed Hawk, Ferruginous Hawk, Bald Eagle, American, Kestrel, and Prairie Falcon.

### **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 Merlins was only non-significantly above average and the passage rate of Golden Eagles was significantly below average in 2008 (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 11 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 2004, 2007, and 2008, 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 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, ongoing, 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 2008. 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.

The overall patterns of change and derived trend estimates suggested by the RPI 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 2008. The only substantive differences between the RPI results and those presented herein, which clearly relate to addition of three more years of data include: 1) high passage rates in 2007 and 2008 returned stabilizing quadratic trends to significant linear increasing trends for Turkey Vultures (Figure 3) and Broad-winged Hawks (Figure 5); and 2) drops in passage rates in 2007 and especially 2008 converted what had been a significant linear increasing trend to a quadratic trend for Red-tailed Hawks, newly emphasizing the contrast between a strong increasing trend through the mid-to-late 1990s and a relatively stable pattern since then (Figure 5).

### **Age Ratios**

Immature : adult ratios were significantly below average in 2008 for 8 of 10 species with data suited to comparisons and were significantly above average only for Golden Eagles (Table 2). Among all species with low age ratios except Broad-winged Hawks, reduced abundance of identified immatures contributed to the low ratios, suggesting that low productivity in 2008 may have influenced the results. For Broad-winged Hawks, the number of identified immatures matched the average, whereas the count of identified adults was well above average. This suggests that adult survivorship may have been high in 2008 within the limited population of Broad-winged Hawks that breed in western Canada. Similar to the case for Broad-winged Hawks, the tally of identified, non-adult Golden Eagles was about average; however, unlike for Broad-winged Hawks, the count of identified adult Golden Eagles was well below average. It is possible that this reflects low adult survival and low recruitment of subadults into the full adult

population in the past year; however, another possibility is that the opposite may be true for this species in this region. In fact, long-term, age-specific trends for Golden Eagles at this site suggest that declining adult numbers 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 non-adults have now increased for three years in a row, returning to an average level in 2007 and 2008. 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. It is important to note here, however, that the proportion of unknown-age birds differed significantly from the long-term average for five species (Sharp-shinned Hawks, Cooper’s Hawks, Northern Goshawks, Ferruginous Hawks, and Golden Eagles), and hence the age-ratio results for these species should be considered with caution.

### **Seasonal Timing**

The 2008 combined-species median passage date of 27 September was a marginally significant two days later than the 1990–2007 average (Table 3). The combined-species seasonal distribution pattern confirmed that the season started off slower than average, but then followed a typical pattern for the remainder of the season except for a high spike in activity in late September and relatively strong activity during the last five days of the season in early November. The overall mild weather of 2008 undoubtedly contributed to the slow start and slightly later overall timing of the season. The late September spike involved a variety of species, most notably Ospreys, Sharp-shinned Hawks, Red-tailed Hawks, and American Kestrels, and did not correspond to any noteworthy weather changes except for an extended spate of north to northeasterly winds. The higher than usual activity levels during the final week of the season reflected atypical activity levels for Northern Harriers, Sharp-shinned Hawks, Ferruginous Hawks, Golden Eagles, Merlins, and Prairie Falcons.

At the species level, 10 of 17 species showed later than average median passage dates in 2008, with the differences significant for eight of these species (Osprey, Northern Goshawk, Broad-winged Hawk, Ferruginous Hawk, Golden Eagle, Bald Eagle, American Kestrel, and Prairie Falcon), and only 5 species showed earlier than average timing, with the differences significant for Red-tailed and Rough-legged Hawks and Peregrine Falcons (Table 3). Thus, there was little consistency in timing trends within primary species groups (e.g., accipiters, buteos, eagles, and falcons), except for both eagle species showing late timing. However, age-specific data revealed additional detail and consistencies. Among all seven species for which a comparison was possible, immature birds showed late timing in 2008, with the differences in median passage dates significant except for Red-tailed Hawks (Table 4). In contrast, among the eight species for which adult passage dates could be calculated, only adult Bald Eagles showed significantly late timing, whereas adult Sharp-shinned Hawks and adult Red-tailed Hawks showed significantly early timing. Thus, it appears that the mild weather mostly delayed passage of immature birds, which typically pass through earlier than adults of the same species.

### **TRAPPING EFFORT**

The crews operated one or both of the two available banding stations on 62 of 69 days between 21 August and 28 October 2008 (see Appendix F for daily capture records and Appendix G for annual summaries). The number of trapping days was 3% higher than the 1980–2007 average for the site, whereas the number of station hours (503) was 47% below average due to a purposefully reduced crew size.

## **TRAPPING SUMMARY**

The 2008 capture total of 1,032 raptors included nine species, 1,026 newly banded birds, four recaptures of birds previously banded in the Goshutes, and two “foreign” recaptures of birds originally banded elsewhere (Table 5, Appendix G). The 2008 effort raises the total number of birds captured since project inception to 56,885, including 97 Goshute recaptures and 42 foreign recaptures. Sharp-shinned Hawks accounted for 60% of the total captures, followed by Cooper’s Hawks (30%), American Kestrels (4%), and Red-tailed Hawks (4%). Each of the remaining species accounted for <1% of the total.

The 2008 combined-species capture total was 47% below the long-term average (Table 5), consistent with a 43% reduction in station hours. Capture totals were markedly below average for all species except Peregrine Falcons, reflecting the effects of both low flight volume and reduced trapping effort. Capture success also was substantially below average (41% combined) for all species except Golden Eagles, again because of the reduced effort (Table 5). In contrast, capture rates (birds captured per 100 station hours) were above average for most commonly captured species, indicating that trapping efficiency was generally high (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 below-average immature : adult ratios for all three accipiter species in 2008 and, as is typical at this site, the capture age ratios were consistently higher than the count age ratios. For Cooper’s Hawks and Northern Goshawks, the count and capture age ratios fell below average to similar degrees, suggesting that immature birds were proportionately less abundant than usual compared to adults in 2008 (possibly due to decreased productivity), but were about as susceptible to capture as usual (i.e., more susceptible than adults, which is typical, but no more so than usual). In contrast, for Sharp-shinned Hawks, the count age ratio was 42% below average, whereas the capture ratio was only 25% below average. This suggests that immature Sharp-shinned Hawks were less abundant than usual compared to adults and more susceptible to capture (hungrier) than usual.

The trapping data alone further indicated typical sex ratios for Sharp-shinned and Cooper’s Hawks in 2008, whereas the female : male capture ratio for Northern Goshawks of 5.00 was 267% above average (Table 6). The latter statistic must be considered with caution, however, given the atypically limited sample size of only six captured birds (average 30).

The capture sex ratio for American Kestrels in 2008 of 0.56 was 41% below average (Table 6), whereas the count sex ratio was nearly three times higher (1.50) and 53% above average. These data suggest that, compared to males, female kestrels were substantially more abundant and less susceptible to capture than usual in 2008. The count data do not yield age-specific data for American Kestrels, so the banding data for this species are particularly useful in this regard. Similar to the past three seasons, the 2008 banding data yielded an immature : adult ratio that was a significant 48% below average (Table 6). This suggests that young kestrels may have been relatively scarce during at least the past four 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).

## **ENCOUNTERS WITH PREVIOUSLY BANDED BIRDS**

The 2008 captures included “recaptures” of 1 male and 3 female Cooper’s Hawks originally banded in the Goshutes during a previous season, and 2 “foreign recaptures” of female Sharp-shinned Hawks originally banded at Idaho Bird Observatory’s autumn migration site on Boise Ridge in western Idaho (Table 7). The two recaptured, female Cooper’s Hawks were banded as hatch-year (HY) birds in 2004, the male as a HY bird in 2006, and the third female as an after-hatch-year (AHY) bird in 2006. These

new recaptures raise the total number of Goshute recaptures since 1980 to 97 birds, all accipiters (Appendix G). The first Boise Ridge Sharp-shinned Hawk was banded in 2002 as a HY bird; the second as a second-year (SY) bird in 2007. These new foreign recaptures raise the total number for the Goshute site since 1980 to 42 individuals of five species, and the total number of exchanges of banded birds with Idaho Bird Observatory's project to 22, all Sharp-shinned and Cooper's Hawks.

Eleven raptors originally banded in the Goshutes were encountered elsewhere in 2008, which is just below the annual average for the site of 12 birds (Table 8, Appendix G). This raises the total number of "foreign encounters" for the project since 1980 to 344. The 2008 encounters involved 4 Cooper's Hawks, 4 Red-tailed Hawks, and 3 Sharp-shinned Hawks. Eight of the encounters involved birds that were found dead of unknown causes. One Red-tailed Hawk banded as a HY bird in 2002 was shot dead in April ~1,463 km south of the project site in Sinaloa, Mexico. Another Red-tailed Hawk banded as a HY bird in October 2008 was captured and released by a colleague (Jeff Kidd) 15 days later on the Seal Beach Naval Weapons Station in Orange County, California ~ 736 km to the southwest; this bird lost 26 g (3%) in mass between captures. One female Cooper's Hawk banded as an after-second-year (ASY) adult in 1999 was found near Libby, Montana ~ 725 km to the north, and was believed to have been killed by another raptor.

The three male Sharp-shinned Hawks all were recovered dead of unknown causes in April. They included a bird banded as an AHY in 2003 and found ~724 km northwest near Chattaroy, Washington; a bird banded as a HY in 2006 and found ~292 km north near Ketchum, Idaho; and a bird banded as an AHY in 2002 and found ~1,264 km northwest near 100 Mile House, British Columbia.

All three of the remaining Cooper's Hawks were recovered in Arizona. Two females were banded as HY birds in 1998 and one male as a HY bird in 2005. One female was found ~746 km away near Ajo in February, and the other in March near Tucson (838 km). The male was recovered during October ~759 km south near Valley Farms.

The two remaining Red-tailed Hawks both were found dead in April. One was banded as a HY bird in 2001 and recovered ~178 km north near Jackpot, Nevada, and the other was banded as a HY bird in 2002 and recovered ~713 km north near Coeur D'Alene, Idaho.

All of the new 2008 encounter locations fell well within the expected ranges of Goshute migrants (Hoffman et al. 2002).

## **RESIDENT RAPTORS**

For the first time in close to a decade, it appeared that the Northern Goshawks that typically nest near the project site either did not attempt to nest or failed to produce any fledglings, and the crew recorded no obvious resident activity by this species during the 2008 season. Sightings of resident Sharp-shinned and Cooper's Hawks also occurred much less frequently than usual. Apparently resident birds were seen only intermittently but throughout the season, typically moving north or south and then diving into the trees attempting to hunt. On one occasion on 11 September, an immature Sharp-Shinned Hawk was seen harassing an American Kestrel, then flying south along the ridge, at which point it flushed and caught a Red-breasted Nuthatch.

Red-tailed Hawks have been known to breed in the meadows to the east of the observation point, but again no such activity was apparent this year. Other local activity was noted, however, typically late in the day as thermal activity declined, suggesting that primarily transient rather than true resident birds (summer or winter) may have been involved. Apparently resident Red-tailed Hawks were recorded kiting and hunting and occasionally harassing other Red-tailed Hawks from 19 August through 22 October.

One of the few constant presences during at least the first half of the season was an immature (possibly subadult) Golden Eagle, seen throughout late August and into early September. This bird often was seen

doing an undulating territorial display to passing eagles, and on 17 September the observers first saw another adult Golden Eagle displaying. After that, further displays were seen occasionally through late October, often in conjunction with the apparent locals escorting migrants through area. Golden Eagles were present all season and views of them heading north were common.

At least one adult Peregrine Falcon resided in the area through mid-September. The first sighting was of a molting adult seen four times in one day harassing migrants as they passed by. Similar sightings occurred sporadically after that, with adult peregrines seen harassing Golden Eagles and immature Sharp-shinned Hawks on several occasions.

This assemblage differs from the past in terms of the absence of goshawks and limited representation of Sharp-shinned and Cooper's Hawks, American Kestrels, and Prairie Falcons, as well as a very recent trend of increased local Peregrine Falcon activity. The decline in local Prairie Falcon activity but increase in local Peregrine Falcon activity 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**

A total of 93 individuals visited the Goshutes in 2008, with 86 accounted for on HWI visitor logs. The visitors included nearly equal numbers of adults and children. Most of the children visited as organized groups, including two local scout troops and two groups of students from Wendover High School. Most visitors came from nearby areas of Nevada (44%) and Utah (46%), with other guests from California, Colorado, and Montana. Most visitors were familiar with the site, including HWI volunteers, their families and friends, and other enthusiasts that have been coming to the site more several years. Most new visitors learned about the project through HWI's web site. Special guests this year included photographer Jerry Johnson, HWI board members that visited for a weekend with HWI Education Director Jen Hajj, and Steve Dondero, Ken Miller, and Derrick Holdstock from the BLM Elko District Office.

In 2008, 699 hourly assessments by the official observers of visitor disturbance resulted in the following ratings: >99% none, <1% low, and 0% moderate or high.

## **ACKNOWLEDGMENTS**

Financial support for the 2008 project was provided by the USDI Bureau of Land Management – Elko District Office, the Arthur and Elaine Johnson Foundation, the Walbridge Fund, the Schaffner Family Foundation, and HWI private donors and members. The BLM Elko District Office also provided helicopter-airlift and other essential logistical support; special thanks to Tamara Hawthorne for her assistance and oversight and to the BLM Fire/Heli-tac crew for their critical support. 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 and Salt Lake Roasting Company in Salt Lake City. We are also grateful for the additional volunteer assistance and crew support provided by Leo Chidester, Jan Chidester Morse, Art Sandack, Jen Callahan, Brian Kelly, and John Martin. Lastly, special thanks to Roy Bouck, Bart Gross, Barry Herbert, and Buzz Hull at Golden Gate Raptor Observatory for helping us secure lure birds for the trapping operations.

## LITERATURE CITED

- Bildstein, K. L. 2001. Why migratory birds of prey make great biological indicators. Pages 169–179 in K. L. Bildstein and D. Klem (Editors). Hawkwatching in the Americas. Hawk Migration Association of North America, North Wales, Pennsylvania, U.S.A.
- Bildstein, K. L. 2006. Migrating raptors of the world: their ecology and conservation. Cornell University Press, Ithaca, NY U.S.A. 320 pp.
- Bildstein, K. L., J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors). 2008. State of North America's birds of prey. Series in Ornithology No. 3. Nuttall Ornithological Club, Cambridge, Massachusetts, and American Ornithologists' Union, Washington, DC U.S.A.
- Farmer, C. J., L. J. Goodrich, E. Ruelas Inzunza, and J. P. Smith. 2008. Conservation status of North America's birds of prey. Pages 303–420 in K. L. Bildstein, J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors), State of North America's birds of prey. Series in Ornithology No. 3. Nuttall Ornithological Club, Cambridge, Massachusetts, and American Ornithologists' Union, Washington, DC U.S.A.
- Farmer, C. J., D. J. T. Hussell, and D. Mizrahi. 2007. Detecting population trends in migratory birds of prey. *Auk* 124:1047–1062.
- Farmer, C. J., and J. P. Smith. In review. Migration counts indicate widespread declines of American Kestrels (*Falco sparverius*) in North America. *Journal of Raptor Research*, 2009 Special Issue on American Kestrels.
- Goodrich, L. J., and J. P. Smith. 2008. Raptor migration in North America. Pages 37–150 in K. L. Bildstein, J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors), State of North America's birds of prey. Series in Ornithology No. 3. Nuttall Ornithological Club, Cambridge, Massachusetts, and American Ornithologists' Union, Washington, DC U.S.A.
- Hoffman, S. W., and J. P. Smith. 2003. Population trends of migratory raptors in western North America, 1977–2001. *Condor* 105:397–419.
- Hoffman, S. W., J. P. Smith, and T. D. Meehan. 2002. Breeding grounds, winter ranges, and migratory routes of raptors in the Mountain West. *Journal of Raptor Research* 36:97–110.
- Lott, C. A., and J. P. Smith. 2006. A geographic-information-system approach to estimating the origin of migratory raptors in North America using hydrogen stable isotope ratios in feathers. *The Auk* 123:822–835.
- Smith, J. P. 2009. Fall 2008 Flammulated Owl migration study in the Goshute Mountains of northeastern Nevada. HawkWatch International, Inc., Salt Lake City, Utah U.S.A.
- Smith, J. P., C. J. Farmer, S. W. Hoffman, G. S. Kaltenecker, K. Z. Woodruff, and P. Sherrington. 2008. Trends in autumn counts of migratory raptors in western North America. Pages 217–252 in K. L. Bildstein, J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors), State of North America's birds of prey. Series in Ornithology No. 3. Nuttall Ornithological Club, Cambridge, Massachusetts, and American Ornithologists' Union, Washington, DC U.S.A.
- Smith, J. P., C. J. Farmer, S. W. Hoffman, C. A. Lott, L. J. Goodrich, J. Simon, C. Riley, and E. Ruelas Inzunza. 2008b. Trends in autumn counts of migratory raptors around the Gulf of Mexico, 1995–2005. Pages 253–278 in K. L. Bildstein, J. P. Smith, E. Ruelas Inzunza, and R. R. Veit (Editors), State of North America's birds of prey. Series in Ornithology No. 3. Nuttall Ornithological Club, Cambridge, Massachusetts, and American Ornithologists' Union, Washington, DC U.S.A.
- Smith, J. P., and A. Hutchins. 2008. Northwest Utah raptor nest survey 2007. HawkWatch International, Inc., Salt Lake City, Utah U.S.A 43 pp.
- Vekasy, M. S., and J. P. Smith. 2002. Fall 2001 raptor migration study in the Goshute Mountains of northeastern Nevada. HawkWatch International, Salt Lake City, Utah U.S.A. 41 pp.



**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: 1983–2007 versus 2008.**

SPECIES	COUNTS			RAPTORS/100 HOURS <sup>1</sup>		
	1983–2007 <sup>2</sup>	2008	% CHANGE	1983–2007 <sup>2</sup>	2008	% CHANGE
Turkey Vulture	356 ± 70.7	637	+79	64.4 ± 12.31	111.2	+115
Osprey	92 ± 16.9	89	-4	21.1 ± 3.41	20.0	+26
Northern Harrier	173 ± 27.8	158	-9	26.9 ± 3.80	23.7	0
Sharp-shinned Hawk	4,502 ± 769.4	4,967	+10	993.4 ± 139.04	1035.8	+1
Cooper's Hawk	3,162 ± 548.5	1,957	-38	796.5 ± 113.73	486.8	+7
Northern Goshawk	101 ± 22.4	27	-73	16.8 ± 3.57	4.2	-51
Unknown small accipiter <sup>3</sup>	292 ± 121.4	204	-30	–	–	–
Unknown large accipiter <sup>3</sup>	10 ± 9.2	6	-37	–	–	–
Unknown accipiter	277 ± 90.1	11	-96	–	–	–
TOTAL ACCIPITERS	8,114 ± 1282.9	7,172	-12	–	–	–
Red-shouldered Hawk	0.2 ± 0.2	0	-100	–	–	–
Broad-winged Hawk	50 ± 15.1	81	+64	19.6 ± 5.85	31.6	+178
Swainson's Hawk	237 ± 82.2	248	+5	61.5 ± 21.42	64.1	-40
Red-tailed Hawk	3,117 ± 358.0	2,439	-22	516.2 ± 47.63	397.7	+6
Ferruginous Hawk	16 ± 2.7	10	-37	2.5 ± 0.41	1.8	-36
Rough-legged Hawk	14 ± 4.0	15	+10	6.2 ± 1.65	6.7	-11
Unidentified buteo	70 ± 18.8	91	+30	–	–	–
TOTAL BUTEOS	3,502 ± 409.2	2,884	-18	–	–	–
Golden Eagle	252 ± 26.9	226	-10	39.6 ± 3.94	33.4	-23
Bald Eagle	13 ± 2.5	6	-53	2.6 ± 0.48	1.3	-28
Unidentified eagle	1 ± 0.5	0	-100	–	–	–
TOTAL EAGLES	265 ± 28.2	232	-13	–	–	–
American Kestrel	1,887 ± 348.5	965	-49	397.1 ± 67.09	207.3	-39
Merlin	39 ± 9.9	51	+29	7.6 ± 1.91	9.4	-14
Prairie Falcon	26 ± 5.7	10	-62	4.4 ± 0.82	1.1	-37
Peregrine Falcon	12 ± 3.4	22	+90	2.1 ± 0.60	4.0	+69
Unknown small falcon <sup>3</sup>	4.2 ± 3.4	4	-4	–	–	–
Unknown large falcon <sup>3</sup>	3 ± 1.6	0	-100	–	–	–
Unknown falcon	6 ± 2.1	2	-68	–	–	–
TOTAL FALCONS	1,972 ± 362.4	1,054	-47	–	–	–
Unidentified raptor	114 ± 35.9	51	-55	–	–	–
GRAND TOTAL	14,589 ± 1962.8	12,277	-16	–	–	–

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

<sup>2</sup> Mean ± 95% confidence interval.

<sup>3</sup> 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: 1990–2007 versus 2008.**

SPECIES	TOTAL AND AGE-CLASSIFIED COUNTS						% UNKNOWN AGE		IMMATURE : ADULT RATIO	
	1990–2007 AVERAGE			2008			1990–2007 <sup>1</sup>	2008	1990–2007 <sup>1</sup>	2008
	TOTAL	IMM.	ADULT	TOTAL	IMM.	ADULT				
Northern Harrier	198	62	58	158	21	71	41 ± 7.1	42	1.24 ± 0.275	0.30
Sharp-shinned Hawk	4984	1755	1344	4967	910	1168	39 ± 5.1	58	1.35 ± 0.238	0.78
Cooper's Hawk	3609	831	987	1957	181	543	50 ± 4.8	63	0.83 ± 0.198	0.33
Northern Goshawk <sup>2</sup>	101	50	32	27	8	10	17 ± 4.3	33	2.17 ± 0.643	0.80
Broad-winged Hawk	62	15	27	81	15	46	36 ± 9.0	25	0.66 ± 0.194	0.33
Red-tailed Hawk	3535	711	2039	2439	255	1570	22 ± 3.5	25	0.35 ± 0.059	0.16
Ferruginous Hawk	18	5	6	10	0	1	44 ± 9.3	90	1.18 ± 0.523	0.00
Golden Eagle <sup>2</sup>	252	123	70	226	118	41	23 ± 4.8	30	2.11 ± 0.408	2.88
Bald Eagle	14	6	7	6	1	5	7 ± 4.5	0.0	1.11 ± 0.342	0.20
Peregrine Falcon	15	5	6	22	3	3	30 ± 10.9	73	0.89 ± 0.330	1.00

<sup>1</sup> 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.

<sup>2</sup> Long-term averages based on data for 1983–2007.

**Table 3. First and last observed, bulk passage, and median passage dates by species for migrating raptors in the Goshute Mountains, NV in 2008, with comparisons of 2008 and 1990–2007 average median passage dates.**

SPECIES	2008				1990–2007
	FIRST OBSERVED	LAST OBSERVED	BULK PASSAGE DATES <sup>1</sup>	MEDIAN PASSAGE DATE <sup>2</sup>	MEDIAN PASSAGE DATE <sup>2,3</sup>
Turkey Vulture	15-Aug	15-Oct	9-Sep–6-Oct	22-Sep	23-Sep ± 1.3
Osprey	19-Aug	3-Nov	31-Aug–6-Oct	20-Sep	15-Sep ± 1.5
Northern Harrier	15-Aug	31-Oct	26-Aug–27-Oct	28-Sep	25-Sep ± 3.3
Sharp-shinned Hawk	15-Aug	3-Nov	11-Sep–17-Oct	27-Sep	26-Sep ± 2.1
Cooper's Hawk	19-Aug	1-Nov	10-Sep–6-Oct	21-Sep	22-Sep ± 1.5
Northern Goshawk	2-Sep	4-Nov	11-Sep–31-Oct	14-Oct	05-Oct ± 2.7
Broad-winged Hawk	8-Sep	14-Oct	15-Sep–1-Oct	27-Sep	23-Sep ± 1.5
Swainson's Hawk	15-Aug	19-Oct	30-Aug–30-Sep	19-Sep	19-Sep ± 3.5
Red-tailed Hawk	15-Aug	4-Nov	8-Sep–24-Oct	3-Oct	06-Oct ± 2.4
Ferruginous Hawk	16-Sep	31-Oct	16-Sep–31-Oct	3-Oct	28-Sep ± 4.1
Rough-legged Hawk	8-Oct	1-Nov	14-Oct–31-Oct	19-Oct	23-Oct ± 1.8
Golden Eagle	16-Aug	4-Nov	30-Aug–26-Oct	13-Oct	09-Oct ± 1.8
Bald Eagle	25-Oct	1-Nov	25-Oct–1-Nov	27-Oct	21-Oct ± 4.9
American Kestrel	15-Aug	1-Nov	5-Sep–6-Oct	20-Sep	16-Sep ± 1.7
Merlin	6-Sep	3-Nov	18-Sep–23-Oct	2-Oct	02-Oct ± 2.2
Prairie Falcon	15-Aug	1-Nov	15-Aug–31-Oct	27-Sep	14-Sep ± 3.8
Peregrine Falcon	26-Aug	7-Oct	30-Aug–25-Sep	10-Sep	23-Sep ± 3.0
Total	15-Aug	5-Nov	9-Sep–17-Oct	27-Sep	25-Sep ± 1.3

<sup>1</sup> Dates between which the central 80% of the flight passed the lookout.

<sup>2</sup> Date by which 50% of the flight had passed the lookout.

<sup>3</sup> 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: 1990–2007 versus 2008.**

SPECIES	ADULT		IMMATURE / SUBADULT	
	1990–2007 <sup>1</sup>	2008	1990–2007 <sup>1</sup>	2008
Northern Harrier	28-Sep ± 4.5	27-Sep	21-Sep ± 5.1	28-Sep
Sharp-shinned Hawk	07-Oct ± 1.5	2-Oct	16-Sep ± 1.1	19-Sep
Cooper's Hawk	26-Sep ± 1.7	25-Sep	18-Sep ± 1.1	20-Sep
Northern Goshawk <sup>2</sup>	13-Oct ± 4.5	14-Oct	30-Sep ± 3.4	14-Oct
Broad-winged Hawk	23-Sep ± 1.5	23-Sep	25-Sep ± 2.3	28-Sep
Red-tailed Hawk	09-Oct ± 1.9	3-Oct	18-Sep ± 4.2	19-Sep
Golden Eagle <sup>2</sup>	14-Oct ± 2.8	16-Oct	04-Oct ± 3.4	8-Oct
Bald Eagle	22-Oct ± 4.2	27-Oct	26-Oct ± 2.4	–

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.

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

<sup>2</sup> Average for 1983–2007.

**Table 5. Capture totals, rates, and successes for migrating raptors in the Goshute Mountains, NV: 1985–2007 versus 2008.**

SPECIES	CAPTURE TOTAL		CAPTURE RATE <sup>1</sup>		CAPTURE SUCCESS (%) <sup>2</sup>	
	1985–2007 <sup>3</sup>	2008	1985–2007 <sup>3</sup>	2008	1985–2007 <sup>3</sup>	2008
Northern Harrier	6 ± 1.9	2	0.5 ± 0.1	0.4	4.0 ± 1.1	1.3
Sharp-shinned Hawk	1340 ± 244.7	616	96.8 ± 7.5	122.6	27.2 ± 4.0	12.0
Cooper's Hawk	671 ± 128.3	314	48.6 ± 4.5	62.5	19.3 ± 2.6	15.6
Northern Goshawk	30 ± 8.6	6	2.3 ± 0.6	1.2	32.1 ± 6.0	22.2
Broad-winged Hawk	1 ± 0.4	0	0.1 ± 0.0	0.0	2.9 ± 1.3	0.0
Swainson's Hawk	0.2 ± 0.2	0	0.0 ± 0.0	0.0	0.1 ± 0.1	0.0
Red-tailed Hawk	70 ± 12.2	40	5.3 ± 0.7	8.0	2.1 ± 0.3	1.6
Rough-legged Hawk	0.1 ± 0.2	0	0.0 ± 0.0	0.0	0.4 ± 0.7	0.0
Golden Eagle	4 ± 1.3	4	0.3 ± 0.1	0.8	1.6 ± 0.5	1.8
American Kestrel	152 ± 46.0	42	9.5 ± 2.0	8.4	7.1 ± 1.9	4.3
Merlin	10 ± 2.7	6	0.7 ± 0.2	1.2	21.2 ± 5.1	11.8
Prairie Falcon	5 ± 1.4	1	0.4 ± 0.1	0.2	21.2 ± 4.2	10.0
Peregrine Falcon	1 ± 0.5	1	0.1 ± 0.0	0.2	8.3 ± 4.3	4.5
All Species	2290 ± 421.2	1032	164.6 ± 11.6	205.4	15.7 ± 2.2	9.2

<sup>1</sup> Captures / 100 station hours.

<sup>2</sup> 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.

<sup>3</sup> 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: 1991–2007 averages versus 2008.**

	FEMALE			MALE			FEMALE : MALE	HY : AHY
	AHY	HY	UNK.	AHY	HY	UNK.	RATIO <sup>1</sup>	RATIO <sup>1</sup>
<b>Sharp-shinned Hawk</b>								
1991–2007 mean	276	448	–	225	542	–	1.00	2.01
2008	137	165	–	108	206	–	0.96	1.51
<b>Cooper's Hawk</b>								
1991–2007 mean	247	194	–	135	179	–	1.49	0.97
2008	137	55	–	76	46	–	1.57	0.47
<b>Northern Goshawk</b>								
1991–2007 mean	5	11	–	2	13	–	1.36	8.29
2008	1	4	–	0	1	–	5.00	3.50
<b>American Kestrel</b>								
1991–2007 mean	8	64	21	23	72	2	0.95	5.27
2008	6	8	1	5	22	0	0.56	2.73

<sup>1</sup> 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 2008.**

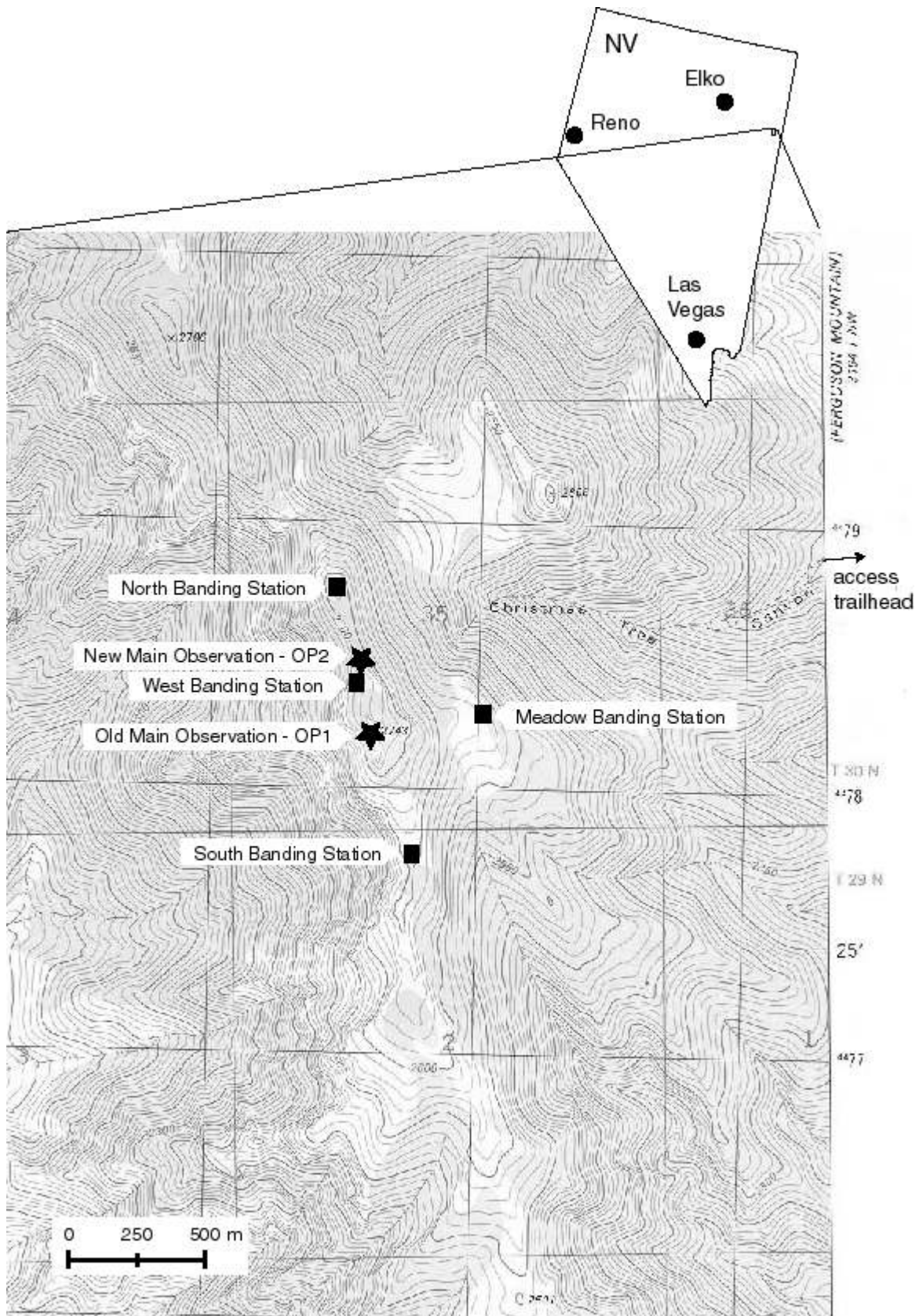
SPECIES	SEX	BAND #	BANDING SITE	BANDING DATE	BANDING AGE <sup>1</sup>	RECAPTURE DATE	RECAPTURE AGE <sup>1</sup>
Cooper's Hawk	F	1005-24216	Goshutes	03-Oct-04	HY	20-Sep-08	5 <sup>th</sup> yr
Cooper's Hawk	M	0804-31190	Goshutes	30-Sep-06	HY	24-Sep-08	TY
Cooper's Hawk	F	1005-24436	Goshutes	23-Sep-04	HY	26-Sep-08	5 <sup>th</sup> yr
Cooper's Hawk	F	1005-23278	Goshutes	08-Oct-06	AHY	17-Oct-08	≥4 <sup>th</sup> yr
Sharp-shinned Hawk	F	1623-00618	Boise Ridge, ID	15-Sep-07	SY	25-Sep-08	TY
Sharp-shinned Hawk	F	1963-09113	Boise Ridge, ID	05-Sep-02	HY	07-Oct-08	7 <sup>th</sup> yr

<sup>1</sup> 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.

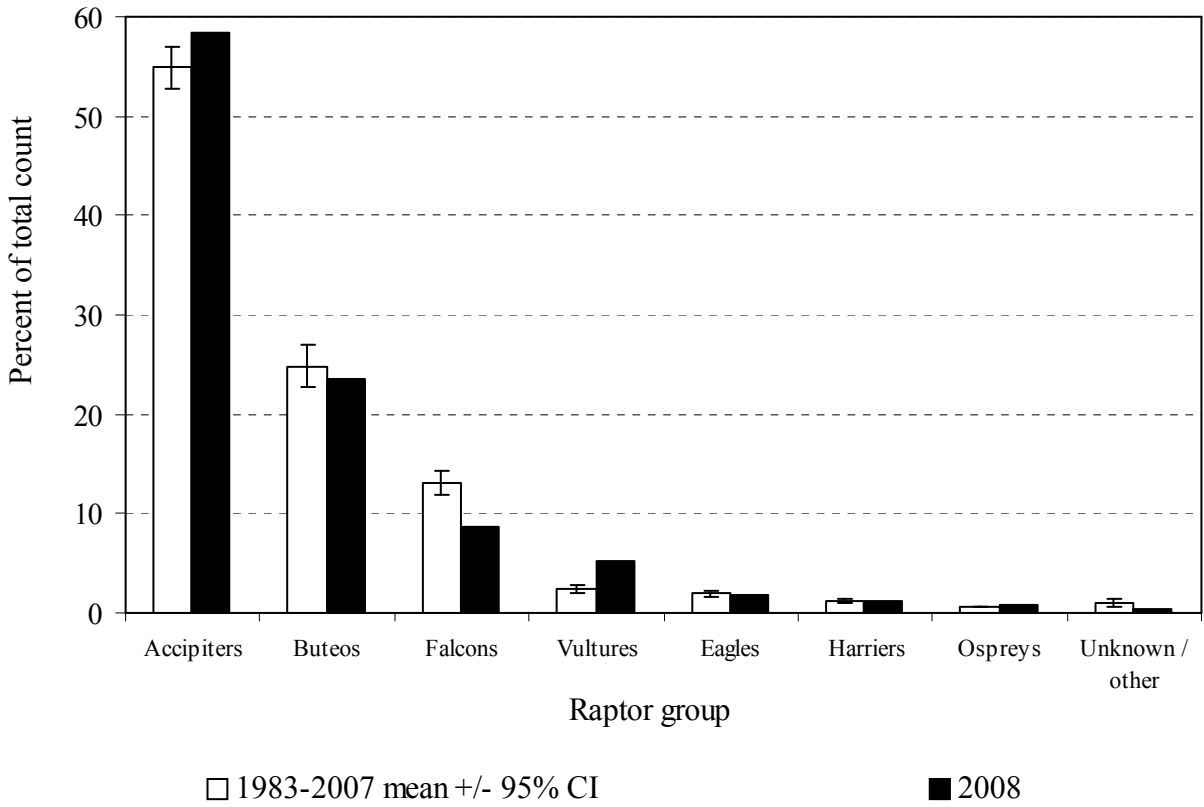
**Table 8. Foreign encounters in 2008 with raptors banded in the Goshute Mountains, NV.**

SPECIES	SEX	BAND #	BANDING DATE	BANDING AGE <sup>1</sup>	ENCOUNTER DATE	ENCOUNTER AGE <sup>1</sup>	ENCOUNTER LOCATION	DISTANCE (km)	STATUS
Sharp-shinned Hawk	M	1212-71796	19-Oct-03	AHY	13-Apr-08	≥5 <sup>th</sup> yr	Chattaroy, WA	724	found dead
Sharp-shinned Hawk	M	0822-20964	22-Sep-06	HY	26-Apr-08	SY	Ketchum, ID	292	found dead
Sharp-shinned Hawk	M	1152-65559	30-Sep-02	AHY	27-Apr-08	≥7 <sup>th</sup> yr	100 Mile House, BC, Canada	1264	found dead
Cooper's Hawk	F	1705-40465	23-Sep-98	HY	16-Feb-08	9 <sup>th</sup> yr	Ajo, AZ	746	found dead
Cooper's Hawk	F	1705-24082	25-Sep-98	HY	24-Mar-08	9 <sup>th</sup> yr	Tucson, AZ	838	found dead
Cooper's Hawk	F	1005-05216	23-Sep-99	ASY	21-Jun-08	≥11 <sup>th</sup> yr	Libby, MT	725	raptor kill
Cooper's Hawk	M	0804-31120	30-Sep-05	HY	07-Oct-08	TY	Valley Farms, AZ	759	found dead
Red-tailed Hawk	U	1177-06347	14-Oct-02	AHY	01-Apr-08	≥7 <sup>th</sup> yr	Coeur D'Alene, ID	713	found dead
Red-tailed Hawk	U	1807-81034	19-Sep-02	HY	03-Apr-08	5 <sup>th</sup> yr	Los Mochis, Sinaloa, Mexico	1463	shot dead
Red-tailed Hawk	U	1807-81559	02-Sep-01	HY	19-Apr-08	8 <sup>th</sup> yr	Jackpot, NV	178	found dead
Red-tailed Hawk	U	1807-81158	27-Oct-08	HY	11-Nov-08	HY	Orange County, CA	737	cap/release

<sup>1</sup> 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.

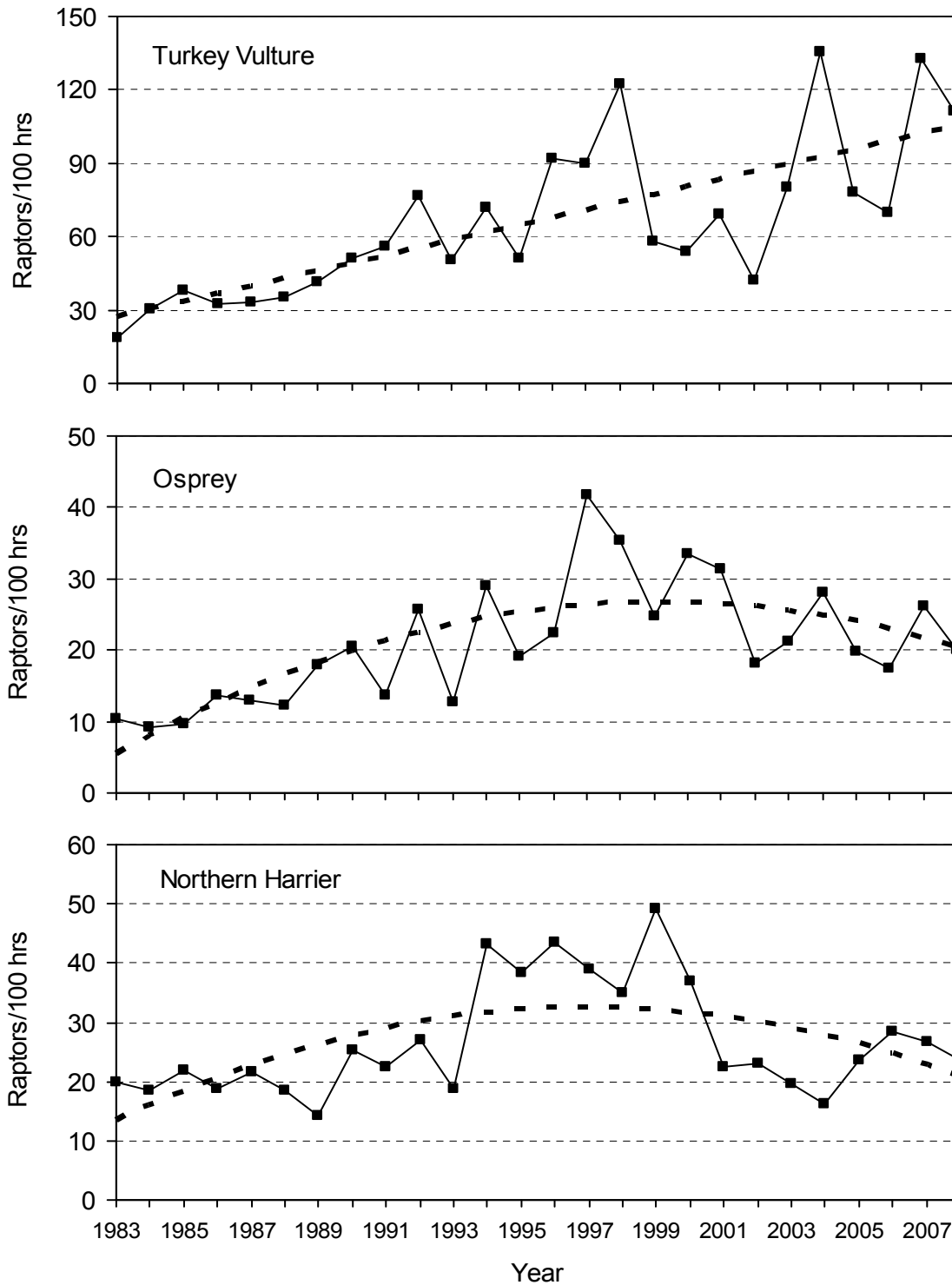


**Figure 1. Location of the Goshute Mountains Raptor Migration Project study site.**

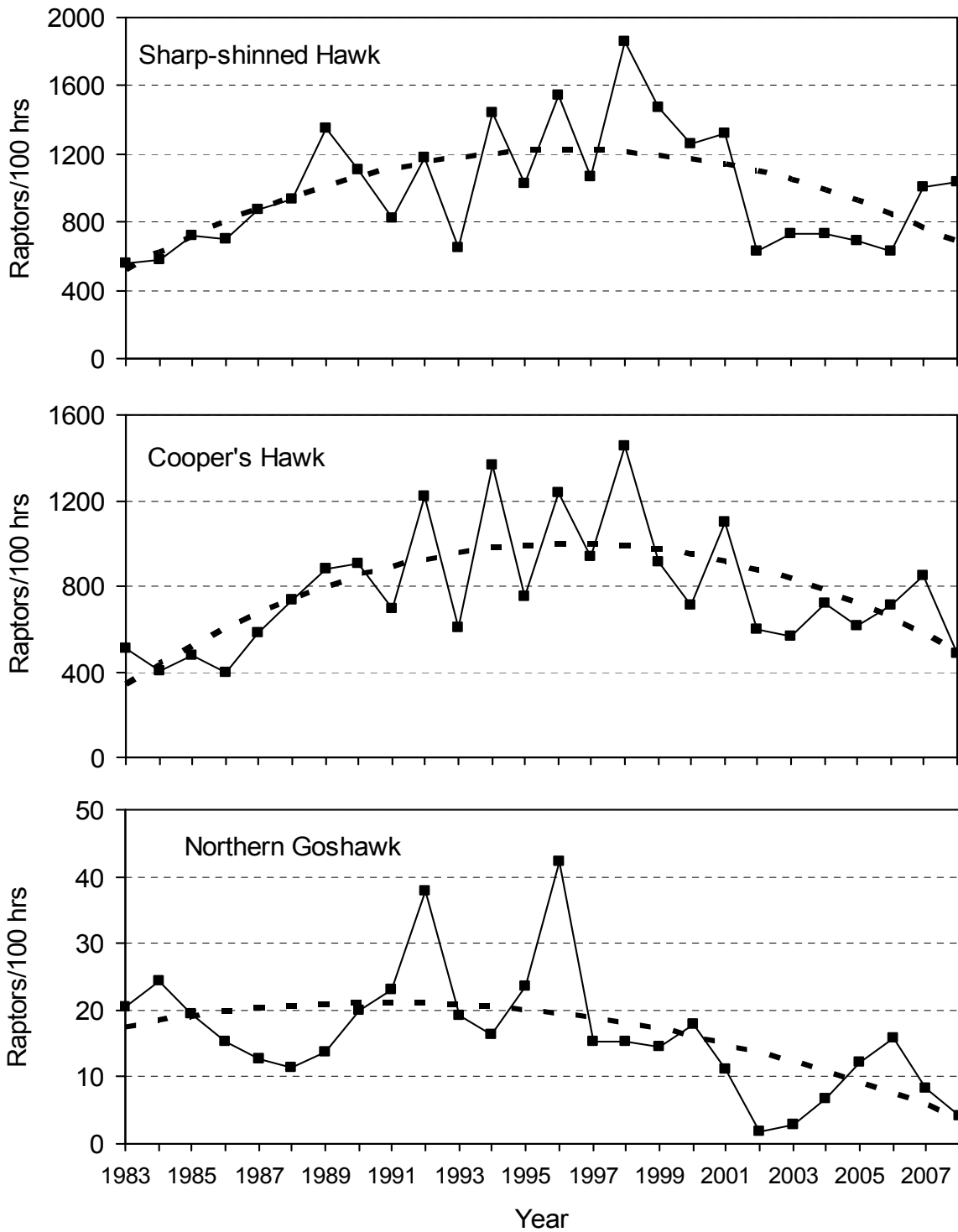


**Figure 2. Fall migration flight composition by major species groups in the Goshute Mountains, Nevada: 1983–2007 versus 2008.**

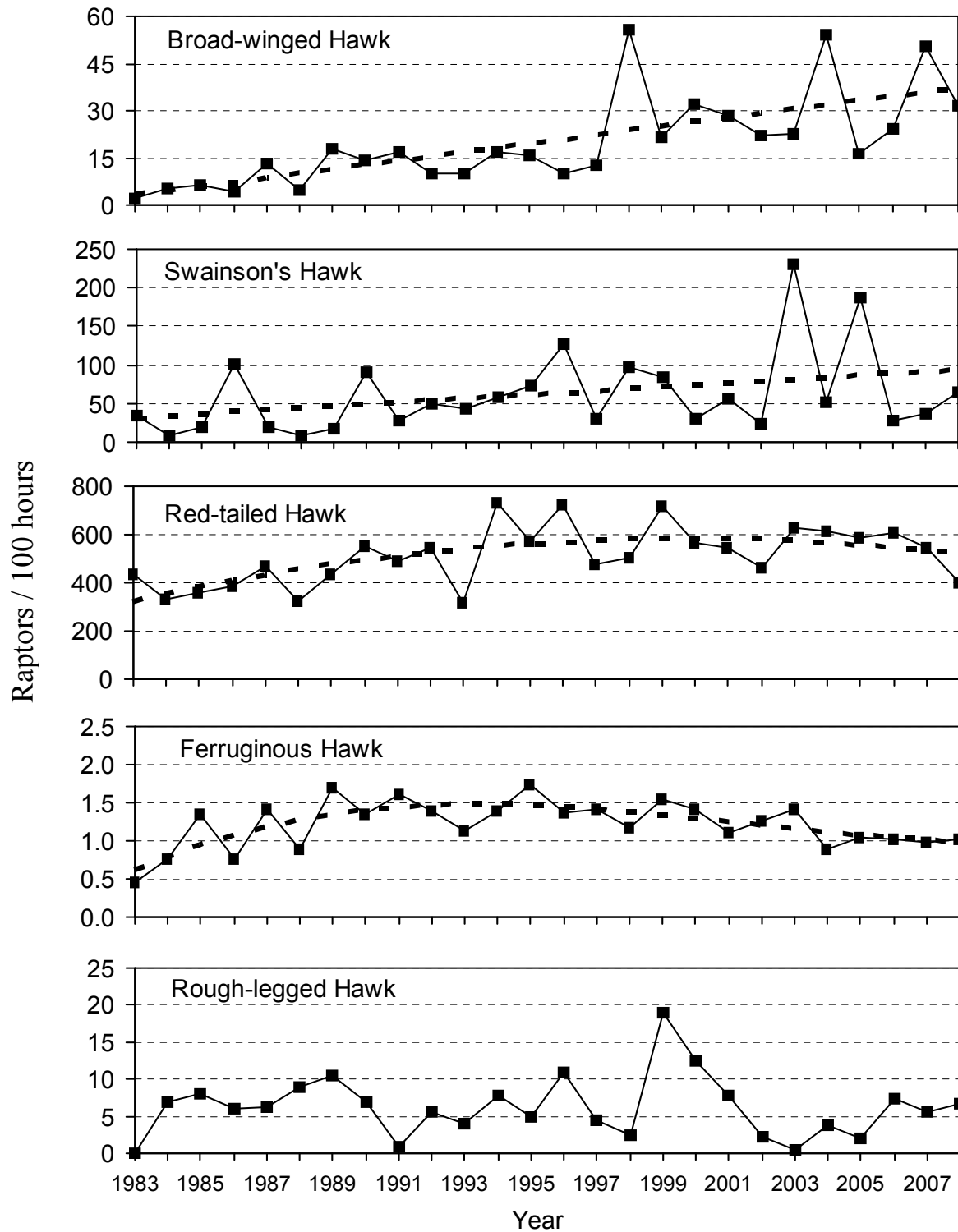




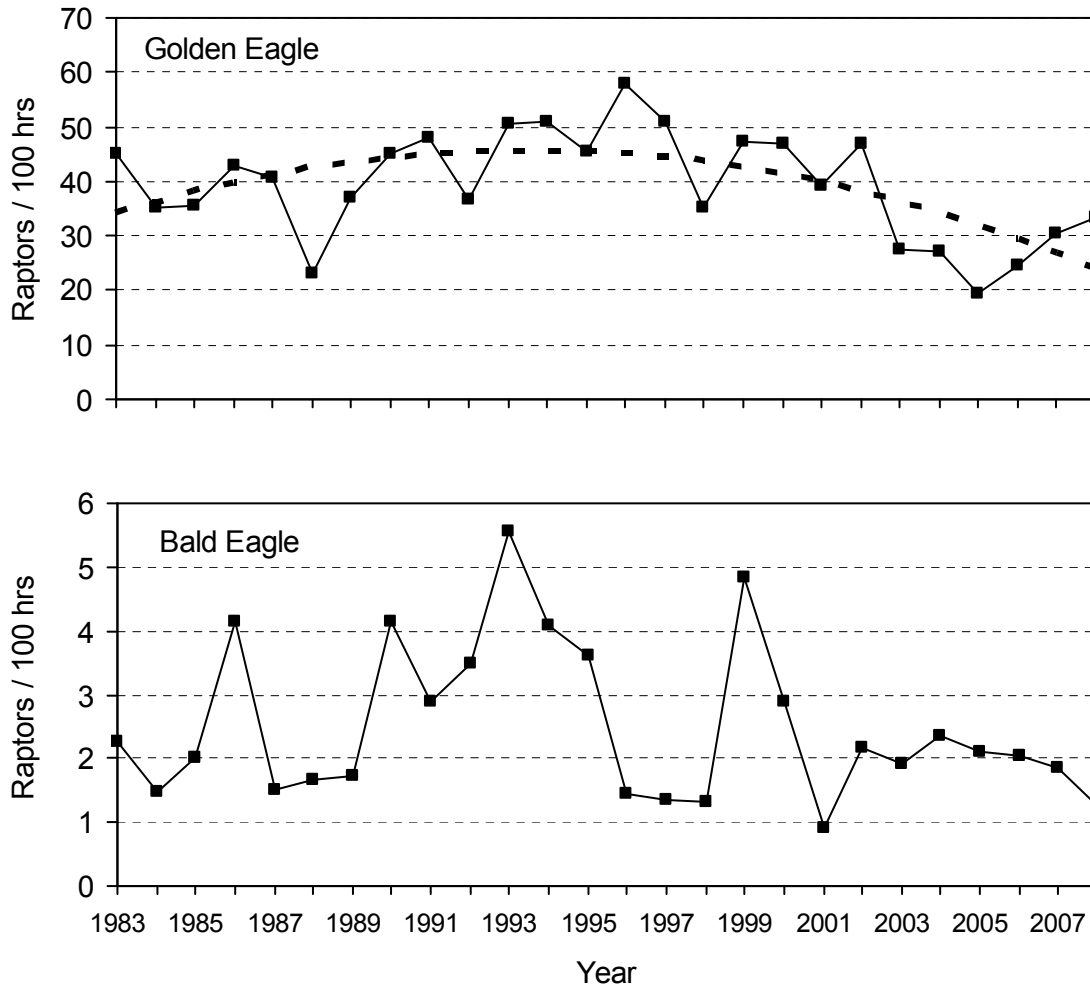
**Figure 3. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for Turkey Vultures, Ospreys, and Northern Harriers: 1983–2008. Dashed lines indicate significant linear or quadratic regressions.**



**Figure 4. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks: 1983–2008. 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: 1983–2008. 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: 1983–2008. Dashed lines indicate significant linear or quadratic regressions.**

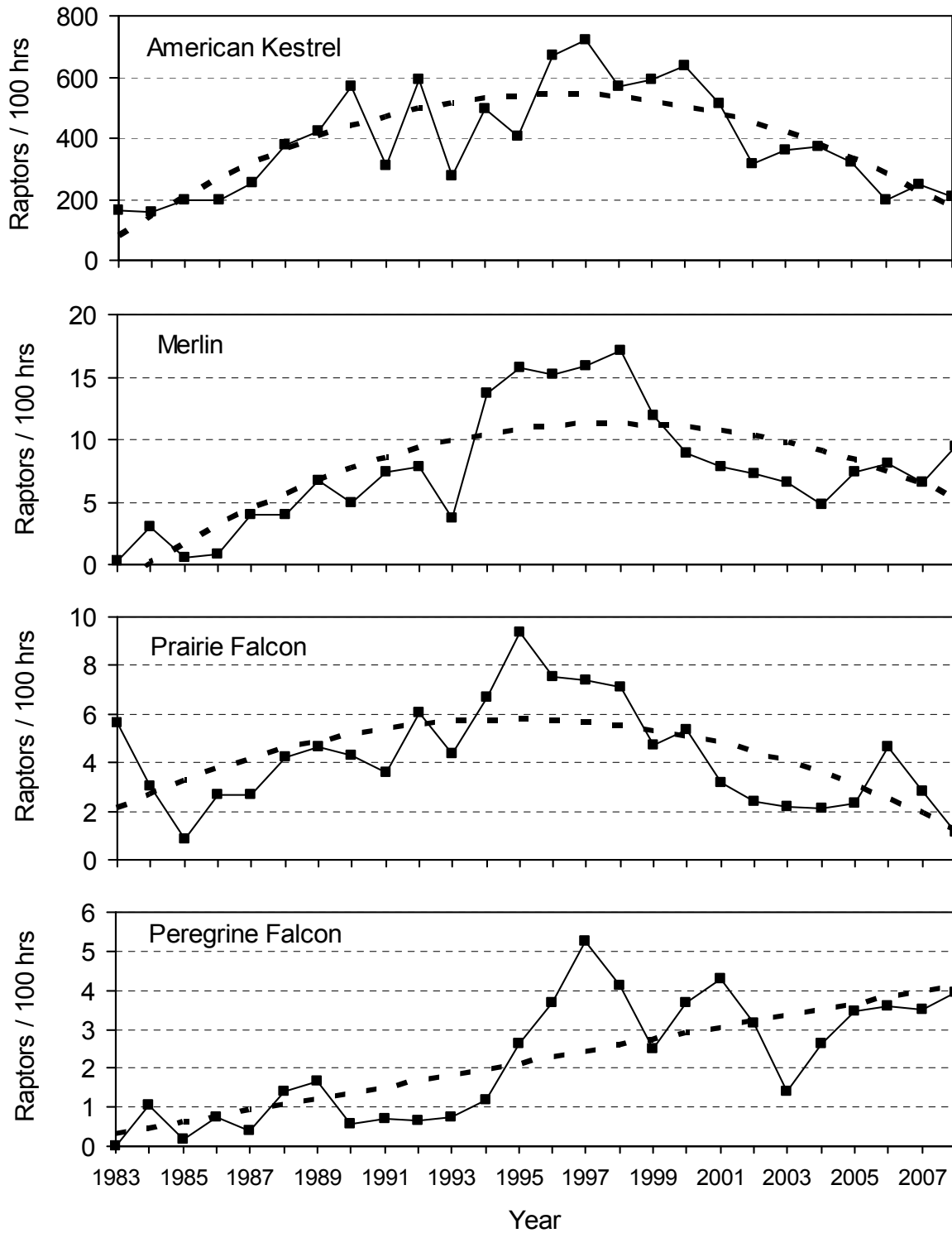
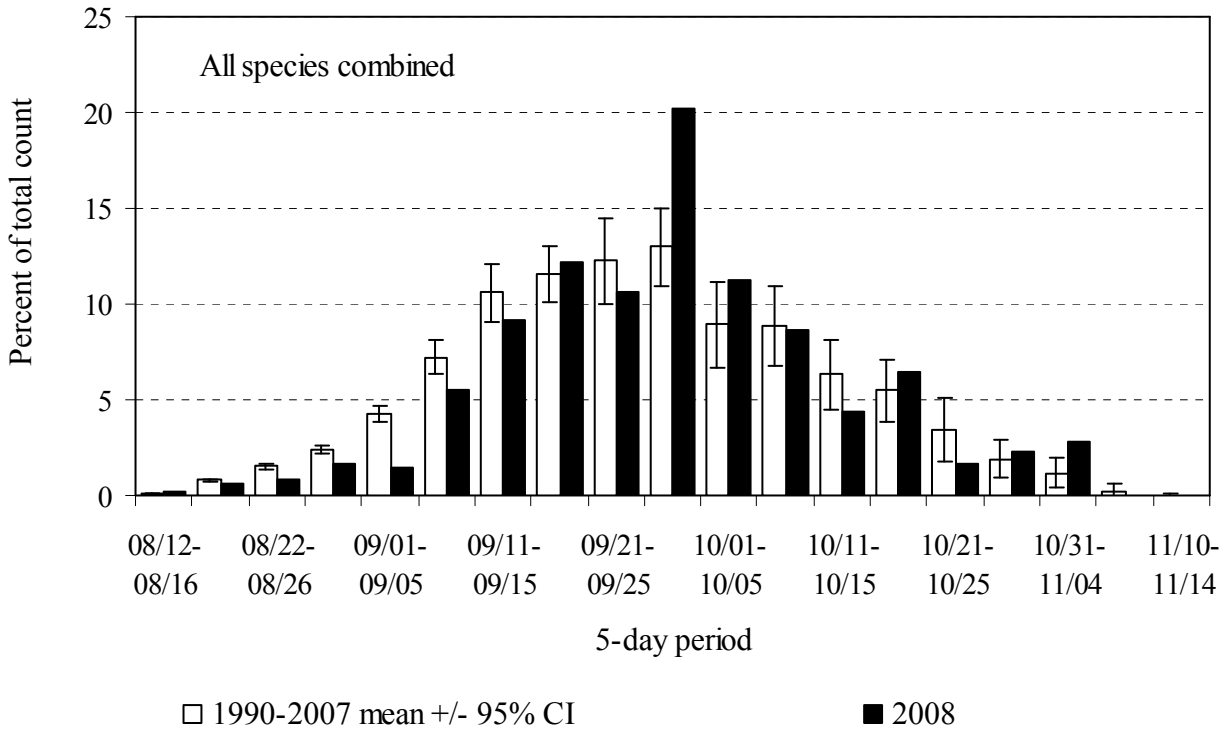


Figure 7. Adjusted fall-migration passage rates in the Goshute Mountains, Nevada for American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons: 1983–2008. Dashed lines indicate significant linear or quadratic regressions.



**Figure 8. Combined-species passage volume by five-day periods: 1990–2007 versus 2008.**

## **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)<sup>1</sup>; 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).

**2008:** Two observers throughout. Steve Seibel (6+) and Jeremy Russell (1+).

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<sup>1</sup> 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 <sup>1</sup>	SEX <sup>2</sup>	COLOR MORPH <sup>3</sup>
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 <sup>4</sup>	U	NA
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BE	I, S1, S2, NA, A, U <sup>5</sup>	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

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

<sup>2</sup> Sex codes: M = male, F = female, U = unknown.

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

<sup>4</sup> 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.

<sup>5</sup> 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: 2008.**

DATE	OBS. HOURS	OBSRVR / HOUR <sup>1</sup>	MEDIAN	PREDOMINANT WEATHER <sup>3</sup>	WIND	WIND DIRECTION	TEMP (°C) <sup>1</sup>	BAROM.	MEDIAN	VISIB.	VISIB.	MEDIAN	BIRDS / HOUR
			VISITOR DISTURB <sup>2</sup>		SPEED (KPH) <sup>1</sup>			PRESS. (IN HG) <sup>1</sup>	THERMAL LIFT <sup>4</sup>	WEST (KM) <sup>1</sup>	EAST (KM) <sup>1</sup>	FLIGHT DISTANCE <sup>5</sup> / HOUR	
15-Aug	8.50	2.0	0	clr	6.3	n-e	21.6	30.47	3	55	55	2	2.5
16-Aug	8.50	1.9	0	clr	6.5	ne	20.5	30.44	3	100	96	2	1.2
17-Aug	8.00	2.0	0	clr	6.6	ne	22.6	30.42	2	100	98	2	1.9
18-Aug	9.00	1.9	0	clr-ovc	5.7	n-ne, w	25.1	30.37	3	100	94	2	0.9
19-Aug	8.50	2.0	0	clr-ovc	11.7	w	24.9	30.28	3	93	100	2	3.8
20-Aug	8.00	2.0	0	clr	7.0	nw	23.0	30.29	2	100	95	2	0.8
21-Aug	8.00	2.0	0	clr	18.3	w	24.1	30.22	2	100	100	2	2.3
22-Aug	8.50	2.0	0	clr	5.9	ne	20.2	30.42	3	100	74	2	2.9
23-Aug	8.50	1.9	0	clr-pc	5.6	ne, w	24.8	30.46	2	100	100	2	2.6
24-Aug	9.00	1.9	0	clr-pc	2.8	n, w	25.7	30.47	2	100	100	2	1.6
25-Aug	9.00	2.4	0	clr-mc	13.4	w	27.5	30.31	2	100	96	1	3.1
26-Aug	9.25	2.0	0	clr-pc	5.5	ne, w	20.3	30.33	3	82	76	2	4.9
27-Aug	8.50	2.0	0	clr-pc	8.2	wnw	24.0	30.41	2	100	98	2	2.9
28-Aug	9.00	2.0	0	clr	2.2	n-e	20.3	30.48	2	100	93	3	2.9
29-Aug	8.50	2.0	0	clr	3.9	var	21.0	30.43	2	100	96	2	4.4
30-Aug	8.50	2.0	0	pc-ovc	20.3	w	26.0	30.19	2	99	99	3	8.2
31-Aug	5.83	1.8	0	clr-ovc, PM scat ts	16.8	w	16.3	29.93	3	90	74	2	7.4
01-Sep	8.00	2.0	0	clr-pc	11.3	w	10.3	30.23	2	96	99	1	2.8
02-Sep	8.50	2.0	0	clr	3.0	ne	11.9	30.43	3	100	100	2	2.4
03-Sep	9.00	1.7	0	clr	3.5	ne, w	16.3	30.42	2	100	100	3	5.0
04-Sep	8.50	2.0	0	clr	7.0	w	20.2	30.34	3	100	98	2	5.1
05-Sep	9.00	2.0	0	clr	4.0	ne, w	17.8	30.38	2	100	95	3	12.6
06-Sep	9.50	2.0	0	clr	2.3	ne, w	18.7	30.41	2	100	98	2	18.3
07-Sep	9.00	2.2	0	clr-pc	2.9	n-ne, w	20.5	30.35	1	100	98	2	13.8
08-Sep	8.50	2.0	0	clr-pc	1.3	ne	21.6	30.31	2	100	99	2	16.1
09-Sep	6.75	1.9	0	mc-ovc, PM scat ts/rains	11.2	w	16.9	30.18	3	93	88	2	20.0
10-Sep	9.35	2.5	0	ovc, AM scat rain	8.4	ne, w	12.5	30.19	3	63	83	1	25.2
11-Sep	9.75	2.0	0	clr	3.8	ne, w	12.0	30.28	2	100	96	3	30.9
12-Sep	9.50	2.0	0	clr	5.1	w	16.4	30.34	2	100	100	2	16.3
13-Sep	8.50	2.0	0	clr	3.4	ne, w	19.9	30.39	1	100	98	2	23.6
14-Sep	9.00	2.0	0	clr	4.7	ne, w	19.5	30.54	1	100	96	3	26.3
15-Sep	9.00	2.0	0	clr	6.2	ne	19.2	30.60	2	98	98	2	36.9
16-Sep	9.50	2.0	0	clr	3.6	ne, w	20.3	30.53	2	97	100	2	20.2
17-Sep	9.75	1.9	0	clr-ovc	4.2	n-ne, w	21.2	30.47	4	92	82	2	24.2
18-Sep	9.00	2.0	0	pc-ovc, PM rain	3.0	var	18.3	30.45	3	100	94	2	38.7
19-Sep	9.75	2.6	0	pc-ovc	4.9	n-ne, w	19.1	30.38	2	100	100	2	40.0
20-Sep	9.50	2.9	0	clr-mc	13.3	w	18.2	30.19	3	100	96	3	50.8
21-Sep	8.75	2.0	0	clr-ovc	5.4	ne, w	15.1	30.21	2	100	100	2	23.8
22-Sep	9.00	2.0	0	clr-pc	7.8	w	12.2	30.37	2	93	82	2	10.1
23-Sep	9.33	1.9	0	clr-mc	3.5	var	13.7	30.49	2	100	98	3	28.9
24-Sep	9.50	2.0	0	clr	5.7	e, w	16.3	30.47	3	100	100	2	26.8
25-Sep	10.25	2.0	0	clr-mc	17.0	wsw	19.3	30.42	3	95	95	2	41.5
26-Sep	9.25	2.0	0	clr-pc	5.2	ne	17.9	30.51	2	100	98	2	52.2
27-Sep	10.00	2.0	0	clr-pc	3.5	n-ne, wsw	20.7	30.50	1	100	100	2	44.6
28-Sep	10.00	2.8	0	clr-pc	6.8	ne	18.7	30.56	2	100	99	2	80.0
29-Sep	10.00	2.0	0	clr-pc	7.6	ne	18.2	30.58	2	100	100	2	33.0
30-Sep	8.00	2.0	0	clr-mc	1.1	n-e	19.6	30.63	2	100	96	2	24.3

Appendix C. continued

DATE	OBS. HOURS	OBSRVR / HOUR <sup>1</sup>	MEDIAN	PREDOMINANT WEATHER <sup>3</sup>	WIND	WIND DIRECTION	TEMP (°C) <sup>1</sup>	BAROM. PRESS.	MEDIAN THERMAL	VISIB. WEST	VISIB. EAST	MEDIAN FLIGHT	BIRDS / HOUR
			VISITOR DISTURB <sup>2</sup>		SPEED (KPH) <sup>1</sup>			(IN HG) <sup>1</sup>	LIFT <sup>4</sup>	(KM) <sup>1</sup>	(KM) <sup>1</sup>	DISTANCE <sup>5</sup>	
01-Oct	9.50	2.0	0	clr-mc	2.0	ne	18.5	30.54	2	100	100	2	27.4
02-Oct	8.75	2.0	0	mc-ovc, PM scat ts/rain	14.1	ws	18.0	30.29	4	62	59	2	39.3
03-Oct	9.25	2.0	0	ovc	3.4	n-e, w	15.5	30.10	3	100	72	2	59.4
04-Oct	4.50	1.4	0	ovc, AM fog	15.0	w	7.3	29.88	4	37	38	2	8.0
05-Oct	9.00	1.9	0	pc-ovc	4.9	w	8.6	30.12	3	100	100	2	4.1
06-Oct	9.00	2.0	0	clr	2.9	w	10.0	30.43	2	100	100	2	21.9
07-Oct	9.50	2.0	0	clr	17.0	w	14.4	30.52	2	100	100	2	27.6
08-Oct	9.75	2.0	0	clr	9.3	ne, w	11.4	30.35	4	100	100	2	29.6
09-Oct	9.50	2.0	0	clr-pc	26.3	w	9.3	29.90	2	100	100	3	29.7
10-Oct	8.25	2.0	0	clr-ovc, PM scat snow	5.0	ne	-0.2	29.80	3	100	86	2	8.1
11-Oct	0.00			Weather Day: snow									
12-Oct	6.50	1.7	0	ovc, snow	4.6	w	-0.4	30.08	4	37	17	2	2.9
13-Oct	9.00	2.0	0	clr	3.8	ne	1.5	30.52	3	100	100	2	14.6
14-Oct	9.75	2.0	0	clr	3.9	var	7.9	30.48	3	93	100	2	32.2
15-Oct	9.50	2.0	0	clr	23.0	w	11.3	30.40	4	100	100	2	16.1
16-Oct	9.00	1.9	0	clr	3.7	w	12.4	30.54	2	100	100	2	18.7
17-Oct	8.75	2.0	0	clr	4.3	w	15.1	30.60	2	100	100	2	24.7
18-Oct	9.00	2.0	0	clr-pc	7.5	w	13.7	30.38	3	100	100	2	11.9
19-Oct	8.50	2.0	0	pc-mc	4.4	ne	12.8	30.39	2	100	100	2	17.9
20-Oct	8.00	2.0	0	clr-ovc	10.9	w	12.1	30.33	3	100	98	2	3.3
21-Oct	8.17	1.9	0	clr	9.1	w	6.3	30.45	3	100	100	2	2.3
22-Oct	8.00	2.0	0	clr	3.9	ene, wsw	4.7	30.63	3	100	100	2	5.0
23-Oct	8.33	2.0	0	clr	7.6	w	12.0	30.44	3	100	100	2	8.0
24-Oct	8.75	2.2	0	clr-pc, AM haze	10.6	wnw	11.1	30.44	3	99	90	2	5.4
25-Oct	8.75	2.0	0	clr	11.6	wnw	13.7	30.51	3	100	100	2	8.1
26-Oct	8.25	1.9	0	clr	10.4	ne	10.3	30.65	3	100	100	2	4.5
27-Oct	8.25	2.0	0	clr	8.7	ws	15.7	30.69	2	100	100	4	8.1
28-Oct	8.00	2.0	0	clr-mc	8.3	ws	17.2	30.64	2	100	100	2	5.6
29-Oct	8.75	1.9	0	clr	10.9	w	13.7	30.45	3	80	79	2	6.5
30-Oct	8.50	2.0	0	clr-pc	20.1	w	14.1	30.44	3	96	96	2	20.1
31-Oct	7.50	2.0	0	ovc	25.1	w	11.6	30.50	3	100	100	2	11.2
01-Nov	8.25	2.0	0	ovc	19.8	w	12.0	30.39	3	100	89	2	9.1
02-Nov	1.50	1.0	0	pc-ovc, AM fog/scat snow	28.9	ws	3.4	30.03	4	22	16	-	0.0
03-Nov	8.00	2.0	0	ovc, PM scat snow	15.6	w	5.4	29.98	4	88	88	2	1.8
04-Nov	5.00	2.0	0	mc-ovc, PM snow	32.7	w	-0.9	29.78	4	66	33	2	0.6
05-Nov	3.00	1.5	0	mc-ovc, AM fog/snow	25.4	w	-2.0	30.08	4	57	31	-	0.0

<sup>1</sup> Average of hourly records.

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

<sup>3</sup> 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.

<sup>4</sup> 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.

<sup>5</sup> 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: 2008.**

DATE	HOURS	SPECIES <sup>1</sup>																								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	8.50	3	0	1	1	0	0	0	0	0	0	0	2	8	0	0	1	0	0	0	4	0	1	0	0	0	0	0	21	2.5
16-Aug	8.50	0	0	1	1	0	0	0	0	0	0	0	0	4	0	0	0	3	0	0	1	0	0	0	0	0	0	10	1.2	
17-Aug	8.00	3	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	3	0	0	0	0	0	0	0	0	0	15	1.9	
18-Aug	9.00	2	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	2	0	0	1	0	0	0	0	0	0	8	0.9	
19-Aug	8.50	4	1	4	0	3	0	0	0	0	0	0	0	10	0	0	0	3	0	0	7	0	0	0	0	0	0	32	3.8	
20-Aug	8.00	0	0	0	1	1	0	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	0	0	0	6	0.8	
21-Aug	8.00	4	0	1	0	0	0	0	0	0	0	0	3	5	0	0	1	4	0	0	0	0	0	0	0	0	18	2.3		
22-Aug	8.50	0	1	2	0	5	0	0	0	0	0	0	2	11	0	0	1	0	0	0	3	0	0	0	0	0	0	25	2.9	
23-Aug	8.50	1	0	1	2	4	0	0	0	0	0	0	0	12	0	0	1	0	0	0	1	0	0	0	0	0	0	22	2.6	
24-Aug	9.00	2	0	0	2	2	0	0	0	0	0	0	2	5	0	0	0	0	0	0	1	0	0	0	0	0	0	14	1.6	
25-Aug	9.00	0	1	4	4	1	0	1	0	0	0	0	1	0	0	0	10	0	0	0	6	0	0	0	0	0	0	28	3.1	
26-Aug	9.25	2	1	4	2	2	0	0	0	0	0	0	5	12	0	0	1	4	0	0	11	0	0	1	0	0	0	45	4.9	
27-Aug	8.50	0	1	0	4	2	0	0	0	0	0	0	1	12	0	0	0	1	0	0	3	0	0	1	0	0	0	25	2.9	
28-Aug	9.00	2	0	0	1	0	0	0	0	1	0	0	5	11	0	0	0	0	0	0	6	0	0	0	0	0	0	26	2.9	
29-Aug	8.50	5	3	1	6	2	0	0	0	0	0	0	1	12	0	0	0	0	0	7	0	0	0	0	0	0	0	37	4.4	
30-Aug	8.50	4	0	5	8	13	0	0	0	0	0	0	8	20	0	0	1	6	0	0	4	0	0	1	0	0	0	70	8.2	
31-Aug	5.83	8	1	1	3	6	0	0	0	1	0	0	4	14	0	0	0	2	0	0	1	0	0	2	0	0	0	43	7.4	
01-Sep	8.00	2	0	2	5	0	0	1	0	0	0	0	0	6	0	0	0	5	0	0	1	0	0	0	0	0	0	22	2.8	
02-Sep	8.50	0	1	0	2	2	1	0	0	0	0	0	5	7	0	0	1	0	0	0	1	0	0	0	0	0	0	20	2.4	
03-Sep	9.00	5	2	1	13	5	0	1	0	0	0	0	0	10	0	0	0	1	0	0	7	0	0	0	0	0	0	45	5.0	
04-Sep	8.50	3	0	0	14	6	0	0	0	0	0	0	0	5	0	0	1	0	0	0	14	0	0	0	0	0	0	43	5.1	
05-Sep	9.00	3	2	1	32	20	0	3	4	1	0	0	6	19	0	0	1	2	0	0	19	0	0	0	0	0	0	113	12.6	
06-Sep	9.50	2	0	2	73	38	0	1	0	1	0	0	1	22	0	0	1	1	0	0	29	1	0	2	0	0	0	174	18.3	
07-Sep	9.00	3	2	6	33	14	1	2	0	0	0	0	8	16	0	0	0	1	0	0	35	0	0	2	0	0	1	124	13.8	
08-Sep	8.50	3	0	2	57	19	0	1	0	0	0	1	6	17	0	0	2	0	0	0	29	0	0	0	0	0	0	137	16.1	
09-Sep	6.75	4	2	2	60	33	0	0	0	0	0	1	3	8	0	0	0	0	0	0	21	0	1	0	0	0	0	135	20.0	
10-Sep	9.35	37	10	1	85	44	0	7	0	0	0	1	12	30	0	0	3	1	0	0	2	0	0	2	0	0	1	236	25.2	
11-Sep	9.75	20	0	5	125	70	1	5	0	0	0	0	2	35	0	0	8	2	0	0	25	1	0	1	0	0	1	301	30.9	
12-Sep	9.50	4	1	0	55	43	0	6	0	1	0	1	5	18	0	0	0	1	0	0	19	1	0	0	0	0	0	155	16.3	
13-Sep	8.50	3	2	2	72	48	0	5	0	0	0	0	3	15	0	0	2	1	0	0	44	0	0	3	1	0	0	201	23.6	
14-Sep	9.00	7	4	0	77	62	0	3	0	0	0	4	7	23	0	0	0	1	0	0	45	1	1	2	0	0	0	237	26.3	
15-Sep	9.00	13	4	3	126	76	1	1	0	0	0	7	13	51	0	0	6	1	0	0	29	1	0	0	0	0	0	332	36.9	
16-Sep	9.50	4	1	1	105	47	0	1	0	0	0	2	2	8	1	0	0	0	0	0	19	0	0	0	0	0	1	192	20.2	
17-Sep	9.75	11	0	2	92	47	1	35	0	0	0	0	3	25	0	0	1	4	0	0	12	0	0	2	0	0	1	236	24.2	
18-Sep	9.00	37	2	2	141	109	0	7	0	0	0	0	2	20	0	0	1	2	0	0	23	2	0	0	0	0	0	348	38.7	

Appendix D. continued

DATE	HOURS	SPECIES <sup>1</sup>																								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
19-Sep	9.75	28	2	2	181	98	0	4	0	1	0	3	10	39	0	0	3	1	0	0	15	0	0	0	2	0	0	1	390	40.0
20-Sep	9.50	8	2	1	257	141	0	5	0	0	0	3	2	14	0	0	1	7	0	0	40	1	1	0	0	0	0	0	483	50.8
21-Sep	8.75	44	0	0	71	45	1	0	0	1	0	0	6	12	0	0	0	1	0	0	25	2	0	0	0	0	0	0	208	23.8
22-Sep	9.00	47	0	3	12	15	0	0	0	1	0	0	2	10	0	0	0	0	0	1	0	0	0	0	0	0	0	91	10.1	
23-Sep	9.33	16	3	0	72	50	1	3	0	0	0	8	21	84	0	0	0	0	0	11	1	0	0	0	0	0	0	270	28.9	
24-Sep	9.50	2	4	2	145	61	2	8	0	0	0	3	2	18	0	0	0	0	0	8	0	0	0	0	0	0	0	255	26.8	
25-Sep	10.25	3	5	4	208	81	0	8	0	0	0	1	9	17	0	0	0	3	0	0	79	0	0	2	0	0	0	5	425	41.5
26-Sep	9.25	70	6	3	233	63	0	7	0	0	0	4	10	38	1	0	1	2	0	0	44	1	0	0	0	0	0	0	483	52.2
27-Sep	10.00	43	4	4	173	63	0	5	0	0	0	5	7	67	0	0	3	6	0	0	62	2	1	0	0	0	0	1	446	44.6
28-Sep	10.00	43	4	3	284	111	0	8	0	0	0	24	32	234	1	0	2	6	0	0	42	4	0	0	1	0	0	1	800	80.0
29-Sep	10.00	28	2	2	134	64	0	2	0	1	0	3	1	67	0	0	1	0	0	22	2	0	0	0	0	0	0	1	330	33.0
30-Sep	8.00	1	1	4	77	28	1	14	0	0	0	1	12	38	1	0	1	3	0	0	6	0	0	0	0	0	0	6	194	24.3
01-Oct	9.50	1	1	0	132	58	0	5	0	0	0	1	2	36	0	0	0	1	0	0	22	0	0	0	0	0	0	1	260	27.4
02-Oct	8.75	0	3	6	223	42	1	3	1	0	0	2	1	16	0	0	0	4	0	0	34	6	0	0	0	0	0	2	344	39.3
03-Oct	9.25	25	1	1	250	105	0	5	0	0	0	3	7	126	1	0	2	3	0	0	17	2	0	0	0	0	0	1	549	59.4
04-Oct	4.50	1	0	0	7	2	0	0	0	0	0	0	2	20	0	0	0	1	0	0	3	0	0	0	0	0	0	0	36	8.0
05-Oct	9.00																													
06-Oct	9.00	48	1	1	54	23	0	6	0	0	0	1	1	32	0	0	5	1	0	0	21	0	2	0	0	0	0	1	197	21.9
07-Oct	9.50	19	2	4	128	28	0	8	0	1	0	1	3	30	0	0	6	3	0	0	21	2	1	1	0	0	0	4	262	27.6
08-Oct	9.75	3	0	3	140	20	1	1	0	0	0	0	0	96	0	1	1	8	0	0	14	1	0	0	0	0	0	0	289	29.6
09-Oct	9.50	2	3	5	97	30	0	8	0	0	0	0	2	91	0	0	7	4	0	0	24	2	0	0	0	0	1	6	282	29.7
10-Oct	8.25	0	0	1	21	1	0	0	0	0	0	0	0	38	0	0	1	3	0	0	0	0	0	0	0	0	0	2	67	8.1
11-Oct	0.00																													
12-Oct	6.50	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	1	0	0	0	0	0	0	0	0	0	1	19	2.9
13-Oct	9.00	0	0	2	8	2	0	6	0	0	0	0	0	104	0	0	1	4	0	0	0	1	0	0	0	0	0	3	131	14.6
14-Oct	9.75	3	0	2	62	14	3	3	0	0	0	1	0	203	0	2	2	14	0	0	4	0	0	0	0	0	0	1	314	32.2
15-Oct	9.50	1	0	3	106	4	2	1	0	0	0	0	0	21	0	0	0	11	0	0	1	3	0	0	0	0	0	0	153	16.1
16-Oct	9.00	0	0	5	91	13	0	6	0	0	0	0	1	35	1	0	1	11	0	0	3	1	0	0	0	0	0	0	168	18.7
17-Oct	8.75	0	0	6	145	8	3	0	0	0	0	0	0	43	0	3	0	6	0	0	1	1	0	0	0	0	0	0	216	24.7
18-Oct	9.00	0	0	6	62	13	0	1	1	0	0	0	0	14	0	1	0	3	0	0	2	2	0	0	0	0	1	1	107	11.9
19-Oct	8.50	0	1	1	58	10	3	2	0	0	0	0	1	57	0	1	1	11	0	0	2	3	0	0	0	0	0	1	152	17.9
20-Oct	8.00	0	0	3	17	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	3.3
21-Oct	8.17	0	0	1	10	2	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	1	0	0	0	0	0	0	19	2.3
22-Oct	8.00	0	0	0	1	1	0	0	0	0	0	0	0	34	0	0	0	3	0	0	0	0	0	0	0	0	0	1	40	5.0
23-Oct	8.33	0	0	0	12	5	0	0	0	0	0	0	0	43	0	1	0	5	0	0	0	1	0	0	0	0	0	0	67	8.0

Appendix D. continued

DATE	HOURS	SPECIES <sup>1</sup>																								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
24-Oct	8.75	0	0	2	10	2	0	0	0	0	0	0	0	27	0	0	0	4	0	0	0	0	0	0	0	0	0	2	47	5.4
25-Oct	8.75	0	0	1	13	5	0	2	0	0	0	0	0	30	0	4	0	12	2	0	1	0	0	0	0	0	1	71	8.1	
26-Oct	8.25	0	0	1	13	0	0	0	0	0	0	0	0	18	0	0	0	5	0	0	0	0	0	0	0	0	0	37	4.5	
27-Oct	8.25	0	0	5	25	3	1	0	0	0	0	0	0	31	0	0	0	1	1	0	0	0	0	0	0	0	0	67	8.1	
28-Oct	8.00	0	0	2	27	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	0	0	0	0	0	0	0	45	5.6	
29-Oct	8.75	0	0	1	22	1	0	1	0	0	0	0	0	29	0	0	0	2	0	0	0	1	0	0	0	0	0	57	6.5	
30-Oct	8.50	0	0	6	93	11	0	0	0	1	0	0	0	43	1	0	1	9	2	0	2	1	0	0	0	0	1	171	20.1	
31-Oct	7.50	0	1	4	30	0	1	0	0	0	0	0	0	32	3	1	6	5	0	0	0	0	1	0	0	0	0	84	11.2	
01-Nov	8.25	0	0	0	39	1	1	0	0	0	0	0	0	23	0	1	0	4	1	0	1	2	1	0	0	0	1	75	9.1	
02-Nov	1.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0	
03-Nov	8.00	0	1	0	7	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	1	0	0	0	0	0	14	1.8	
04-Nov	5.00	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	3	0.6	
05-Nov	3.00	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	
Total	698.51	637	89	157	4953	1951	27	202	6	11	0	81	248	2434	10	15	90	225	6	0	959	51	10	22	4	0	2	50	12240	17.5

<sup>1</sup> See Appendix B for explanation of species codes.

**Appendix E. Annual summaries of observation effort and unadjusted raptor counts by species: 1983–2008.**

	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 <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown large accipiter <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-
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 <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-
Unknown large falcon <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-
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

<sup>1</sup> Designations used consistently beginning in 2002.

## Appendix E. continued

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	MEAN
Start Date	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	14-Aug
End Date	4-Nov	5-Nov	31-Oct	5-Nov	5-Nov	5-Nov	5-Nov	5-Nov	5-Nov	5-Nov	5-Nov	5-Nov	5-Nov	3-Nov
Observation days	74	79	71	82	78	83	81	79	76	83	82	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	698.51	669.90
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	1,758	2,143
SPECIES	RAPTOR COUNTS													
Turkey Vulture	486	482	732	349	297	441	243	466	685	445	355	735	637	367
Osprey	99	187	176	110	152	152	83	96	120	83	68	113	89	92
Northern Harrier	255	255	247	356	233	178	154	127	96	153	177	186	158	172
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	4,967	4,520
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	1,957	3,116
Northern Goshawk	241	97	99	84	123	80	11	16	41	74	95	55	27	98
Unknown small accipiter <sup>1</sup>	-	-	-	-	-	-	246	268	299	521	57	360	204	279
Unknown large accipiter <sup>1</sup>	-	-	-	-	-	-	4	3	11	32	6	1	6	9
Unknown accipiter	464	368	75	132	87	56	7	0	8	37	9	5	11	266
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	7,172	8,078
Red-shouldered Hawk	2	0	0	0	1	0	0	0	0	0	0	0	0	0.2
Broad-winged Hawk	27	37	160	59	87	79	58	58	122	36	57	122	81	51
Swainson's Hawk	498	143	507	334	132	251	91	908	197	664	109	163	248	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	2,439	3,091
Ferruginous Hawk	16	18	16	25	19	14	20	20	8	12	10	11	10	16
Rough-legged Hawk	17	10	6	50	24	23	6	1	7	6	17	13	15	14
Unidentified buteo	62	77	5	24	21	13	42	57	117	97	13	44	91	71
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	2,884	3,478
Golden Eagle	344	329	235	341	305	295	330	181	160	130	152	218	226	251
Bald Eagle	6	6	6	31	14	8	12	9	12	11	9	10	6	12
Unidentified eagle	1	0	0	0	0	0	0	0	4	0	0	0	0	1
TOTAL EAGLES	351	335	241	372	319	303	342	190	176	141	161	228	232	264
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	965	1,852
Merlin	71	78	91	59	49	51	39	33	22	40	40	34	51	40
Prairie Falcon	44	48	50	30	37	23	12	14	11	9	26	19	10	26
Peregrine Falcon	21	29	26	14	21	29	15	9	11	14	17	18	22	12
Unknown small falcon <sup>1</sup>	-	-	-	-	-	-	0	10	9	1	2	3	4	4
Unknown large falcon <sup>1</sup>	-	-	-	-	-	-	4	1	3	6	2	1	0	2
Unidentified falcon	21	7	2	7	3	2	2	2	0	4	0	2	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	1,054	1,937
Unidentified raptor	83	102	25	57	34	26	81	79	51	104	3	86	51	112
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	12,277	14,500

<sup>1</sup> Designations used consistently beginning in 2002.

**Appendix F. Daily trapping effort and captures by species: 2008.**

DATE	STATION	SPECIES <sup>1</sup>													CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	RL	GE	AK	ML	PR	PG	TOTAL	/STN HR
21-Aug	4.50	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.2
22-Aug	7.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
23-Aug	7.50	0	2	1	0	0	0	0	0	0	0	0	0	0	3	0.4
24-Aug	7.50	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0.3
25-Aug	0.00															
26-Aug	0.00															
27-Aug	0.00															
28-Aug	7.00	0	1	1	0	0	0	0	0	0	0	0	0	0	2	0.3
29-Aug	7.25	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0.3
30-Aug	6.00	0	1	1	0	0	0	2	0	0	0	0	0	0	4	0.7
31-Aug	3.50	0	1	0	0	0	0	1	0	0	0	0	0	0	2	0.6
01-Sep	7.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
02-Sep	7.50	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.1
03-Sep	7.00	0	3	3	0	0	0	0	0	0	2	0	0	0	8	1.1
04-Sep	7.25	0	5	1	0	0	0	1	0	0	2	0	0	0	9	1.2
05-Sep	8.00	0	10	3	0	0	0	0	0	0	2	0	0	0	15	1.9
06-Sep	7.75	0	17	3	0	0	0	0	0	0	2	0	0	0	22	2.8
07-Sep	8.00	0	7	4	0	0	0	0	0	0	2	0	0	0	13	1.6
08-Sep	8.00	0	21	2	0	0	0	2	0	0	3	0	0	0	28	3.5
09-Sep	5.00	0	16	8	0	0	0	0	0	0	1	0	0	0	25	5.0
10-Sep	3.25	0	15	1	0	0	0	0	0	0	0	0	0	0	16	4.9
11-Sep	7.25	0	15	15	0	0	0	0	0	0	1	0	0	0	31	4.3
12-Sep	7.50	0	8	6	0	0	0	2	0	0	3	0	0	0	19	2.5
13-Sep	8.00	1	6	5	0	0	0	0	0	0	4	1	0	0	17	2.1
14-Sep	6.00	0	19	7	0	0	0	0	0	0	1	0	0	0	27	4.5
15-Sep	0.00															
16-Sep	7.50	1	24	20	0	0	0	1	0	0	2	0	0	0	48	6.4
17-Sep	8.00	0	22	10	0	0	0	0	0	0	0	0	0	1	33	4.1
18-Sep	8.00	0	31	12	0	0	0	0	0	0	2	0	0	0	45	5.6
19-Sep	8.00	0	22	13	0	0	0	1	0	0	2	0	0	0	38	4.8
20-Sep	8.00	0	14	12	0	0	0	0	0	0	1	0	1	0	28	3.5
21-Sep	8.00	0	16	10	0	0	0	1	0	0	3	0	0	0	30	3.8
22-Sep	7.50	0	4	3	0	0	0	0	0	0	1	0	0	0	8	1.1
23-Sep	7.50	0	10	9	0	0	0	0	0	0	0	0	0	0	19	2.5
24-Sep	8.00	0	17	11	0	0	0	1	0	0	1	0	0	0	30	3.8
25-Sep	8.00	0	8	6	0	0	0	0	0	0	0	0	0	0	14	1.8
26-Sep	8.00	0	12	18	0	0	0	1	0	0	0	0	0	0	31	3.9
27-Sep	8.00	0	25	11	0	0	0	0	0	0	1	2	0	0	39	4.9
28-Sep	8.30	0	26	13	0	0	0	1	0	0	2	0	0	0	42	5.1
29-Sep	6.75	0	7	22	0	0	0	0	0	0	0	0	0	0	29	4.3
30-Sep	0.00															



## Appendix F. continued

DATE	STATION	SPECIES <sup>1</sup>													CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	RL	GE	AK	ML	PR	PG	TOTAL	/STN HR
01-Oct	7.50	0	17	10	0	0	0	0	0	0	2	0	0	0	29	3.9
02-Oct	7.00	0	17	9	0	0	0	1	0	0	1	2	0	0	30	4.3
03-Oct	8.00	0	25	18	0	0	0	0	0	0	0	0	0	0	43	5.4
04-Oct	0.00															
05-Oct	7.00	0	0	2	0	0	0	0	0	0	0	0	0	0	2	0.3
06-Oct	7.50	0	15	8	0	0	0	1	0	0	1	0	0	0	25	3.3
07-Oct	8.25	0	18	2	0	0	0	0	0	0	0	0	0	0	20	2.4
08-Oct	8.00	0	16	16	1	0	0	1	0	0	0	0	0	0	34	4.3
09-Oct	7.50	0	4	1	0	0	0	1	0	0	0	0	0	0	6	0.8
10-Oct	7.50	0	2	1	0	0	0	0	0	0	0	0	0	0	3	0.4
11-Oct	0.00															
12-Oct	1.25	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.8
13-Oct	16.00	0	2	0	0	0	0	0	0	1	0	0	0	0	3	0.2
14-Oct	15.75	0	19	4	1	0	0	2	0	1	0	0	0	0	27	1.7
15-Oct	7.75	0	9	1	1	0	0	2	0	1	0	1	0	0	15	1.9
16-Oct	8.00	0	8	3	0	0	0	0	0	1	0	0	0	0	12	1.5
17-Oct	16.00	0	46	3	3	0	0	1	0	0	0	0	0	0	53	3.3
18-Oct	8.00	0	7	2	0	0	0	0	0	0	0	0	0	0	9	1.1
19-Oct	16.00	0	5	1	0	0	0	0	0	0	0	0	0	0	6	0.4
20-Oct	13.50	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
21-Oct	15.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
22-Oct	7.50	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0.3
23-Oct	12.25	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
24-Oct	8.00	0	1	0	0	0	0	5	0	0	0	0	0	0	6	0.8
25-Oct	8.00	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0.4
26-Oct	8.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
27-Oct	7.50	0	7	1	0	0	0	3	0	0	0	0	0	0	11	1.5
28-Oct	8.00	0	5	0	0	0	0	4	0	0	0	0	0	0	9	1.1
Total	502.55	2	616	314	6	0	0	40	0	4	42	6	1	1	1032	2.1

<sup>1</sup> See Appendix B for explanation of species codes.

**Appendix G. Annual summaries of banding effort and capture totals by species: 1980–2008.**

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
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
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
Blinds in operation	1	1	2	2	2	3	3	3	4	4	4	4	5	5	5
Trapping days	21	37	27	55	69	?	?	?	?	?	66	64	74	59	65
Station days	21	37	?	66	104	?	?	?	?	159	205	240	296	254	278
Station hours	149	227	159	443	622	654	483.8	833	1,085	1,203	1,454	1,899	2,316	1,971	2,290
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
SPECIES	RAPTOR CAPTURES														
Northern Harrier	0	2	0	8	3	6	2	4	10	9	4	9	10	4	7
Sharp-shinned Hawk	62	376	186	571	548	705	410	886	1,177	1,527	1,583	1,694	2,036	1,526	2,686
Cooper's Hawk	36	300	129	306	261	366	164	395	553	652	821	909	1,220	822	1,473
Northern Goshawk	6	11	3	32	40	42	5	27	22	29	44	33	104	27	35
Broad-winged Hawk	0	0	0	0	2	0	1	1	1	1	1	2	0	2	1
Swainson's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1
Red-tailed Hawk	14	26	13	43	31	51	15	43	37	66	99	93	97	53	158
Rough-legged Hawk	0	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	11
Bald Eagle	0	0	0	1	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
Merlin	0	1	1	0	2	0	0	1	5	8	2	9	10	8	21
Prairie Falcon	0	0	0	6	5	2	1	3	7	5	7	7	8	1	7
Peregrine Falcon	0	0	0	0	1	0	0	0	0	2	1	1	0	1	0
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	4,685
Recaptures <sup>1</sup>	0	0	0	0	0	0	0	0	0	0	4	4	7	9	10
Foreign Recaptures <sup>2</sup>	0	0	1	0	0	0	0	0	0	2	0	0	1	1	2
Foreign Encounters <sup>3</sup>	0	1	5	3	9	12	5	7	11	12	15	18	14	21	19

<sup>1</sup> Recaptures in the Goshutes of birds originally banded in the Goshutes.

<sup>2</sup> Recaptures in the Goshutes of birds originally banded elsewhere.

<sup>3</sup> Birds originally banded in the Goshutes and subsequently encountered elsewhere.

Appendix G. continued

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	MEAN
Start date	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	21-Aug	24-Aug
End date	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	28-Oct	25-Oct
Blinds in operation	6	5	5	5	3	4	4	4	4	3	4	3	3	2	3.6
Trapping days	63	61	62	63	72	62	72	68	66	53	69	72	63	62	60.1
Station days	312	270	264	236	131	174	210	188	163	105	150	128	81	69	170.7
Station hours	2,382	2,061	2,087	1,690	939	1,286	1,666	1,474	1,276	807	1,073	888	550	503	1,182.2
Captures /100 stn hrs	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	205.4	172.8
SPECIES	RAPTOR CAPTURES														
Northern Harrier	2	1	18	4	0	17	11	8	7	2	3	2	6	2	5.6
Sharp-shinned Hawk	1,823	2,091	1,783	2,131	897	1,235	1,608	1,283	825	791	902	503	683	616	1,144.2
Cooper's Hawk	695	737	767	1,006	438	504	975	791	460	342	562	356	383	314	578.3
Northern Goshawk	27	68	20	20	20	24	23	7	9	28	21	26	18	6	27.0
Broad-winged Hawk	3	0	0	1	0	3	1	0	2	1	2	1	2	0	1.0
Swainson's Hawk	0	0	0	0	0	0	1	0	0	0	1	1	0	0	0.2
Red-tailed Hawk	93	84	67	69	49	58	76	109	63	61	67	56	39	40	61.1
Rough-legged Hawk	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0.1
Golden Eagle	4	7	5	4	8	2	1	9	1	2	1	1	0	4	3.9
Bald Eagle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
American Kestrel	193	290	351	149	97	285	168	127	88	35	76	38	19	42	126.9
Merlin	13	18	26	13	16	11	12	15	5	11	11	5	6	6	8.1
Prairie Falcon	3	7	17	7	3	8	3	4	3	4	3	5	3	1	4.5
Peregrine Falcon	1	1	4	0	1	1	1	3	0	0	2	2	0	1	0.8
All Species	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	1,032	1,961.6
Recaptures <sup>1</sup>	3	3	7	9	4	6	9	7	2	2	2	2	3	4	3.3
Foreign Recaptures <sup>2</sup>	1	4	3	5	2	3	4	3	1	2	4	0	1	2	1.4
Foreign Encounters <sup>3</sup>	16	9	18	15	10	19	10	28	12	16	10	8	10	11	12.0

<sup>1</sup> Recaptures in the Goshutes of birds originally banded in the Goshutes.

<sup>2</sup> Recaptures in the Goshutes of birds originally banded elsewhere.

<sup>3</sup> Birds originally banded in the Goshutes and subsequently encountered elsewhere.