

**FALL 2007 RAPTOR MIGRATION STUDIES IN THE  
MANZANO MOUNTAINS OF CENTRAL NEW MEXICO**



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



**February 2008**

**FALL 2007 RAPTOR MIGRATION STUDIES IN THE  
MANZANO MOUNTAINS OF CENTRAL NEW MEXICO**

*Report prepared by:*

**Jeff P. Smith and Mike C. Neal**

*Counts conducted by:*

**Tim Hanks and Aldo Raul Coutreras Reyes**

*Trapping and banding conducted by:*

**Zach Hurst, Lyla Hunt, Ashley Green, Erin Burke, and Walt Lehman**

*On-site education by:*

**Britta Schielke**

*Project coordinated by:*

**HawkWatch International, Inc.**

**Principal Investigator: Dr. Jeff P. Smith**

**2240 S. 900 E., Salt Lake City, UT 84106**

**(801) 484-6808**

**February 2008**

# TABLE OF CONTENTS

List of Tables .....	iii
List of Figures .....	iv
Introduction.....	1
Study Site.....	1
Methods .....	1
Standardized Counts.....	1
Trapping and Banding .....	2
Results and Discussion .....	2
Weather .....	2
Observation Effort.....	3
Flight Summary.....	3
Passage Rates and Long-term Trends .....	4
Age Ratios.....	5
Seasonal Timing.....	5
Trapping Effort.....	5
Trapping and Banding Summary.....	6
Encounters With Previously Banded Birds .....	6
Satellite Telemetry .....	7
Resident Raptors.....	8
Site Visitation.....	8
Acknowledgments.....	8
Literature Cited.....	9
Tables.....	10
Figures .....	16
Appendix A. History of official observer participation in the Manzano Mountains Raptor Migration Project: 1985–2007.....	24
Appendix B. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications for all diurnal raptor species observed during fall migration in the Manzano Mountains, NM.....	25
Appendix C. Daily observation effort, visitor disturbance ratings, weather records, and flight summaries for the Manzano Mountains Raptor Migration Project: 2007.....	26
Appendix D. Daily observation effort and fall raptor migration counts by species in the Manzano Mountains, NM: 2007.....	28
Appendix E. Annual observation effort and fall raptor migration counts by species (unadjusted data) in the Manzano Mountains, NM: 1985–2007.....	30
Appendix F. Daily trapping effort and capture totals of migrating raptors by species in the Manzano Mountains, NM: 2007.....	33
Appendix G. Annual trapping and banding effort and capture totals of migrating raptors by species in the Manzano Mountains, NM: 1990–2007.....	35

## LIST OF TABLES

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 Manzano Mountains, NM: 1985–2006 versus 2007.....	10
Table 2.	Annual raptor migration counts by age classes and immature : adult ratios for selected species in the Manzano Mountains, NM: 1990–2006 versus 2007. ....	11
Table 3.	First and last observed, bulk passage, and median passage dates by species for migrating raptors in the Manzano Mountains, NM in 2007, with comparisons of 2007 and 1985–2006 average median passage dates. ....	12
Table 4.	Median passage dates by age classes for selected species of migrating raptors in the Manzano Mountains, NM: 1985–2006 versus 2007.....	13
Table 5.	Capture totals, rates, and successes for migrating raptors in the Manzano Mountains, NM: 1991–2006 versus 2007.....	14
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 Manzano Mountains, NM: 1990–2006 averages versus 2007. ....	14
Table 7.	Recaptures of previously banded raptors in the Manzano Mountains, NM: 2007. ....	15
Table 8.	Foreign encounters with raptors originally banded in the Manzano Mountains, NM: 2007. ....	15

## LIST OF FIGURES

Figure 1.	Map of the Manzano Mountains raptor-migration study site in central New Mexico.....	16
Figure 2.	Fall raptor-migration flight composition by major species groups in the Manzano Mountains, NM: 1985–2006 versus 2007.....	17
Figure 3.	Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Turkey Vultures, Ospreys, and Northern Harriers in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions. ....	18
Figure 4.	Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Sharp-shinned Hawks, Cooper’s Hawks, and Northern Goshawks in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions. ....	19
Figure 5.	Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Broad-winged, Swainson’s, Red-tailed and Ferruginous Hawks in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions. ....	20
Figure 6.	Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Golden and Bald Eagles in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions. ....	21
Figure 7.	Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions. ....	22
Figure 8.	Combined-species, fall-migration passage volume by five-day periods for raptors in the Manzano Mountains, NM: 1985–2006 versus 2007.....	23

## INTRODUCTION

The Manzano Mountains raptor migration study in central New Mexico is an ongoing effort to monitor long-term trends in populations of raptors using the southern portion of the Rocky Mountain migratory flyway (Hoffman et al. 2002, Hoffman and Smith 2003, Smith et al. in press). HawkWatch International (HWI) initiated standardized counts of the autumn raptor migration through this region in 1985, and began an extensive trapping and banding program at the project site in 1990. To date, HWI observers have recorded 18 species of migratory raptors at the site, with counts typically ranging between 4,000 and 7,000 migrants per season. The 2007 season marked the 23<sup>rd</sup> consecutive count and the 18<sup>th</sup> consecutive season of trapping and banding conducted at the site by HWI. This report summarizes the 2007 count and banding results.

## STUDY SITE

The project site is located in the Manzano Wilderness Area of the Cibola National Forest (Manzano Ranger District) near Capilla Peak, approximately 56 km south-southeast of Interstate 40 (34°42.25' N, 106°24.67' W; Figure 1). The observation post is located at an elevation of 2,805 m (9,195 ft) on a northwest-southeast facing outcrop of a limestone ridge. It is reached by walking up a 1.2 km trail from the main road leading up to Capilla Peak (FS 522). The predominant vegetation on the slopes of the ridge consists of Gambel oak (*Quercus gambelli*), Douglas-fir (*Pseudotsuga menziesii*), White fir (*Abies concolor*), Ponderosa pine (*Pinus ponderosa*), Pinyon pine (*Pinus edulis*), New Mexico locust (*Robinia neomexicana*), and Bigtooth maple (*Acer grandidentatum*).

During 2007, two traditional banding stations were operated within 0.25–1 km of the observation point (Figure 1). **North** station, operated every year since 1990, was located 100 m east and 50 m north of the observation point at an elevation of 2,790 m. **West** station, operated every year since 1991, was located 0.5 km southwest of the observation point at an elevation of 2,684 m. **South** station, operated part to full-time most years since 1991, was not operated this year.

Many factors make the Manzano Lookout well suited for observing consistent flights of migrating raptors during fall. Several mountain ranges to the north serve as leading lines (Bildstein 2006), funneling raptors into the Manzanos. The Manzano Mountains also are a relatively narrow and well-defined north-south range, which creates beneficial updrafts and serves as a distinct flight path for migrating raptors. The Capilla Peak site provides an excellent source of thermal lift, with two other peaks located 10–15 km north of the observation site also attracting southbound migrants that benefit from strong ridge updrafts. The concentration effect of the Manzano range is further enhanced by the absence of parallel ranges nearby to serve as alternate flight paths.

## METHODS

### STANDARDIZED COUNTS

Two official or designated observers, relieved or supplemented by other trained volunteers, conducted standardized daily counts of migrating raptors from a single, traditional observation site. Official observer Tim Hanks had four previous seasons of migration counting experience; three at this site (see Appendix A for a complete history of observer participation). This was official observer Aldo Raul Coutreras Reyes' fourth season of migration counting experience, but first season at the Manzanos. Visitors and other crewmembers occasionally assisted with the counts. Weather permitting, observations typically began by 0900 H Mountain Standard Time (MST) and ended by 1800 H MST.

Data gathering and recording followed standardized protocols used at all HWI migration sites (Hoffman and Smith 2003). The observers routinely recorded the following data:

1. Species, age, sex, and color morph of each migrant raptor, whenever possible and applicable (Appendix A 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 (high, moderate, low, none) 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 including 2007 data 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 2–3 trappers and processors operated each trapping station. The crews generally trapped between 0800–0900 and 1600–1700 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.

## **RESULTS AND DISCUSSION**

### **WEATHER**

In 2007, inclement weather entirely precluded only one full day of potential observations and did not severely hamper ( $\leq 4$  hours observation) observations on any other days; however, a wildfire evacuation precluded seven additional full days of planned observations (see Appendix C for daily weather summaries). The number of days fully precluded by weather was well the below 1997–2006 average of 5.7 days (range 1–14), but the total number of fully precluded days (8) was above average. The number of days otherwise severely hampered by weather also was below the 10-year average of 2.3 days (range 0–5). Sky conditions during active observation periods also deviated from the usual patterns in 2007, with an above average proportion of days featuring predominantly fair skies (62% of the active observation days versus 1997–2006 average of 49%) and below average proportions of days featuring transitional skies (i.e., changed from fair skies to mostly cloudy or overcast during the day, or vice versa; 24% vs. average of 34%) and mostly cloudy to overcast skies (14% vs. average of 18%). Nevertheless, the prevalence of rain or snow showers during active observation periods was above average (21% of active days vs. average of 16%). Visibility reducing fog and especially haze also were considerably more prevalent than usual in 2007, occurring on a record high 74% of the active observation days compared to

the 1997–2006 average of 31%. This did not translate, however, to any reductions in average maximum-visibility ratings to the east (93 km vs. average of 89.5 km) and west (90 km, matching the long-term average). The proportion of days where the observers rated the thermal lift conditions as good to excellent was near average (44% of active days vs. average of 45%).

Similar to the past two years, the proportion of active days where light winds (<12 kph) prevailed was below average (65% vs. 1997–2006 average of 72%), the proportion of days with predominantly moderate winds (12–28 kph) was above average (32% vs. 1997–2006 average of 25%), and strong winds (>28 kph) prevailed on an average proportion (3%) of the active observation days.

In terms of wind directions, the range of conditions seen in 2007 was similar to 2006 but differed from the long-term average pattern in several ways. As usual, SW–W winds was the most common pattern but, similar to last year, this wind pattern was much more common than usual in 2007 (56% of the active days vs. 1997–2006 average of 39%). Similarly, the prevalence of variable SE–SW winds was higher than average in both 2006 and 2007 (13% vs. 9%), whereas S–SW winds rank as the second most common pattern in terms of the long-term average, but were less common than usual in 2006 and especially 2007 (2% of active days vs. 1997–2006 average of 16%). Other notable differences in 2007 included the complete absence of days where SW–NW winds prevailed (average 9% of days), and a low 3% of days with winds in the N–SE range (average 8% of days).

The temperature during active observation periods averaged 15.2°C (the average of daily values, which in turn were averages of hourly readings), ranging from -0.2–20.7°C. The overall daily average was 0.5 degrees above the 1997–2006 average of 14.7°C, and the minimum and maximum daily-averages fell well within the range of values recorded since 1997. We began recording hourly barometric pressure readings on site in 2001. In 2007, the overall average (30.25 inHg; the average of daily values, which in turn were averages of hourly readings) and minimum (29.62) and maximum (30.54) daily averages were slightly above average.

In summary, similar to the previous two years, in 2007 inclement weather had relatively little impact on the observer's ability to conduct daily counts, but a wildfire on the mountaintop unexpectedly precluded a full week of observations during a period of active migration. Fair skies prevailed more often than usual in 2007, but the prevalence of scattered rain and snow showers also was higher than average during active observation periods, and the prevalence of haze was much higher than average. The increase in haze may have been primarily due to the fires raging in southern California and the rapid development occurring in Albuquerque, but fortunately did not appear to substantially hamper visibility. As is typical for the site, southwesterly to westerly winds predominated, but more than usual in 2006 and 2007, with average wind speeds also a higher than usual.

## **OBSERVATION EFFORT**

The observers worked on 63 of 71 possible days between 27 August and 5 November. The number of observation days was a non-significant 2% lower than the 1985–2006 average of  $65 \pm 95\%$  CI of 2.2 days. Despite the week-long gap in coverage due to the wildfire, the total hours of observation (553.58) was a significant 9% above the long-term average of  $509.33 \pm 25.36$  hours due to the reduction in days hampered by inclement weather. The 2007 average of 2.2 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) matched the 1985–2006 average of  $2.2 \pm 95\%$  CI of 0.15 observers/hr.

## **FLIGHT SUMMARY**

The observers counted 4,889 migrant raptors of 16 species during the 2007 season (see Appendix D for daily count records and Appendix E for annual summaries). The flight was composed of 48% accipiters, 29% buteos, 10% vultures, 8% falcons, 2% eagles, 1.5% harriers, and  $\leq 1\%$  each of Ospreys and unidentified raptors. This composition includes significantly above average proportions of buteos,



vultures, harriers, and Ospreys, but significantly below average proportions of falcons and unidentified raptors (Figure 2). No group proportions amounted to record levels in 2007. The differences in group composition were influenced by the absence of observations during the fire evacuation, which occurred at the tail-end of peak migration for many of the groups that were underrepresented in 2007. The Sharp-shinned Hawk was the most abundant species, followed by Cooper's Hawks, Swainson's Hawks, Red-tailed Hawks, Turkey Vultures, and American Kestrels (Table 1, Appendix E). The count of American Kestrels dropped to a new record low (46% below average), whereas no record-high counts were recorded in 2007.

### Passage Rates and Long-term Trends

Adjusted passage rates were significantly above average for five species (Osprey, Northern Goshawk, Broad-winged Hawk, Bald Eagle, and Merlin) and were significantly below average for six species (Sharp-shinned Hawk, Red-tailed Hawk, Ferruginous Hawk, Rough-legged Hawk, American Kestrel, and Prairie Falcon; Table 1, Figures 3–7). Updated regression analyses (after Hoffman and Smith 2003) indicated a significant ( $P \leq 0.05$ ) quadratic trend for Turkey Vultures, loosely tracking a strong increasing pattern through 1998, followed by a sharp three-year decline but then mostly moderate counts and no real trend since 2001 (Figure 3). A roughly similar pattern applied to Northern Harriers, except that counts had remained low since crashing from a high peak in 1998 but then rebounded in the past two years, and the addition of second season of moderately high passage rates in 2007 eliminated what had previously been a significant quadratic trend (Figure 3). A significant ( $P \leq 0.05$ ) linear increasing trend was indicated for Ospreys, but more detailed examination shows a strong increasing pattern through 1995, a sharp drop in 1999, and a return to a gradual increasing pattern since then with a high spike in 2003 (Figure 3). Among the accipiters, low adjusted passage rates in the last two years eliminated a previously significant increasing trend for Sharp-shinned Hawks and dampened but did not eliminate a still highly significant ( $P \leq 0.01$ ) long-term increase for Cooper's Hawks (Figure 4). Among the buteos, significant long-term increases were indicated for Broad-winged and Swainson's Hawks, whereas a highly significant long-term decrease continued to be indicated for Ferruginous Hawks (Figure 5). However, following a strong slide between 1992 and 2000, the trajectory of Ferruginous Hawk passage rates is now once again showing a slight upward trend. Like for Sharp-shinned Hawks, low passage rates in 2006 and 2007 eliminated a previously significant long-term increase for Red-tailed Hawks (Figure 5). Among the falcons, a significant long-term decrease was newly indicated for American Kestrels; previously no long-term trend was indicated, but the addition of two record-low passage rates in a row in 2006 and 2007 has now resulted in indication of a significant long-term decline (Figure 7). Significant quadratic trends were indicated for Merlins and Prairie Falcons, tracking increasing patterns for both species through 1998, then a steady decline thereafter for Prairie Falcons and a sharp drop in 1999 but then a return to a gradual increasing pattern for Merlins (Figure 7). A highly significant long-term increasing trend was indicated for Peregrine Falcons, but subsequent to peaking in 2002, peregrine passage rates dropped each year until increasing again slightly in 2007 (Figure 7).

Smith et al. (in press) presents new trend analyses of data collected through 2005 for most of the long-term, on-going, autumn migration studies in western North America. These analyses, which cover many of the same sites, are based on a more sophisticated analytical approach (also see Farmer et al. 2007) than that represented in Hoffman and Smith (2003). Among other refinements, this new approach both fits 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. This new modeling approach allowed for fitting up to fourth-order polynomials to the 21-year Manzano dataset that was analyzed, which for several species resulted in the fitting of higher-order models than those represented herein using the approach of Hoffman and Smith (2003; i.e., limited to second-order models), and therefore more closely tracked the patterns of interannual variation for these species. Species for which this was true included Turkey Vulture, Swainson's Hawk, Golden Eagle, Prairie Falcon, and Peregrine Falcon. Note, however, that restrictions related to the mathematical assumptions

behind the new approach precluded analyzing data for rare species, which in this case included Northern Goshawk, Broad-winged Hawk, Ferruginous Hawk, and Bald Eagle. Otherwise, with a few notable exceptions, the overall patterns of change suggested by the new modeling and the derived trend estimates generally yielded similar inferences as the simpler methodology used in Hoffman and Smith (2003) and herein to provide trend assessments updated through 2007.

Differences between results presented in Smith et al (in press) and those presented herein that clearly relate to addition of two more years of data include: a) elimination of a significant second-order model fit for Northern Harriers due to addition of high counts in 2006 and 2007; b) elimination of significant long-term increasing trends for Sharp-shinned and Red-tailed Hawks due to low counts in 2006 and 2007; c) indications of a renewed, long-term increasing trend for Swainson's Hawks due to addition of high counts in 2006 and 2007; and d) a newly significant long-term decreasing trend for American Kestrels due to low counts in 2006 and 2007. The only other substantive difference in the two sets of results concerns the fitting of a highly significant fourth-order model to the Golden Eagle data and indication of a significant long-term decrease through 2005 based on the Smith et al. analyses. The more complex polynomial fit clearly suggests potential tracking of a long-term cyclical pattern. In this light, after dropping in 2005 to a very low level not seen since 1990, passage rates for Golden Eagles have now increased again for two years in a row, perhaps reflecting initiation of another cyclical upswing and resulting in detection of no long-term, overall trend through 2007 (Figure 6). Otherwise, both the Smith et al. analyses of data through 2005 and simple linear regressions of annual passage rates through 2007 confirm no significant, long-term trend for Turkey Vultures and Prairie Falcons, but significant long-term increases for Ospreys and Merlins.

### **Age Ratios**

Among 10 species with data suited to comparisons, immature: adult ratios were significantly above average for only Golden Eagles, but were significantly below average for Northern Harriers, Red-tailed Hawks, Ferruginous Hawks, and Peregrine Falcons (Table 2). Young Golden Eagles were only slightly more abundant than usual, but adult eagles were much less common than usual, resulting in an inflated ratio. Adult Northern Harriers were 53% more common than usual, while the number of immature birds was on par with the long-term mean, indicating that adult survival may have been higher in 2007. For Red-tailed Hawks and Peregrine Falcons, immatures comprised only 58% of the long-term mean, significantly reducing their respective age ratios. Ferruginous Hawks do not occur in large enough numbers for this metric to be statistically useful. We also must consider these data tentatively because in most cases significant variation in the proportions of unaged birds confounds the comparisons (Table 2).

### **Seasonal Timing**

The 2007 combined-species median passage date of 25 September nearly matched the 1985–2006 average of 26 September (Table 3). The overall seasonal distribution of activity followed a typical pattern, but showed higher than average activity during the second half of September and in late October, lower than average activity during the first five-day period in October, and an absence of activity during the third five-day period in October due to the wildfire evacuation (10-16 October; Figure 8). These variations from the average pattern are undoubtedly in part due to the exclusion of counts from the evacuation period. Species-specific data revealed additional complexity, which again is confounded by the fire evacuation. Median passage dates were significantly later than average for four species (Sharp-shinned Hawk, Northern Goshawk, Golden Eagle, and Peregrine Falcon) and were significantly earlier than average for Red-tailed Hawks (Table 3). There were, however, no distinct multi-species patterns of note, and age-specific data revealed no additional noteworthy patterns (Table 4).

### **TRAPPING EFFORT**

The crews operated at least one banding station on 47 of 54 possible days between 2 September and 27 October 2007, with effort totaling 105 station days and 452.97 station hours (see Appendix F daily

trapping records and Appendix G for annual summaries). The number of trapping days was 6% below the long-term average, and the number of station days and hours were 10 and 48% below average, respectively, primarily due to crew experience levels and the wildfire evacuation (Appendix G).

## TRAPPING AND BANDING SUMMARY

The 2007 capture total of 377 birds included 11 species and all were newly banded (Table 5, Appendix G). The 2007 effort raises the total number of birds captured since project inception to 17,267, including 34 recaptures of Manzano-banded birds and 23 foreign recaptures (i.e., birds originally banded elsewhere and subsequently recaptured in the Manzanos; Appendix G). Sharp-shinned and Cooper's Hawks accounted for 52% and 38% of the total captures, respectively, with Red-tailed Hawks (2%), American Kestrels (2%), Peregrine Falcons (1.6%), and Merlins (1.3 %) being the next most abundant species. Each of the remaining species accounted for <1% of the total.

The overall combined-species capture total was 64% below average, the overall capture rate of 83.2 birds per 100 station hours was 29% below average, and overall capture success of 11% was 53% below average (Table 5), again largely reflecting crew training needs and the wildfire evacuation. With a capture total of one bird, the Broad-winged Hawk was the only species for which all three metrics were above average in 2007; however, the capture rates for Northern Harriers, Merlins, and Peregrine Falcons also were significantly above average. Conversely, commonly captured species for which the 2007 capture totals, rates, and successes were all significantly below average included Sharp-shinned Hawk, Cooper's Hawk, Northern Goshawk, Red-tailed Hawk, Golden Eagle, and American Kestrel.

Compared to the counts, at this site banding yields unique and substantial sex-age specific data only for Sharp-shinned Hawks, Cooper's Hawks, and American Kestrels. Capture totals were significantly below average (48–82%) for all age classes of Sharp-shinned and Cooper's Hawks (Table 6). The 2007 immature : adult capture ratios for Sharp-shinned and Cooper's Hawk were significantly above average (Table 6), however, and this contrasted with the count-based ratios being closer to average (Table 2). For both species, the count-based age ratios were lower than the capture-based ratios, suggesting that juvenile birds were more susceptible to capture than adults, which is typical. The female : male capture ratios were near average for both species (Table 6). Also note that these age-class comparisons may be confounded by the timing of the fire evacuation period, which overlapped the peak activity periods for adult Sharp-shinned Hawks (especially males) and to a lesser degree adult Cooper's Hawks.

Capture totals also were well below average for all sex-age classes of American Kestrels, and both the immature : adult and female : male capture ratios were below average (Table 6). Females, in particular, were ten times less abundant than the usual among the captured birds. The count data yielded a sex ratio that was near average (0.86), whereas the capture-based sex ratio (0.30) was both much lower than the count-based ratio and significantly below the long-term average of  $0.70 \pm 95\%$  CI of 0.20. In combination, the evidence suggests that kestrels were substantially less abundant than usual in 2007, with females proportionately less abundant than males, and juvenile females appeared less susceptible than usual to capture, while especially adult males were either less susceptible than usual to capture or were proportionately especially scarce in 2007.

## ENCOUNTERS WITH PREVIOUSLY BANDED BIRDS

**Recaptures.**—No recaptures of birds previously banded in prior years in the Manzano Mountains occurred in 2007 (Appendix G).

**Foreign Encounters.**—Six raptors originally banded in the Manzanos were encountered elsewhere in 2007 (Table 7), which brings the total foreign encounters since 1990 to 112 birds (Appendix G). The 2007 encounters included one male and one female Cooper's Hawks. The male was banded as an after-second-year bird in 2006 and was found dead of unknown causes on 26 April 2007 ~333 km north of the project site near Cierro Pass, Colorado. The female Cooper's Hawk was banded as a hatch-year bird in 2000 and was found dead of unknown causes on 19 October 2007 ~399 km north of the project site near

Delta, Colorado. A female Sharp-shinned Hawk originally banded as an after-hatch-year bird in 2002 was found dead of unknown causes on 25 February 2007 ~1,399 km south of the project site near La Piedad, Michoacán, Mexico. A male Merlin originally banded as a hatch-year bird in 2000 was found dead of unknown causes on 27 February ~816 km north of the project site near Thermopolis, Wyoming. A Red-tailed Hawk originally banded as a hatch-year bird in 1999 was found dead of unknown causes on 1 March ~111 km south of the project site near Mountainair, New Mexico. The last foreign encounter of 2007 involved a female Northern Goshawk originally banded as an after-second-year bird in 1994 and was found sick or injured on 14 September near the New Canyon Campground by site coordinator Zach Hurst. The goshawk died soon after it was spotted, just off the forest road ~ 11 km southeast of the project site. This is one of the oldest goshawks recovered from our banding operations, being at least 15 years old! These new encounters all fall within the expected range of Rocky Mountain migrants (Hoffman et al. 2002).

### **SATELLITE TELEMETRY**

After having spent the 2006 winter primarily in the midst of a large oil field near Midland, Texas, the young male Golden Eagle we outfitted in the Manzanos during fall 2006 began its 2007 spring migration in mid-May. He traveled north through eastern and central New Mexico and up through the Sangre de Cristo Mountains into Colorado. He then traversed the central Rocky Mountains of Colorado, continued north into Wyoming along the Sierra Madre Mountains, and crossed central Wyoming to reach the Big Horn Mountains. He then proceeded to spend the summer wandering around primarily the Big Horn and Absaroka Mountains of northwestern Wyoming. Unfortunately, in mid-November 2007 before the bird had begun his next fall migration, this transmitter abruptly ceased providing further useful location data. Beginning in early October, sensor data provided confusing indicators, suggesting limited, continued movement but very low temperatures indicative of the transmitter no longer being attached to a warm body. Thus we suspect that the bird died in northern Wyoming prior to initiating another fall migration, and the abrupt cessation of transmissions was due to the solar panel on the unit no longer receiving sufficient energy to power the unit. The lack of further transmissions will likely preclude a recovery attempt; however, unlike all previous transmitters we have deployed, this unit provided high-accuracy Global Positioning System (GPS) coordinates, which may allow us to find the bird, once the snow clears, without having to rely on an active signal.

We also continue to receive data from the young female Golden Eagle we outfitted in the Manzanos during all 2005, but are unsure of her status at present. After release, this bird traveled northwest ~450 km (280 mi) up into southwestern Colorado and remained there after that. We received regular location data from this bird through June 2007, received no useable location data for the next six months, and then all of a sudden started receiving location data again in mid-January 2008! Throughout this time, sensor data continued to indicate no problems with bird activity, temperature indicators or battery voltage, but, if still alive, the bird has moved very little compared to most of the eagles we have tracked to date. Although we were unable to search for the bird last fall as hoped, assuming the transmitter continues to signal, we expect to visit the area this spring to investigate further and see if we can determine whether or not she is actually still alive.

Lastly, after an amazing 4 years and 3 months of successful tracking using a battery-only transmitter, transmissions from the male Golden Eagle we outfitted in the Manzanos during fall 2002 finally ceased in April 2007. At that point, the bird had begun a new spring migration and was located in northeast Alberta, apparently once again heading for its favored summer range in north-central Canada around the Nunavut–Northwest Territories border area. Overall, we conclusively documented this eagle summering three seasons in north-central Canada and one around the Alberta–Saskatchewan border several hundred kilometers farther south, and spending its first two winters in southern New Mexico and nearby northern Mexico but the next three winters in eastern Wyoming and adjacent South Dakota.

Complete tracking summaries and maps for all of HWI's telemetry birds can be found at <http://www.hawkwatch.org>.

## **RESIDENT RAPTORS**

Local birds observed this season included a family of Red-tailed Hawks, two adults and one immature, seen regularly between 27 August and 10 October. After the count resumed following the wildfire evacuation, the immature bird was seen only a few more times, whereas the adults were seen throughout the rest of the season. Two adult Golden Eagles were seen sporadically throughout the season. Immature and subadult birds were seen on a few occasions. Turkey Vultures were common until 6 October; the largest group of non-migrants seen included 18 birds. Swainson's Hawks were seen catching insects almost daily until late September, but their numbers decreased greatly after mid-September. Two immature Peregrine Falcons and at least one adult were seen frequently until 7 October. The immatures were often together and appeared to be a male and a female. Only one adult was ever seen at any one time. Two Prairie Falcons were seen throughout the season, uncommonly until early October but more frequently after that, apparently coinciding with departure of the Peregrine Falcons. Most Prairie Falcon sightings were in Canon de Jaramillo, just south of the observations site. A brown Merlin that did not seem to be migrating was seen twice on 26 October. The next day an adult, male, Taiga Merlin showed up and was frequently seen through the remainder of the season. There were only two days (28 August and 4 September) when an American Kestrel was seen behaving like a resident. Two immature Sharp-shinned Hawks were seen frequently through early October, with at least one seen often through the remainder of the season. An adult was seen less frequently, although it was still very common over the whole season. There were two resident immature Cooper's Hawks very early, but after 4 September only one was seen and it stayed around until early October. One local adult Cooper's Hawk was seen multiple times on 29 August, but not again until the first week of October and no resident Cooper's Hawks were seen after that. A resident immature Northern Goshawk was seen multiple times during the last week of October. A resident immature Northern Harrier was seen on 8 days between 21 September and 29 October, and an adult male took up residence in the area in early November.

This is a typical resident assemblage for the site, except that Sharp-shinned Hawks have been more common in the past.

## **SITE VISITATION**

In 2007, 320 individuals visited the project site from 11 states, the United Kingdom, Guatemala, and Panama. Most folks from the U.S. originated in New Mexico, but others came from Arizona, Michigan, California, Colorado, Rhode Island, Pennsylvania, Illinois, Texas, Washington, and New York. The season's visitors included six organized groups: Venturing Beyond Prevention, Albuquerque Hiking Club, Girl Scouts, University of New Mexico Ornithology Class, Mountainair Elementary School, and El Paso Audubon Society.

In 2007, 598 hourly assessments of visitor disturbance resulted in the following ratings: 63% none, 27% low, 8% moderate, and 1% high. These are only slightly higher visitor disturbance ratings than usual for the site.

## **ACKNOWLEDGMENTS**

Financial support for this project was provided by the USDA Forest Service, Cibola National Forest and Region 3; U.S. Fish and Wildlife Service, Region 2 and the Neotropical Migratory Bird Conservation Act Grant Program; Albuquerque Community Foundation; Intel Corporation; Central New Mexico Audubon Society; and HWI private donors and members. HWI and the field crew also thank Wild Oats and Whole Foods Market of Albuquerque for their generous contributions of food to support the field crew during the season. The field crew would also like to thank Tillie's Inn & RV Park for providing discounted showers. Lastly, we extend our heartfelt thanks to the following individuals for their generous volunteer

service and support during the season: John Acklen, Wes Anderson, Ken Babcock, Marla and Adam Brose, Sue Chavez, Tavo and Kirsten Cruz, John DeLong, Geoff Evans, Denise Falzone, Roger Grimshaw, Helen Haskell, Jessie Jewell, Melanie Keithley, Claire Lamos, Walt and Jennifer Lehman, Peter Neils.

## LITERATURE CITED

- Bildstein, K. L. 2006. Migrating raptors of the world: their ecology and conservation. Cornell University Press, Ithaca, NY U.S.A. 320 pp.
- Farmer, C. J., D. J. T. Hussell, and D. Mizrahi. 2007. Detecting population trends in migratory birds of prey. *Auk* 124:1047–1062.
- 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.
- Smith, J. P., C. J. Farmer, S. W. Hoffman, G. S. Kaltenecker, K. Z. Woodruff, and P. Sherrington. In press. Trends in autumn counts of migratory raptors in western North America, 1983-2005. *In* K. L. Bildstein, J. P. Smith, and E. Ruelas-Inzunza (Editors), *The state of North America's birds of prey. Series in Ornithology No. 3.* American Ornithologists' Union, Washington, DC, and Nuttall Ornithological Club, Cambridge, Massachusetts, USA.

**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 Manzano Mountains, NM: 1985–2006 versus 2007.**

SPECIES	COUNTS			RAPTORS / 100 HRS <sup>1</sup>		
	1985–2006 <sup>2</sup>	2007	% CHANGE	1985–2006 <sup>2</sup>	2007	% CHANGE
Turkey Vulture	385 ± 102.1	499	+30	114.3 ± 29.2	140.1	+23
Osprey	30 ± 7.1	47	+58	8.2 ± 1.8	11.7	+43
Northern Harrier	60 ± 11.1	75	+26	12.1 ± 2.1	14.1	+17
Sharp-shinned Hawk	1465 ± 190.1	1283	-12	361.9 ± 42.7	303.2	-16
Cooper's Hawk	1021 ± 152.4	922	-10	293.0 ± 36.1	273.8	-7
Northern Goshawk	15 ± 3.8	30	+96	3.5 ± 1.0	6.7	+93
Unknown small accipiter <sup>3</sup>	149 ± 36.4	74	-50	–	–	–
Unknown large accipiter <sup>3</sup>	3 ± 1.6	7	+121	–	–	–
Unidentified accipiter	83 ± 27.4	10	-88	–	–	–
TOTAL ACCIPITERS	2625 ± 325.6	2326	-11	–	–	–
Broad-winged Hawk	7 ± 1.8	10	+48	2.4 ± 0.6	3.2	+35
Swainson's Hawk	741 ± 739.3	841	+13	278.5 ± 277.4	309.2	+11
Red-tailed Hawk	652 ± 74.2	537	-18	142.1 ± 14.4	109.1	-23
Ferruginous Hawk	13 ± 2.2	8	-37	2.7 ± 0.5	1.4	-47
Rough-legged Hawk	0.2 ± 0.2	0	-100	0.05 ± 0.04	0.0	-100
Zone-tailed Hawk	1 ± 0.4	0	-100	–	–	–
Unidentified buteo	24 ± 9.9	19	-21	–	–	–
TOTAL BUTEOS	1437 ± 736.4	1415	-2	–	–	–
Golden Eagle	116 ± 13.7	99	-15	25.0 ± 3.2	22.0	-12
Bald Eagle	3 ± 1.1	6	+78	1.1 ± 0.4	1.8	+75
Unidentified Eagle	1 ± 0.6	9	+1220	–	–	–
TOTAL EAGLES	121 ± 13.8	114	-5	–	–	–
American Kestrel	555 ± 62.8	298	-46	154.5 ± 17.3	80.5	-48
Merlin	25 ± 5.9	34	+36	6.3 ± 1.4	8.2	+31
Prairie Falcon	20 ± 4.8	10	-51	4.4 ± 0.9	1.9	-56
Peregrine Falcon	48 ± 15.2	51	+5	11.8 ± 3.7	13.2	+12
Unknown small falcon <sup>3</sup>	2 ± 1.1	0	-100	–	–	–
Unknown large falcon <sup>3</sup>	5 ± 4.3	2	-56	–	–	–
Unidentified falcon	2 ± 1.2	1	-59	–	–	–
TOTAL FALCONS	653 ± 71.4	396	-39	–	–	–
Unidentified raptor	47 ± 16.9	17	-64	–	–	–
GRAND TOTAL	5357 ± 887.2	4889	-9	–	–	–

<sup>1</sup> Based on data truncated to standardized, species-specific sampling periods and adjusted for incompletely identified birds.

<sup>2</sup> Mean ± 95% CI.

<sup>3</sup> Designations used for the first time in 2001.

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

	TOTAL AND AGE-CLASSIFIED COUNTS						IMMATURE : ADULT			
	1990–2006 AVERAGE			2007			% UNKNOWN AGE		RATIO	
	TOTAL	IMM.	ADULT	TOTAL	IMM.	ADULT	1990–2006 <sup>1</sup>	2007	1990–2006 <sup>1</sup>	2007
Northern Harrier	63	32	15	75	34	23	26 ± 6.5	24	2.2 ± 0.50	1.5
Sharp-shinned Hawk	1580	622	684	1283	461	531	18 ± 3.8	23	0.9 ± 0.14	0.9
Cooper's Hawk	1153	411	505	922	329	348	21 ± 4.7	27	0.8 ± 0.13	0.9
Northern Goshawk	15	7	6	30	13	15	13 ± 6.6	7	1.7 ± 0.88	0.9
Broad-winged Hawk	8	1	4	10	2	4	40 ± 16.6	40	0.5 ± 0.39	0.5
Red-tailed Hawk	722	239	379	537	141	297	14 ± 3.7	18	0.7 ± 0.12	0.5
Ferruginous Hawk	11	3	2	8	3	3	49 ± 7.1	25	1.9 ± 0.78	1.0
Golden Eagle	116	62	31	99	67	19	17 ± 4.4	13	2.3 ± 0.49	3.5
Bald Eagle	4	2	1	6	4	2	11 ± 15.2	0	2.0 ± 1.16	2.0
Peregrine Falcon	65	19	28	51	11	30	23 ± 10.3	20	0.8 ± 0.41	0.4

<sup>1</sup> Mean ± 95% CI. For age ratios, note that the long-term mean immature : adult ratio is an average of annual ratios and may differ from the value obtained by dividing average numbers of immatures and adults. Discrepancies in the two values reflect high annual variability in the observed age ratio.



**Table 3. First and last observed, bulk passage, and median passage dates by species for migrating raptors in the Manzano Mountains, NM in 2007, with comparisons of 2007 and 1985–2006 average median passage dates.**

SPECIES	2007				1985–2006
	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	27-Aug	7-Oct	14-Sep – 3-Oct	30-Sep	17-Sep ± 2.9
Osprey	29-Aug	2-Nov	2-Sep – 7-Oct	19-Sep	17-Sep ± 1.4
Northern Harrier	27-Aug	4-Nov	12-Sep – 29-Oct	30-Sep	2-Oct ± 1.9
Sharp-shinned Hawk	28-Aug	5-Nov	12-Sep – 24-Oct	1-Oct	27-Sep ± 1.1
Cooper's Hawk	27-Aug	29-Oct	10-Sep – 6-Oct	24-Sep	25-Sep ± 1.1
Northern Goshawk	15-Sep	2-Nov	22-Sep – 31-Oct	22-Oct	4-Oct ± 4.3
Broad-winged Hawk	19-Sep	17-Oct	19-Sep – 9-Oct	2-Oct	26-Sep ± 2.5
Swainson's Hawk	28-Aug	9-Oct	18-Sep – 24-Sep	19-Sep	20-Sep ± 3.1
Red-tailed Hawk	27-Aug	4-Nov	10-Sep – 23-Oct	30-Sep	2-Oct ± 1.9
Ferruginous Hawk	12-Sep	4-Nov	12-Sep – 4-Nov	23-Oct	1-Oct ± 3.9
Golden Eagle	4-Sep	5-Nov	26-Sep – 4-Nov	26-Oct	14-Oct ± 1.6
Bald Eagle	27-Oct	3-Nov	27-Oct – 3-Nov	31-Oct	20-Oct ± 5.5
American Kestrel	28-Aug	5-Nov	8-Sep – 6-Oct	21-Sep	20-Sep ± 1.5
Merlin	19-Sep	4-Nov	25-Sep – 31-Oct	20-Oct	7-Oct ± 2.8
Prairie Falcon	2-Sep	30-Oct	2-Sep – 22-Oct	3-Oct	24-Sep ± 3.1
Peregrine Falcon	27-Aug	17-Oct	7-Sep – 6-Oct	24-Sep	22-Sep ± 1.4
All species	27-Aug	5-Nov	11-Sep – 20-Oct	25-Sep	26-Sep ± 0.8

<sup>1</sup> Dates between which the central 80% of the flight passed; calculated only for species with counts ≥5 birds.

<sup>2</sup> Date by which 50% of the flight had passed; calculated only for species with counts ≥5 birds.

<sup>3</sup> Mean of annual values ± 95% CI 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 Manzano Mountains, NM: 1985–2006 versus 2007.**

SPECIES	ADULT		IMMATURE / SUBADULT	
	1985–2006 <sup>1</sup>	2007	1985–2006 <sup>1</sup>	2007
Northern Harrier	8-Oct ± 3.8	5-Oct	1-Oct ± 2.4	29-Sep
Sharp-shinned Hawk	5-Oct ± 1.5	7-Oct	18-Sep ± 1.4	22-Sep
Cooper's Hawk	28-Sep ± 2.0	27-Sep	21-Sep ± 1.9	22-Sep
Northern Goshawk	6-Oct ± 4.3	22-Oct	2-Oct ± 6.4	23-Oct
Red-tailed Hawk	7-Oct ± 2.1	4-Oct	25-Sep ± 1.8	22-Sep
Golden Eagle	16-Oct ± 2.3	31-Oct	13-Oct ± 1.5	25-Oct
Peregrine Falcon	24-Sep ± 1.9	2-Oct	17-Sep ± 2.7	16-Sep

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.

**Table 5. Capture totals, rates, and successes for migrating raptors in the Manzano Mountains, NM: 1991–2006 versus 2007.**

SPECIES	CAPTURE TOTAL		CAPTURE RATE <sup>1</sup>		CAPTURE SUCCESS (%) <sup>2</sup>	
	1991–2006 <sup>3</sup>	2007	1991–2006 <sup>3</sup>	2007	1991–2006 <sup>3</sup>	2007
Northern Harrier	4 ± 1.8	3	0.5 ± 0.16	0.7	7 ± 2.9	4
Sharp-shinned Hawk	526 ± 88.7	196	58.6 ± 6.73	43.3	32 ± 2.7	15
Cooper's Hawk	392 ± 63.2	142	44.4 ± 5.88	31.3	33 ± 3.1	15
Northern Goshawk	5 ± 1.9	3	0.6 ± 0.24	0.7	32 ± 9.9	10
Broad-winged Hawk	0.3 ± 0.23	1	0.04 ± 0.030	0.2	3 ± 2.7	10
Swainson's Hawk	0.3 ± 0.39	0	0.03 ± 0.042	0.0	0 ± 0.3	0
Red-tailed Hawk	53 ± 10.9	9	6.0 ± 0.97	2.0	7 ± 1.3	2
Zone-tailed Hawk	0.1 ± 0.12	0	0.00 ± 0.009	0.0	6 ± 10.9	0
Golden Eagle	4 ± 0.9	1	0.5 ± 0.12	0.2	3 ± 0.6	1
American Kestrel	39 ± 11.2	9	4.3 ± 1.08	2.0	7 ± 1.4	3
Merlin	5 ± 1.9	5	0.5 ± 0.21	1.1	16 ± 7.0	15
Prairie Falcon	4 ± 1.4	2	0.5 ± 0.12	0.4	18 ± 3.2	20
Peregrine Falcon	6 ± 2.1	6	0.7 ± 0.26	1.3	10 ± 3.0	11
All Species	1040 ± 167.3	377	116.6 ± 13.09	83.2	23 ± 2.0	11

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

<sup>2</sup> Number of birds captured / number of birds observed. The combined-species value was calculated excluding Ospreys, Turkey Vultures, Swainson's Hawks, Rough-legged Hawks, Ferruginous Hawks, and unknown raptors from the count totals. Species-specific values were calculated after birds identified only to genus were allocated across possible species in proportion to the relative abundance of birds identified to those species.

<sup>3</sup> Mean of annual values ± 95% confidence interval.

**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 Manzano Mountains, NM: 1990–2006 averages versus 2007.**

SPECIES	YEAR	FEMALE		MALE		FEMALE : MALE	IMMATURE : ADULT
		HY	AHY	HY	AHY	RATIO <sup>1</sup>	RATIO <sup>1</sup>
Sharp-shinned Hawk	1990-2006	157	120	149	77	1.3±0.09	1.6 ± 0.24
	2007	73	42	67	14	1.4	2.5
Cooper's Hawk	1990-2006	89	105	93	87	1.1±0.09	0.9 ± 0.16
	2007	46	31	35	30	1.2	1.3
American Kestrel	1990-2006	9	2	16	7	0.7±0.20	4.0 ± 1.12
	2007	1	1	6	1	0.3	3.5

<sup>1</sup> Long-term value: mean ± 95% confidence interval.

**Table 7. Foreign encounters with raptors originally banded in the Manzano Mountains, NM: 2007.**

BAND #	SPECIES <sup>1</sup>	SEX	BANDING AGE <sup>1</sup>	BANDING DATE	ENCOUNTER DATE	ENCOUNTER AGE <sup>2</sup>	ENCOUNTER LOCATION	DISTANCE (KM)	STATUS
1593 – 03236	SS	F	AHY	15-Oct-02	25-Feb-07	≥5 <sup>th</sup> yr	Michoacán, MEX	1,399	found dead
1523 – 71345	ML	M	HY	15-Oct-00	27-Feb-07	≥6 <sup>th</sup> yr	Thermopolis, WY	816	found dead
1177 – 06551	RT	U	HY	06-Oct-99	01-Mar-07	≥7 <sup>th</sup> yr	Mountainair, NM	111	found dead
1005 – 23416	CH	M	ASY	14-Sep-06	26-Apr-07	TY	Cierro Pass, CO	333	found dead
1387 – 69909	NG	F	ASY	22-Oct-94	14-Sep-07	≥15 <sup>th</sup> yr	New Canyon C.G., NM	20	sick/died
1005 – 01396	CH	F	HY	14-Sep-00	19-Oct-07	≥7 <sup>th</sup> yr	Delta, CO	399	found dead

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

<sup>2</sup> HY = hatch year; SY = second year; TY = third year; AHY = after hatch year; ASY = after second year; ATY = after third year.

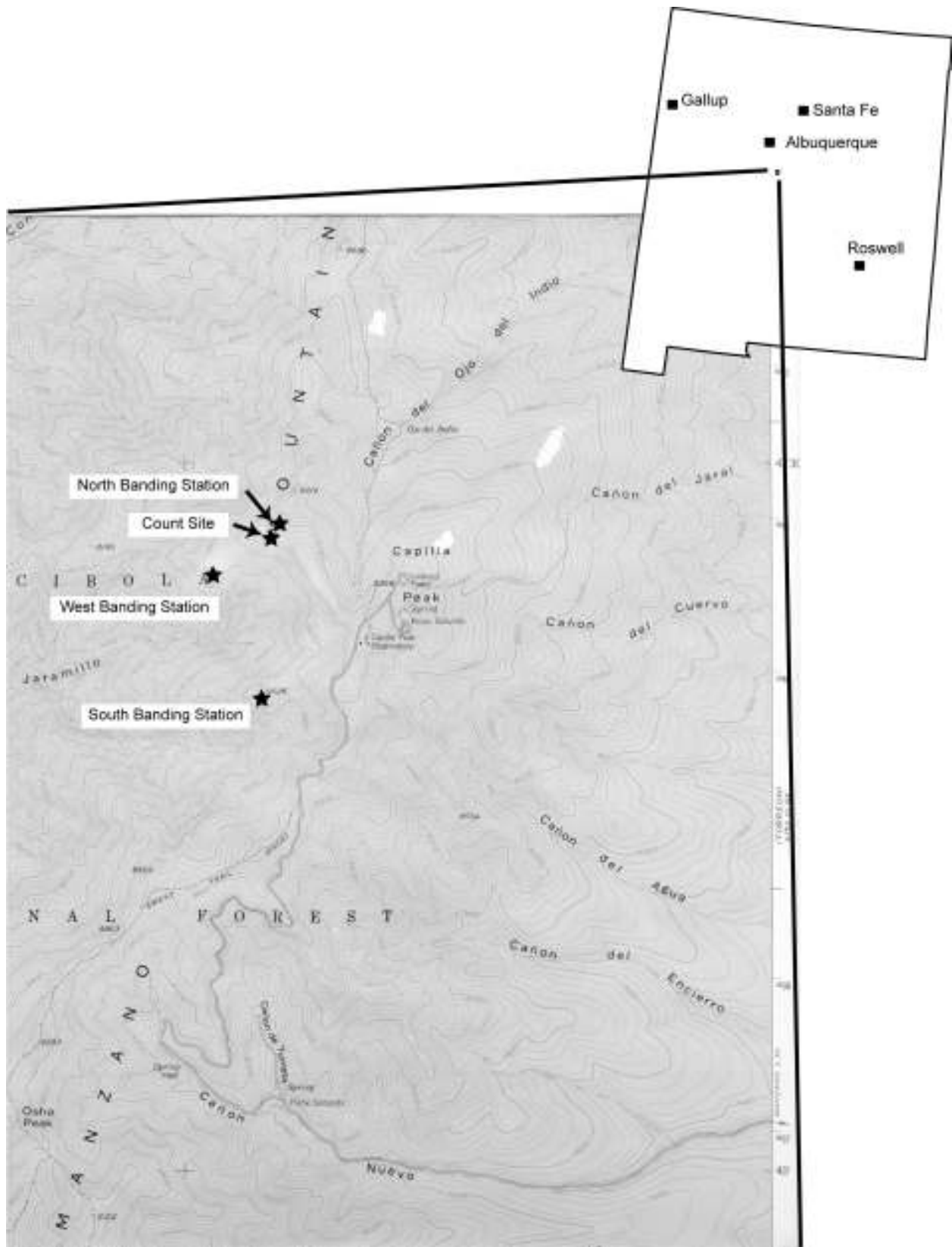
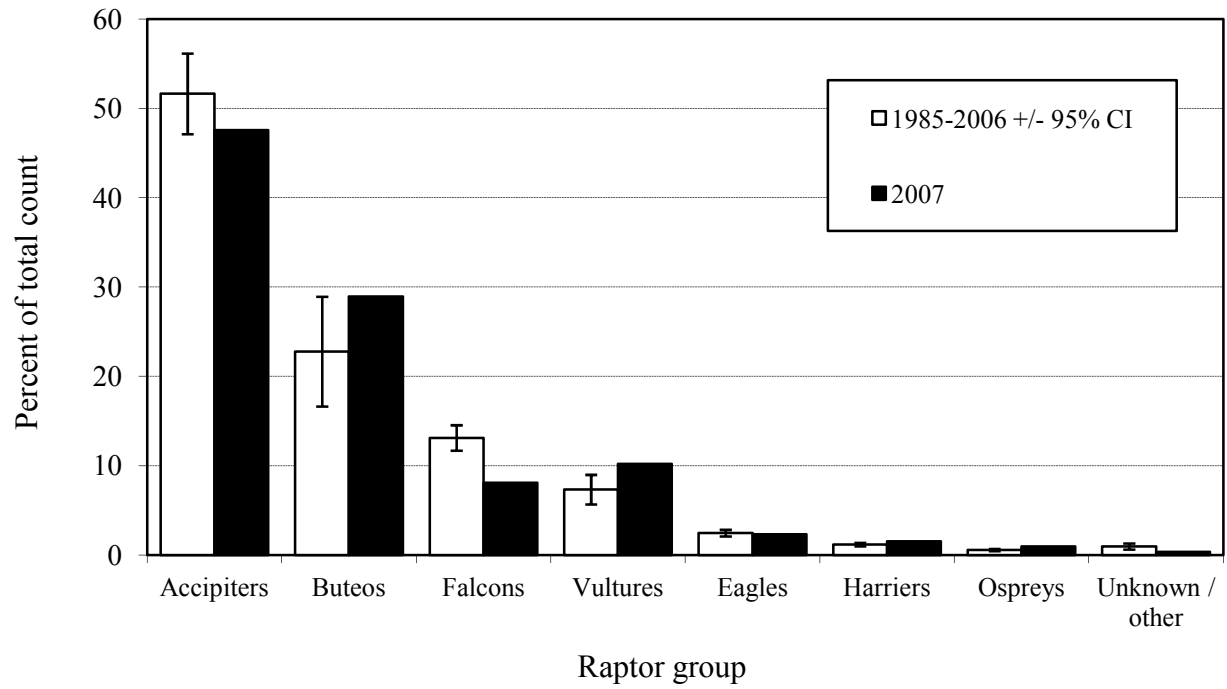
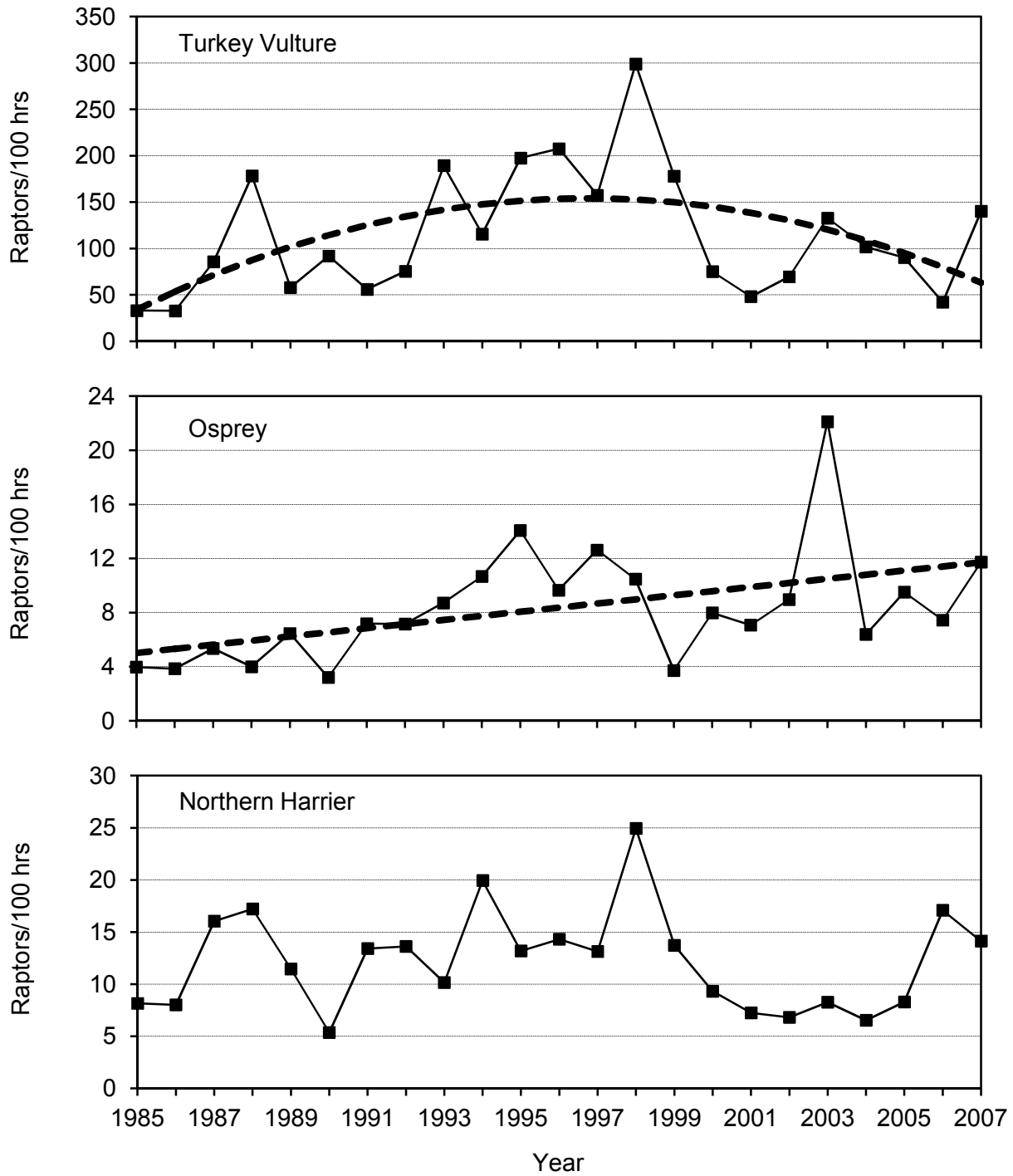


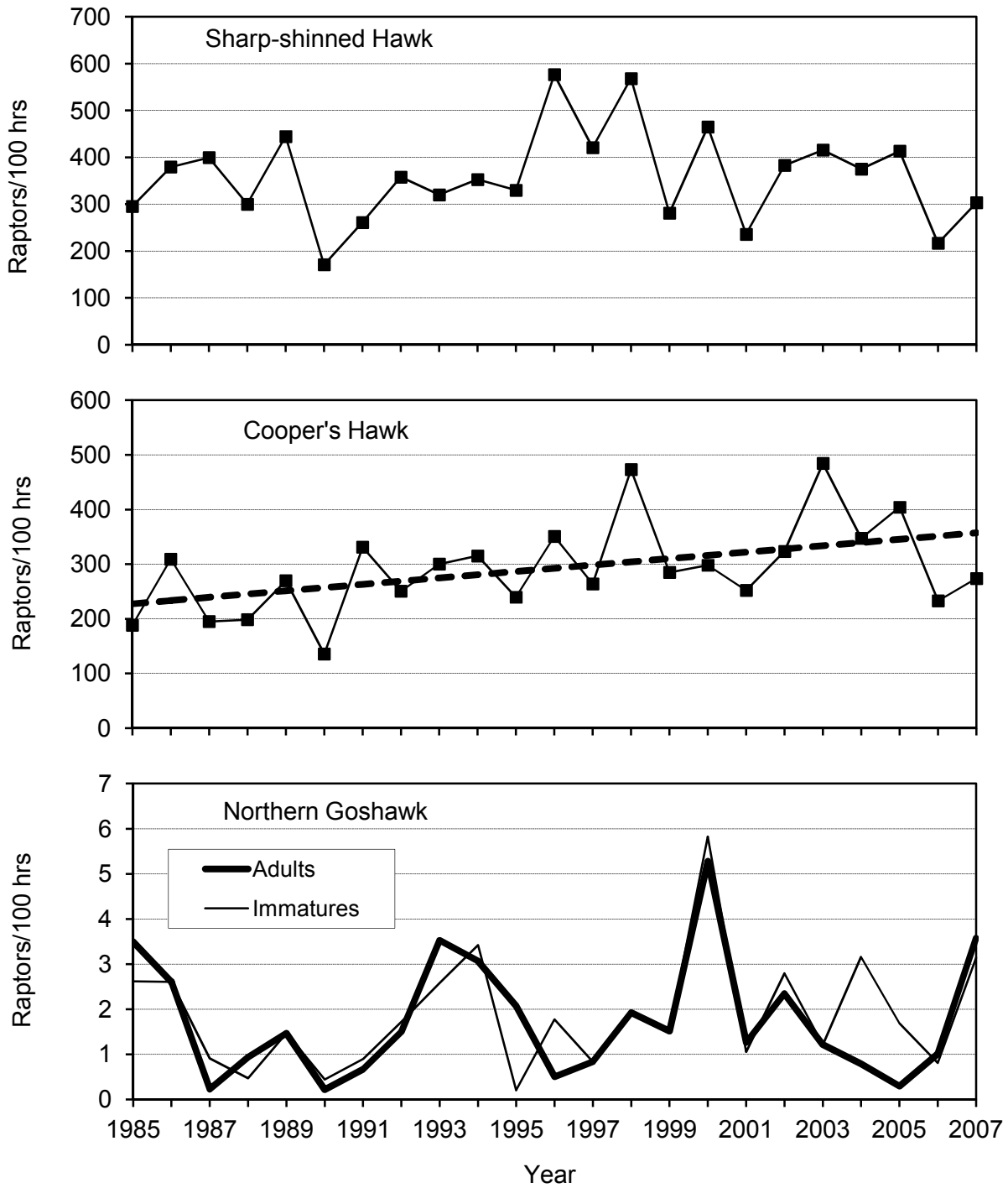
Figure 1. Map of the Manzano Mountains raptor-migration study site in central New Mexico.



**Figure 2. Fall raptor-migration flight composition by major species groups in the Manzano Mountains, NM: 1985–2006 versus 2007.**

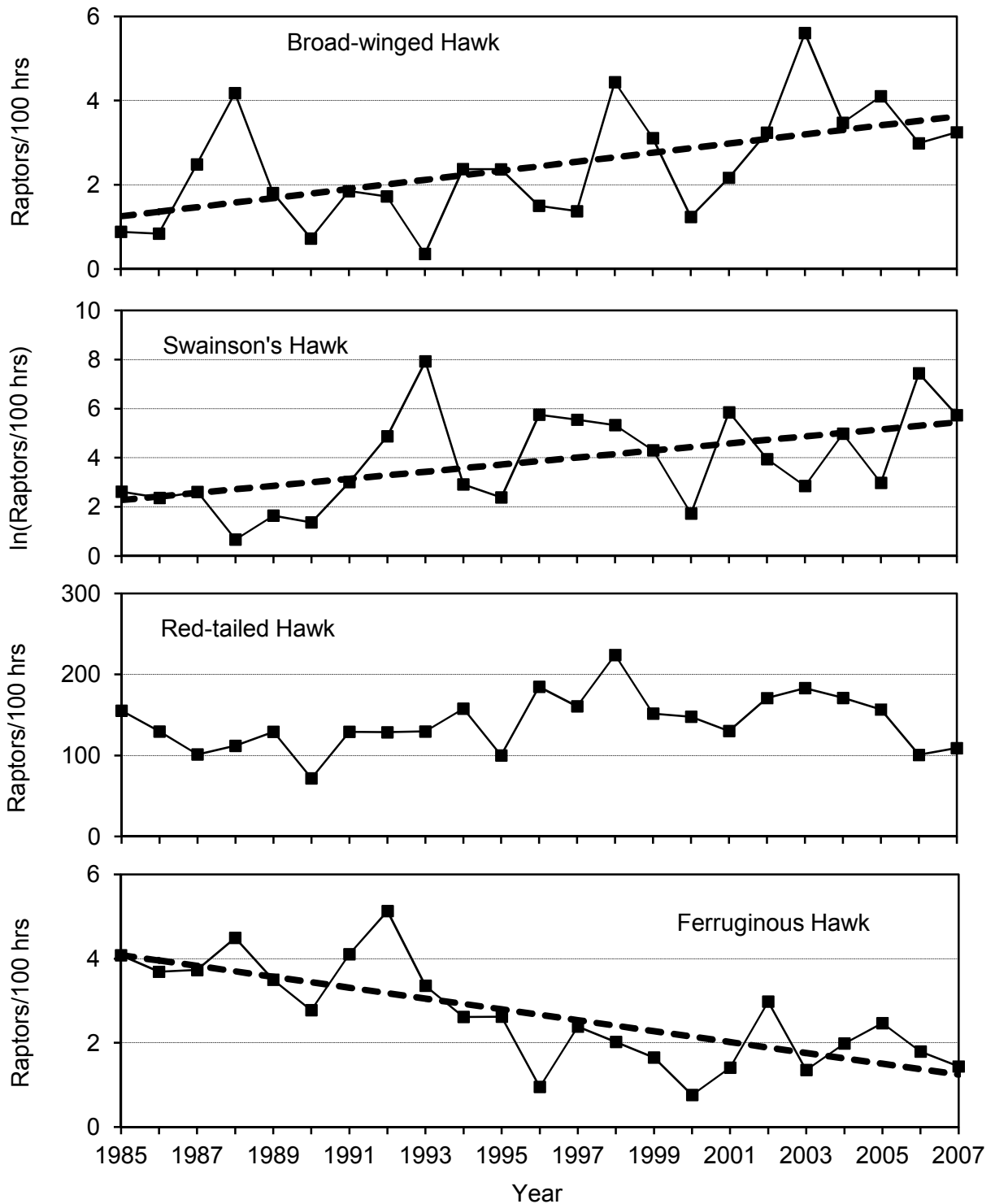


**Figure 3. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Turkey Vultures, Ospreys, and Northern Harriers in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions.**

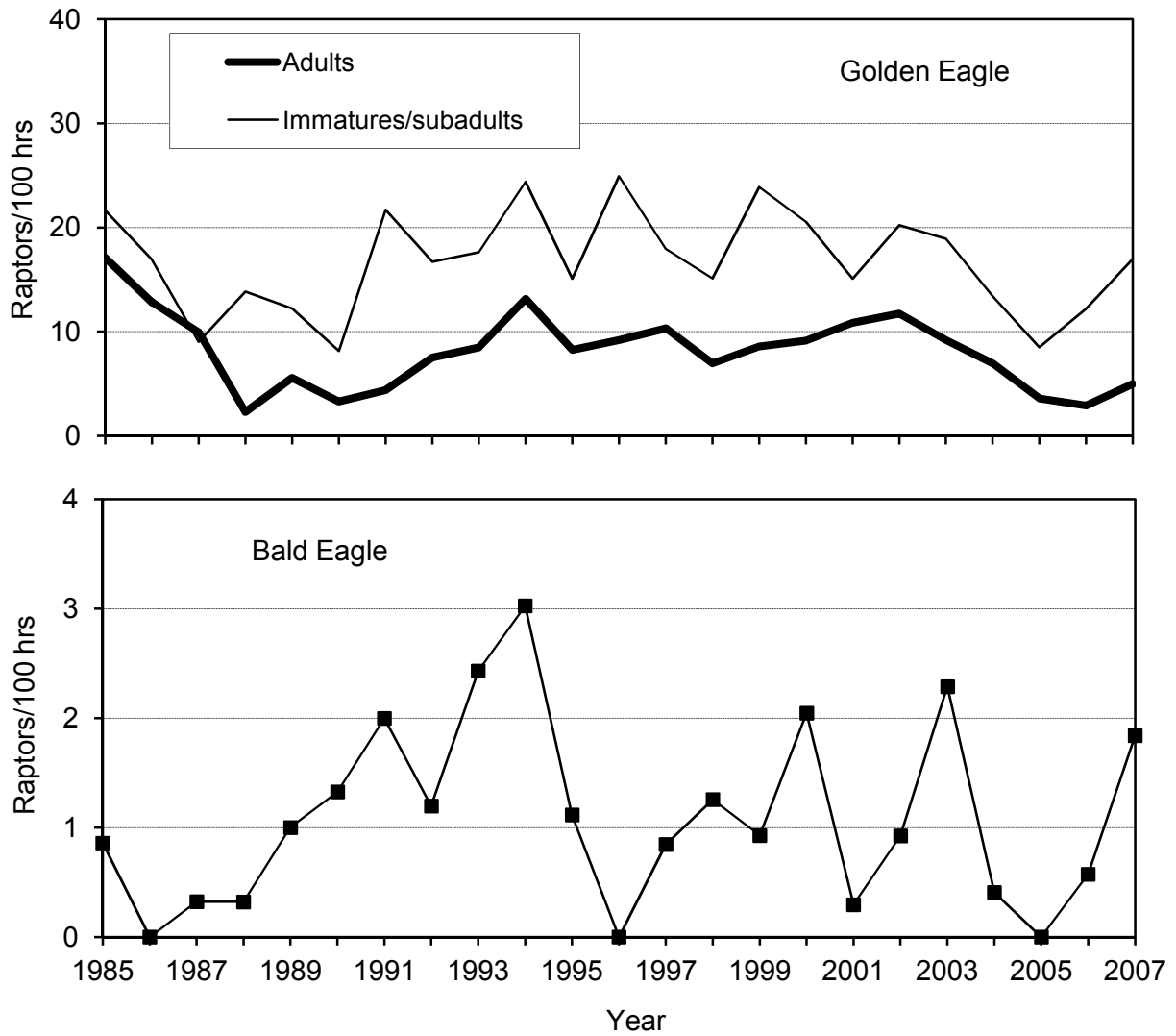


**Figure 4. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions.**

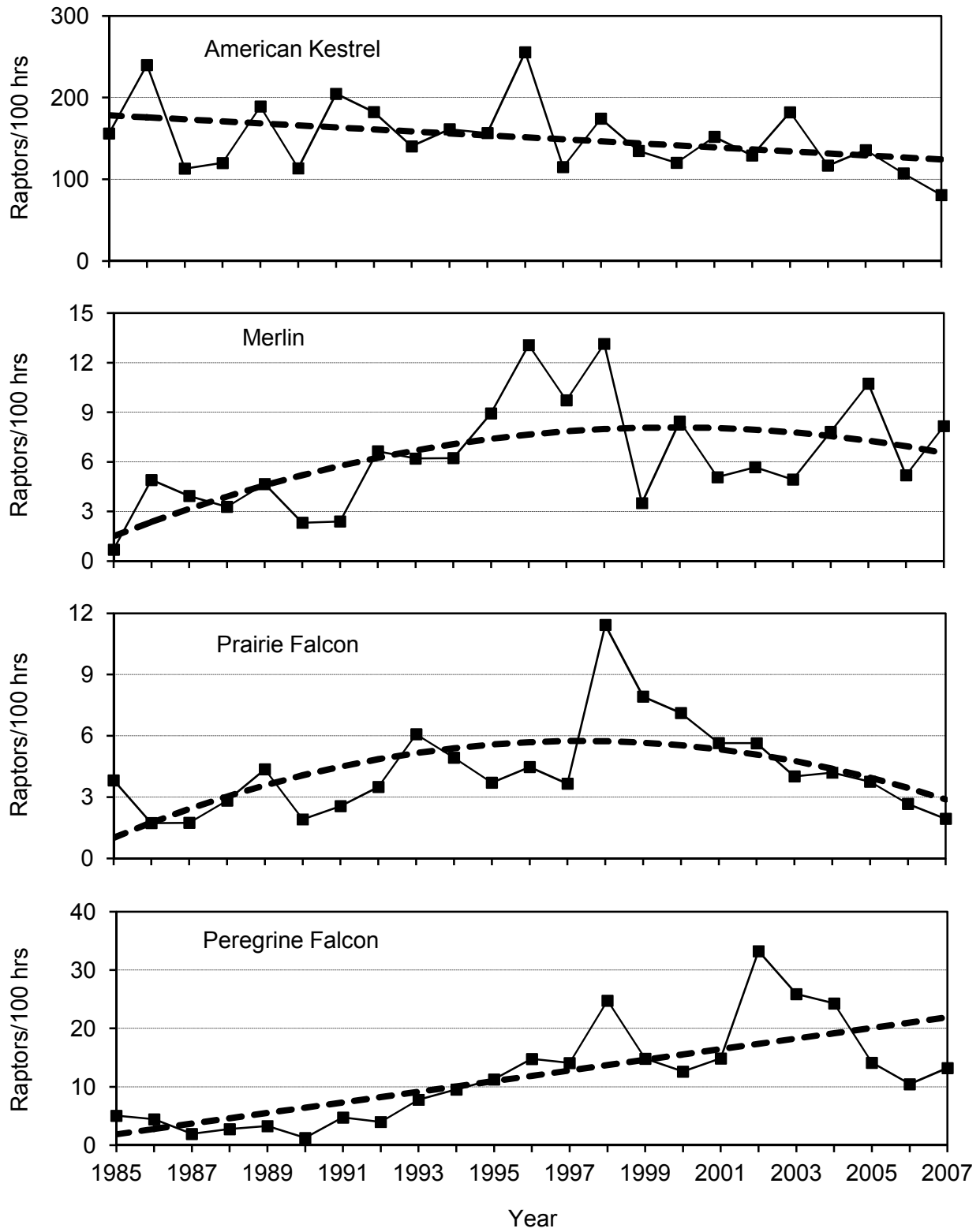




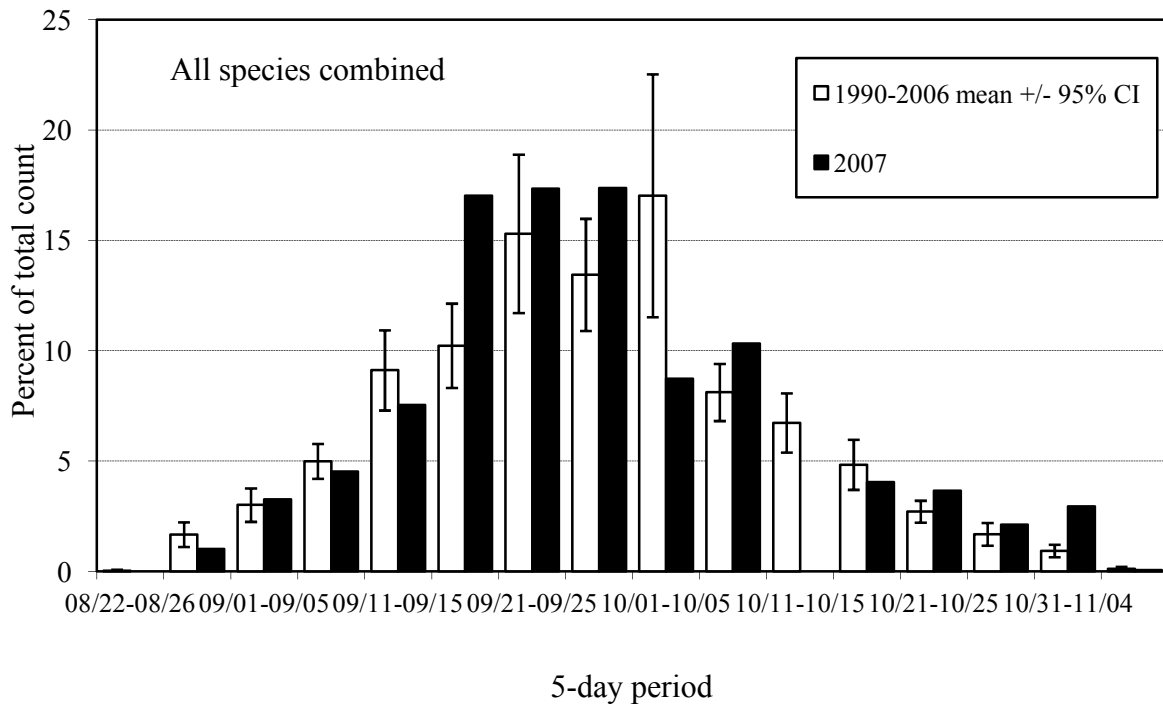
**Figure 5. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Broad-winged, Swainson's, Red-tailed and Ferruginous Hawks in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions.**



**Figure 6. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Golden and Bald Eagles in the Manzano Mountains, NM: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions.**



**Figure 7. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons: 1985–2007. Dashed lines indicate significant ( $P \leq 0.10$ ) regressions.**



**Figure 8. Combined-species, fall-migration passage volume by five-day periods for raptors in the Manzano Mountains, NM: 1985–2006 versus 2007.**

**Appendix A. History of official observer participation in the Manzano Mountains Raptor Migration Project: 1985–2007.**

- 1985** Single observer throughout, shared duty: Gary Cress (0)<sup>1</sup>, Jim Daly (1), Allen Hale (1)
- 1986** Single observer throughout: Jim Daly (2)
- 1987** Single observer throughout: Jim Daly (3)
- 1988** Single observer throughout: Gordon Vickrey (1)
- 1989** Two observers during peak 3/4 of the season, one observer otherwise: Brett Ewald (2), Tim Menard (0)
- 1990** Two observers during peak 3/4 of the season, one observer otherwise: David Curson (0), Gary Cress (1)
- 1991** Two observers throughout: Eric Meyer (1), Tylan Dean (0)
- 1992** Two observers throughout: Eric Meyer (3), Jessie Jewell (0)
- 1993** Two observers throughout: Jessie Jewell (2), John Haskell (0)
- 1994** Two observers throughout: Jessie Jewell (4), Jeff Ogburn (1)
- 1995** Two observers throughout: Jessie Jewell (6), Jeff Ogburn (2)
- 1996** Two observers throughout: Jessie Jewell (8), Sean O'Connor (3)
- 1997** Two observers throughout: Jeff Ogburn (4), Sean O'Connor (4)
- 1998** Two observers throughout: Dan Rossman (1), Lawry Sager (0)
- 1999** Two observers throughout: Jason Beason (4), Lawry Sager (1)
- 2000** Two observers throughout: Jorge Canaca (1), Laura Lutz (1)
- 2001** Two observers throughout: Tim Meehan (1), Carrie Hisaoka (0)
- 2002** Two observers throughout: Carrie Hisaoka (1), Richard Sim (0)
- 2003** Two observers throughout: Carrie Hisaoka (2), Tim Hanks (1)
- 2004** Two observers throughout: Paula Shannon (3), Frank Mayer (2)
- 2005** Two observers throughout: Tim Hanks (2), Geoff Gould (0)
- 2006** Two observers throughout: Tim Hanks (3), Greg Levandoski (3)
- 2007** Two observers throughout: Tim Hanks (4), Aldo Raul Coutreras Reyes (4)

<sup>1</sup> Numbers in parentheses indicate previous full seasons of observation experience.

**Appendix B. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications for all diurnal raptor species observed during fall migration in the Manzano Mountains, NM.**

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
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
Zone-tailed Hawk	<i>Buteo albonotus</i>	ZT	A I U	U	NA
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 for the Manzano Mountains Raptor Migration Project: 2007.**

DATE	OBS. HOURS	OBSRVR / HOUR <sup>1</sup>	MEDIAN		PREDOMINANT WEATHER <sup>3</sup>	WIND		TEMP (°C) <sup>1</sup>	BAROM. PRESS. (IN HG) <sup>1</sup>	MEDIAN THERMAL LIFT <sup>4</sup>	VISIB. WEST (KM) <sup>1</sup>	VISIB. EAST (KM) <sup>1</sup>	MEDIAN FLIGHT DISTANCE <sup>5</sup> / HOUR	BIRDS / HOUR
			VISITOR DISTURB <sup>2</sup>	VISITOR		SPEED (KPH) <sup>1</sup>	WIND DIRECTION							
27-Aug	8.00	2.0	0		clr-mc, AM haze, PM ts	8.4	sw	23.9	30.26	2.5	91	84	2	1.5
28-Aug	8.25	2.0	0		pc-mc	5.9	w, nw	21.0	30.30	2	100	100	1	1.5
29-Aug	8.00	2.0	0		pc-ovc, PM ts	11.3	ne, se	20.1	30.40	4	92	88	1	1.6
30-Aug	6.00	2.2	0		mc-ovc, PM fog	1.9	sw	21.5	30.46	4	74	61	3	2.2
31-Aug	6.75	1.7	0		mc-ovc, AM haze, ts	4.4	var	17.1	30.40	4	73	89	-	0.0
1-Sep	8.50	2.2	0		ovc, AM haze, PM ts	8.5	se	17.1	30.35	4	78	85	-	1.8
2-Sep	8.50	2.7	0		pc-mc, haze	3.8	var	19.7	30.39	2	87	71	3	4.2
3-Sep	8.25	2.4	0		pc, haze	7.2	sw	21.9	30.36	2.5	90	82	2	4.5
4-Sep	8.50	1.8	0		clr-pc, haze	11.0	sw	21.5	30.20	2	93	89	1.5	3.4
5-Sep	8.50	2.2	0		clr-pc, haze	11.6	sw	22.4	30.13	2	100	89	2	5.1
6-Sep	7.25	1.9	1		ovc, AM rain, PM fog	4.6	sw	17.7	30.21	4	48	27	-	0.0
7-Sep	9.25	1.8	1		clr-ovc, haze	6.2	ne, se	19.1	30.28	2.5	84	77	2	5.5
8-Sep	9.25	2.7	1.5		clr-ovc, haze	6.9	sw	20.6	30.27	3	76	81	2	5.2
9-Sep	0.00				weather day									
10-Sep	9.50	3.0	0		pc-mc, PM haze, PM ts	5.7	ene, wsw	19.3	30.35	2	95	88	2.5	12.8
11-Sep	9.50	2.5	0		clr-pc, PM ts	5.6	sw	18.2	30.38	1.5	91	89	2	13.2
12-Sep	8.75	2.9	0		pc-mc, PM ts	9.3	w	17.4	30.26	3	100	100	1	11.0
13-Sep	8.75	2.8	0		clr, haze	6.3	var	20.7	30.28	2	78	76	2	5.7
14-Sep	8.50	2.9	1		clr, haze	10.6	sw	23.9	30.38	2	95	85	2.5	5.3
15-Sep	9.00	2.9	0		pc, haze	9.8	sw	22.3	30.42	2	93	90	2	5.9
16-Sep	10.00	2.7	1		pc-mc, haze	8.2	sw	21.4	30.30	3	96	84	2	7.1
17-Sep	8.25	2.3	0		mc-ovc, AM haze, PM ts	14.1	sw	18.3	30.11	4	89	84	1	1.9
18-Sep	10.25	2.3	0		clr, AM haze	13.7	sw	16.3	30.22	2.5	91	92	2	46.0
19-Sep	9.50	2.0	0		clr-pc	14.5	sw	18.8	30.25	2	100	100	1	27.4
20-Sep	6.25	1.7	0		ovc, AM rain, PM ts	6.7	s, sw	15.2	30.21	4	52	28	1	2.2
21-Sep	10.25	1.9	0		clr-pc, AM fog	7.2	w, nw	15.3	30.26	2.5	95	99	1.5	34.0
22-Sep	10.00	2.6	0		pc, AM haze	3.3	sw	18.9	30.26	1.5	95	97	2	17.8
23-Sep	8.00	2.6	0		pc-ovc, AM haze, PM ts/rain	20.0	s, sw	15.3	30.08	4	78	78	1	6.6
24-Sep	9.50	3.1	0		clr-pc	16.1	sw, w	13.7	30.13	3	100	100	1	19.1
25-Sep	9.17	2.0	1		clr	7.2	sw, w	14.5	30.28	1	100	100	1	9.5
26-Sep	9.25	2.7	1		clr	8.4	sw, w	15.7	30.26	2	97	97	2	19.7
27-Sep	10.25	1.8	1		clr-pc, AM haze	4.8	s, sw, w	17.2	30.31	2	100	99	1	14.3
28-Sep	9.50	1.8	2.5		mc-ovc, haze, PM ts	14.5	s	18.7	30.19	4	90	86	1.5	8.2
29-Sep	9.75	2.2	0		pc-mc, AM haze, PM ts	24.5	s, sw	17.5	30.09	4	94	88	2	13.6
30-Sep	10.33	2.4	1		clr, AM haze	11.3	sw, w	13.2	30.38	2.5	100	97	1	29.9
1-Oct	9.25	1.9	1		ovc, AM haze, PM rain	15.5	s, sw	15.9	30.37	4	82	69	1	3.4
2-Oct	8.17	1.8	0		pc-mc, haze	20.7	wnw	13.1	30.24	4	96	90	2	13.0
3-Oct	9.75	1.9	0		clr, haze	13.7	wsw	14.9	30.20	3	99	86	1	10.7
4-Oct	7.75	2.2	0		mc-ovc, PM ts/rain	11.4	sw	15.0	30.09	4	97	84	2	12.0
5-Oct	9.67	2.3	0		clr-pc, haze	16.6	ssw	16.5	30.07	3	96	90	1	9.6
6-Oct	9.83	2.9	2		clr	24.5	ssw	15.7	29.97	4	100	100	1	14.3
7-Oct	9.67	2.3	2		clr-pc	14.7	w	6.5	30.07	3	100	100	1	10.8
8-Oct	9.83	1.7	1		clr-pc	3.0	var	12.2	30.29	1	100	100	1	10.0
9-Oct	9.00	1.9	0		clr-pc, haze	5.5	sw	15.4	30.40	2	99	97	1	18.0
10-Oct	0.00				fire evacuation									
11-Oct	0.00				fire evacuation									
12-Oct	0.00				fire evacuation									
13-Oct	0.00				fire evacuation									
14-Oct	0.00				fire evacuation									
15-Oct	0.00				fire evacuation									
16-Oct	0.00				fire evacuation									
17-Oct	6.17	1.5	0		pc, haze, blow dust	34.9	w	8.4	29.62	4	92	85	2	6.5
18-Oct	9.33	2.0	0		clr, AM haze	21.7	wnw	3.9	29.89	4	100	99	1	4.8
19-Oct	9.25	1.8	0		clr	14.9	w	9.8	30.19	4	100	100	1	4.3
20-Oct	9.25	2.2	0		pc	40.7	sw	14.4	29.95	4	100	100	1	7.9

Appendix C. continued

DATE	OBS. HOURS	MEDIAN		PREDOMINANT WEATHER <sup>3</sup>	WIND		BAROM.		MEDIAN	VISIB.	VISIB.	MEDIAN	BIRDS / HOUR
		OBSRVR / HOUR <sup>1</sup>	VISITOR DISTURB <sup>2</sup>		SPEED (KPH) <sup>1</sup>	WIND DIRECTION	TEMP (°C) <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>	
21-Oct	9.25	2.0	0	clr-mc	22.0	nw	0.7	29.91	4	93	99	2	4.0
22-Oct	9.00	1.8	0	clr	9.5	w, nw	1.5	30.23	2.5	100	100	1	4.0
23-Oct	9.25	1.8	0	clr, PM haze	4.3	var	10.2	30.46	1	100	100	1.5	4.3
24-Oct	9.33	1.8	0	clr, haze	4.6	var	11.4	30.52	1.5	100	100	1	3.6
25-Oct	8.83	1.9	1.5	clr, haze	7.3	sw, w	13.1	30.23	2	100	100	2	3.6
26-Oct	9.25	1.8	0	clr, AM haze	9.1	sw, w	12.5	30.18	3	100	100	2	3.1
27-Oct	9.00	2.1	1	clr-pc, haze	8.0	se	11.0	30.44	2	92	86	-	2.3
28-Oct	9.00	1.9	1.5	clr, AM haze	7.4	ws	12.2	30.54	2	100	99	1	2.0
29-Oct	8.00	1.0	0	pc, haze	11.8	sw	12.3	30.46	2	100	100	1	0.9
30-Oct	8.75	1.6	0	clr-pc	16.8	sw	12.7	30.18	4	100	100	1	3.3
31-Oct	8.92	1.8	0	pc-mc, haze	8.4	var	10.0	30.25	3	91	97	1	4.7
1-Nov	8.50	2.7	1	clr-pc, haze	14.6	sw	9.9	30.16	3	92	90	1	1.5
2-Nov	9.00	2.7	0	clr-pc, haze	3.8	var	9.8	30.27	1	90	86	2.5	5.0
3-Nov	8.75	3.2	0	clr-pc, haze	11.3	sw	10.0	30.33	3	95	86	2	2.6
4-Nov	8.33	3.1	1	clr-pc, haze	11.1	w	10.4	30.33	3	100	94	2	2.5
5-Nov	4.25	2.3	0	pc-mc, haze	7.3	nw	11.3	30.29	2	100	100	1	0.7

<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 observation effort and fall raptor migration counts by species in the Manzano Mountains, NM: 2007.**

DATE	HOURS	SPECIES <sup>1</sup>																								BIRDS				
		TV	OS	NH	SS	CH	NG	SA	LA	UA	BW	SW	RT	FH	RL	ZT	UB	GE	BE	UE	AK	ML	PR	PG	SF	LF	UF	UU	TOTAL	/ HOUR
27-Aug	8.00	1	0	1	0	2	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	12	1.5
28-Aug	8.25	1	0	1	1	3	0	0	0	0	0	1	2	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0	12	1.5
29-Aug	8.00	0	2	0	1	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	13	1.6	
30-Aug	6.00	1	2	0	2	4	0	0	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	2.2	
31-Aug	6.75	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	
01-Sep	8.50	7	0	0	2	5	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	1.8	
02-Sep	8.50	3	1	0	1	12	0	1	0	1	0	4	8	0	0	1	0	0	0	2	0	1	1	0	0	0	0	36	4.2	
03-Sep	8.25	18	0	0	4	5	0	0	0	0	0	1	4	0	0	0	0	0	0	4	0	0	1	0	0	0	0	37	4.5	
04-Sep	8.50	0	0	0	6	5	0	1	0	0	0	0	6	0	0	0	2	0	0	8	0	0	1	0	0	0	0	29	3.4	
05-Sep	8.50	12	1	0	7	5	0	0	0	0	0	1	7	0	0	0	0	0	0	10	0	0	0	0	0	0	0	43	5.1	
06-Sep	7.25	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	
07-Sep	9.25	0	3	0	10	22	0	2	0	0	0	2	6	0	0	0	2	0	0	0	2	0	1	1	0	0	0	51	5.5	
08-Sep	9.25	0	1	0	14	11	0	1	0	0	0	4	8	0	0	0	1	0	0	0	8	0	0	0	0	0	0	48	5.2	
09-Sep	0.00	weather day																												
10-Sep	9.50	0	8	2	26	42	0	3	0	0	0	5	20	0	0	0	1	0	0	0	11	0	0	2	0	1	0	122	12.8	
11-Sep	9.50	4	3	3	43	44	0	1	0	1	0	0	6	0	0	0	1	0	0	0	15	0	0	1	0	0	3	125	13.2	
12-Sep	8.75	1	0	2	19	18	0	4	0	1	0	3	11	1	0	0	1	1	0	0	31	0	1	2	0	0	0	96	11.0	
13-Sep	8.75	0	0	2	22	15	0	0	0	0	0	0	7	1	0	0	0	0	0	3	0	0	0	0	0	0	0	50	5.7	
14-Sep	8.50	5	0	4	11	18	0	1	0	0	0	0	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	45	5.3	
15-Sep	9.00	3	0	0	18	15	1	0	0	0	0	5	7	0	0	0	0	1	0	0	3	0	0	0	0	0	0	53	5.9	
16-Sep	10.00	0	1	0	23	15	0	2	0	0	0	13	8	0	0	0	0	1	0	0	6	0	0	2	0	0	0	71	7.1	
17-Sep	8.25	0	0	0	10	1	0	0	0	0	0	0	3	0	0	0	0	1	0	0	1	0	0	0	0	0	0	16	1.9	
18-Sep	10.25	28	0	2	41	24	0	1	0	0	0	343	18	0	0	0	0	0	0	0	13	0	0	0	0	0	1	0	471	46.0
19-Sep	9.50	9	3	2	47	48	0	3	0	1	1	113	17	0	0	0	1	0	0	0	11	2	0	2	0	0	0	260	27.4	
20-Sep	6.25	0	0	1	5	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	2.2	
21-Sep	10.25	11	0	1	19	28	1	3	0	0	0	255	6	0	0	0	0	0	0	0	19	1	0	4	0	0	0	1	349	34.0
22-Sep	10.00	0	0	1	70	57	3	5	1	0	0	1	15	0	0	0	0	2	0	0	21	0	0	0	0	0	2	178	17.8	
23-Sep	8.00	1	3	0	23	18	0	0	0	0	0	0	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	53	6.6	
24-Sep	9.50	7	1	2	27	28	0	3	0	0	0	54	12	0	0	0	3	0	0	0	35	0	0	7	0	0	0	2	181	19.1
25-Sep	9.17	0	0	2	32	35	0	0	0	0	0	0	11	0	0	0	0	1	0	0	5	1	0	0	0	0	0	87	9.5	
26-Sep	9.25	54	0	1	32	58	0	5	0	0	0	2	17	0	0	0	2	1	0	0	9	1	0	0	0	0	0	182	19.7	
27-Sep	10.25	9	0	3	27	78	0	2	1	0	0	2	13	0	0	0	0	1	0	0	5	3	0	2	0	0	0	1	147	14.3
28-Sep	9.50	6	4	1	23	19	0	5	0	0	2	0	16	0	0	0	1	1	0	0	0	0	0	0	0	0	0	78	8.2	
29-Sep	9.75	9	3	5	38	45	0	2	0	0	1	5	16	0	0	0	1	2	0	0	1	0	0	4	0	0	0	1	133	13.6
30-Sep	10.33	239	0	2	29	18	1	3	0	0	0	1	9	0	0	0	0	0	0	6	1	0	0	0	0	0	0	0	309	29.9
01-Oct	9.25	0	0	2	16	11	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	31	3.4	
02-Oct	8.17	17	0	0	30	24	0	3	1	0	1	1	12	0	0	0	0	1	0	0	10	1	1	4	0	0	0	106	13.0	
03-Oct	9.75	6	0	0	52	20	0	1	0	0	1	1	7	1	0	0	0	2	0	0	10	1	1	1	0	0	0	104	10.7	
04-Oct	7.75	1	2	1	38	27	0	2	0	0	0	0	12	0	0	0	0	0	0	4	3	0	3	0	0	0	0	93	12.0	
05-Oct	9.67	3	0	2	33	22	0	3	0	0	1	6	13	0	0	0	0	1	0	0	8	0	0	1	0	0	0	93	9.6	

Appendix D. continued

DATE	HOURS	SPECIES <sup>1</sup>																								BIRDS				
		TV	OS	NH	SS	CH	NG	SA	LA	UA	BW	SW	RT	FH	RL	ZT	UB	GE	BE	UE	AK	ML	PR	PG	SF	LF	UF	UU	TOTAL	/ HOUR
06-Oct	9.83	4	3	1	49	30	0	2	2	0	1	6	32	0	0	0	0	3	0	0	2	1	1	4	0	0	0	0	141	14.3
07-Oct	9.67	39	2	0	36	10	0	1	0	0	0	0	12	0	0	0	0	0	0	1	0	0	3	0	0	0	0	104	10.8	
08-Oct	9.83	0	0	3	52	26	0	1	0	0	0	0	10	0	0	0	0	2	0	0	4	0	0	0	0	0	0	98	10.0	
09-Oct	9.00	0	1	6	86	16	0	8	0	3	1	12	21	0	0	0	0	1	0	0	4	0	0	1	0	0	0	2	162	18.0
10-Oct	0.00	fire evacuation																												
11-Oct	0.00	fire evacuation																												
12-Oct	0.00	fire evacuation																												
13-Oct	0.00	fire evacuation																												
14-Oct	0.00	fire evacuation																												
15-Oct	0.00	fire evacuation																												
16-Oct	0.00	fire evacuation																												
17-Oct	6.17	0	0	0	7	3	1	0	0	0	1	0	16	0	0	0	1	0	0	0	8	0	0	1	0	1	0	1	40	6.5
18-Oct	9.33	0	0	2	23	1	0	0	0	1	0	0	12	0	0	0	0	1	0	0	3	1	0	0	0	0	0	1	45	4.8
19-Oct	9.25	0	0	2	22	1	1	0	0	0	0	0	9	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	40	4.3
20-Oct	9.25	0	0	1	31	6	1	3	0	0	0	0	25	0	0	0	0	3	0	0	0	2	1	0	0	0	0	0	73	7.9
21-Oct	9.25	0	0	0	8	1	4	0	1	0	0	0	20	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	37	4.0
22-Oct	9.00	0	1	1	16	2	2	1	0	0	0	0	6	0	0	0	0	2	0	0	0	4	1	0	0	0	0	0	36	4.0
23-Oct	9.25	0	0	2	18	1	3	0	0	0	0	0	10	2	0	0	0	2	0	0	0	2	0	0	0	0	0	0	40	4.3
24-Oct	9.33	0	0	1	20	2	1	0	0	0	0	0	4	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	34	3.6
25-Oct	8.83	0	0	2	15	1	1	1	0	0	0	0	5	0	0	0	0	4	0	0	1	2	0	0	0	0	0	0	32	3.6
26-Oct	9.25	0	0	1	16	1	1	0	0	0	0	0	2	1	0	0	0	6	0	0	0	1	0	0	0	0	0	0	29	3.1
27-Oct	9.00	0	0	1	8	0	0	0	0	0	0	0	9	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	21	2.3
28-Oct	9.00	0	0	0	9	2	0	0	0	0	0	0	2	0	0	0	0	2	1	1	0	1	0	0	0	0	0	0	18	2.0
29-Oct	8.00	0	0	3	2	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0.9
30-Oct	8.75	0	0	0	17	0	3	0	0	1	0	0	2	1	0	0	0	1	0	1	2	0	1	0	0	0	0	0	29	3.3
31-Oct	8.92	0	0	1	14	0	3	0	0	1	0	0	5	0	0	0	1	9	2	1	2	3	0	0	0	0	0	0	42	4.7
01-Nov	8.50	0	0	1	5	0	0	0	0	0	0	0	1	0	0	0	0	4	0	1	1	0	0	0	0	0	0	0	13	1.5
02-Nov	9.00	0	2	2	17	0	2	0	0	0	0	0	8	0	0	0	1	8	0	3	1	0	0	0	0	0	0	1	45	5.0
03-Nov	8.75	0	0	1	6	0	0	0	0	0	0	0	2	0	0	0	0	10	2	1	0	1	0	0	0	0	0	0	23	2.6
04-Nov	8.33	0	0	1	3	0	0	0	0	0	0	0	5	1	0	0	0	9	0	1	0	1	0	0	0	0	0	0	21	2.5
05-Nov	4.25	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	3	0.7
<b>Total</b>	<b>553.58</b>	<b>499</b>	<b>47</b>	<b>75</b>	<b>1283</b>	<b>922</b>	<b>30</b>	<b>74</b>	<b>7</b>	<b>10</b>	<b>10</b>	<b>841</b>	<b>537</b>	<b>8</b>	<b>0</b>	<b>0</b>	<b>19</b>	<b>99</b>	<b>6</b>	<b>9</b>	<b>298</b>	<b>34</b>	<b>10</b>	<b>51</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>17</b>	<b>4889</b>	<b>8.8</b>

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

**Appendix E. Annual observation effort and fall raptor migration counts by species (unadjusted data) in the Manzano Mountains, NM: 1985–2007.**

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Start date	06-Sep	23-Aug	25-Aug	30-Aug	28-Aug	27-Aug	27-Aug	25-Aug	25-Aug	25-Aug
End date	02-Nov	31-Oct	04-Nov	31-Oct	31-Oct	31-Oct	05-Nov	05-Nov	05-Nov	02-Nov
Days of observation	50	63	65	60	63	62	67	70	68	66
Hours of observation	343.33	464.50	517.92	453.08	489.75	510.75	524.58	537.25	489.67	508.75
Raptors / 100 hours	843.2	863.9	758.6	772.3	955.4	494.6	825.6	946.3	2429.2	966.5
SPECIES	RAPTOR COUNTS									
Turkey Vulture	74	118	283	466	178	295	176	268	601	430
Osprey	10	14	19	13	22	12	24	26	31	38
Northern Harrier	28	36	78	78	59	27	66	69	48	97
Sharp-shinned Hawk	956	1300	1622	1118	1834	688	1080	1540	1193	1415
Cooper's Hawk	531	881	679	604	929	471	1105	961	944	1054
Northern Goshawk	21	20	7	6	14	3	8	16	27	30
Unknown small accipiter <sup>1</sup>	-	-	-	-	-	-	-	-	-	-
Unknown large accipiter <sup>1</sup>	-	-	-	-	-	-	-	-	-	-
Unknown accipiter	78	104	119	111	121	120	156	117	266	118
TOTAL ACCIPITERS	1586	2305	2427	1839	2898	1282	2349	2634	2430	2617
Broad-winged Hawk	2	2	7	10	5	2	5	5	1	7
Swainson's Hawk	27	33	44	3	16	9	58	344	7301	67
Red-tailed Hawk	513	527	457	486	604	329	577	667	566	707
Ferruginous Hawk	14	15	17	20	16	13	19	25	17	13
Rough-legged Hawk	0	0	0	1	1	0	0	0	0	0
Zone-tailed Hawk	0	0	0	0	0	0	0	2	0	1
Unknown buteo	21	12	11	16	4	19	30	11	31	22
TOTAL BUTEOS	577	589	536	536	646	372	689	1054	7916	817
Golden Eagle	133	123	86	67	85	52	124	119	120	172
Bald Eagle	2	0	1	1	3	4	7	4	7	9
Unknown Eagle	0	0	0	4	0	4	0	0	0	0
TOTAL EAGLES	135	123	87	72	88	60	131	123	127	181
American Kestrel	421	755	426	385	677	409	728	704	520	582
Merlin	2	16	17	12	18	9	10	28	24	24
Prairie Falcon	13	7	8	12	19	9	14	17	27	22
Peregrine Falcon	14	15	7	10	15	5	21	18	31	37
Unknown small falcon <sup>1</sup>	-	-	-	-	-	-	-	-	-	-
Unknown large falcon <sup>1</sup>	-	-	-	-	-	-	-	-	-	-
Unknown falcon	4	0	1	0	3	5	3	1	0	1
TOTAL FALCONS	454	793	459	419	732	437	776	768	602	666
Unknown raptor	31	35	40	76	56	41	120	142	140	71
TOTAL	2895	4013	3929	3499	4679	2526	4331	5084	11895	4917

<sup>1</sup> New designations used for the first time in 2001.

## Appendix E. continued

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Start date	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	28-Aug
End date	08-Nov	05-Nov	5-Nov	5-Nov	5-Nov	2-Nov	4-Nov	3-Nov	5-Nov	30-Oct
Days of observation	70	59	68	65	70	57	68	65	69	57
Hours of observation	560.00	461.67	565.08	559.58	553.77	434.33	545.47	518.50	577.25	424.08
Raptors / 100 hours	832.9	1545.9	1044.8	1594.2	873.1	991.6	855.8	972.0	1126.4	1039.9
SPECIES	RAPTOR COUNTS									
Turkey Vulture	636	640	563	1116	637	241	164	239	468	289
Osprey	53	33	47	44	14	25	26	32	86	20
Northern Harrier	72	64	69	133	69	38	37	33	50	27
Sharp-shinned Hawk	1519	2174	1872	2585	1212	1698	1032	1524	1861	1268
Cooper's Hawk	907	1205	1018	2025	1069	984	913	1149	1758	964
Northern Goshawk	11	9	9	19	14	42	13	23	12	15
Unknown small accipiter <sup>1</sup>	-	-	-	-	-	-	86	188	205	169
Unknown large accipiter <sup>1</sup>	-	-	-	-	-	-	0	3	5	4
Unknown accipiter	44	147	76	107	51	29	0	11	5	28
TOTAL ACCIPITERS	2481	3535	2975	4736	2346	2753	2044	2898	3846	2448
Broad-winged Hawk	7	4	5	14	12	3	6	9	16	6
Swainson's Hawk	32	867	679	572	194	19	815	139	53	291
Red-tailed Hawk	519	771	803	1151	733	591	632	778	924	636
Ferruginous Hawk	13	4	13	10	8	3	10	14	7	8
Rough-legged Hawk	0	0	0	1	1	0	1	0	0	0
Zone-tailed Hawk	1	0	1	2	0	3	1	1	0	0
Unknown buteo	9	11	3	28	5	2	106	32	30	69
TOTAL BUTEOS	581	1657	1504	1778	953	621	1571	973	1030	1010
Golden Eagle	136	151	145	115	159	115	128	149	146	79
Bald Eagle	4	0	3	4	3	5	1	3	8	1
Unknown Eagle	0	0	0	0	0	1	0	0	1	0
TOTAL EAGLES	140	151	148	119	162	121	129	152	155	80
American Kestrel	584	905	455	742	525	397	560	470	686	362
Merlin	42	48	42	56	14	27	21	22	22	26
Prairie Falcon	18	19	19	58	38	30	28	24	20	18
Peregrine Falcon	49	60	67	116	64	49	63	127	112	82
Unknown small falcon <sup>1</sup>	-	-	-	-	-	-	0	4	2	1
Unknown large falcon <sup>1</sup>	-	-	-	-	-	-	0	15	3	1
Unknown falcon	0	1	0	12	2	1	5	2	1	5
TOTAL FALCONS	693	1033	583	984	643	504	677	664	846	495
Unknown raptor	8	24	15	11	11	4	20	49	21	41
TOTAL	4664	7137	5904	8921	4835	4307	4668	5040	6502	4410

<sup>1</sup> New designations used for the first time in 2001.

## Appendix E. continued

	2005	2006	2007	Mean
Start date	27- Aug	27- Aug	27-Aug	26-Aug
End date	5-Nov	5- Nov	5-Nov	2-Nov
Days of observation	69	68	63	64
Hours of observation	599.58	566.41	553.58	511.26
Raptors / 100 hours	937.8	1433.4	883.2	1042.7
SPECIES	RAPTOR COUNTS			
Turkey Vulture	363	150	499	390
Osprey	35	30	47	31
Northern Harrier	46	90	75	60
Sharp-shinned Hawk	1842	958	1283	1457
Cooper's Hawk	1486	865	922	1017
Northern Goshawk	10	10	30	16
Unknown small accipiter <sup>1</sup>	129	119	74	139
Unknown large accipiter <sup>1</sup>	5	2	7	4
Unknown accipiter	1	6	10	79
TOTAL ACCIPITERS	3473	1960	2326	2612
Broad-winged Hawk	13	9	10	7
Swainson's Hawk	52	4695	841	746
Red-tailed Hawk	823	534	537	647
Ferruginous Hawk	13	9	8	13
Rough-legged Hawk	0	0	0	0
Zone-tailed Hawk	1	0	0	1
Unknown buteo	33	23	19	24
TOTAL BUTEOS	935	5270	1415	1437
Golden Eagle	71	87	99	116
Bald Eagle	1	3	6	3
Unknown Eagle	4	1	9	1
TOTAL EAGLES	76	91	114	120
American Kestrel	520	412	298	544
Merlin	48	23	34	25
Prairie Falcon	16	13	10	20
Peregrine Falcon	61	43	51	49
Unknown small falcon <sup>1</sup>	2	1	0	1
Unknown large falcon <sup>1</sup>	5	3	2	4
Unknown falcon	6	1	1	2
TOTAL FALCONS	658	496	396	642
Unknown raptor	37	32	17	45
TOTAL	5623	8119	4889	5337

<sup>1</sup> New designations used for the first time in 2001.

**Appendix F. Daily trapping effort and capture totals of migrating raptors by species in the Manzano Mountains, NM: 2007.**

DATE	STN.	SPECIES <sup>1</sup>													CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	ZT	GE	AK	ML	PR	PG	TOTAL	/STN HR
2-Sep	5.00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.2
3-Sep	12.10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
4-Sep	7.60	0	3	1	0	0	0	1	0	0	1	0	0	0	6	0.8
5-Sep	8.00	0	1	2	0	0	0	0	0	0	0	0	0	1	4	0.5
6-Sep	5.00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.2
7-Sep	8.00	0	2	1	0	0	0	0	0	0	0	0	0	0	3	0.4
8-Sep	0.00															
9-Sep	0.00															
10-Sep	7.50	0	3	1	0	0	0	0	0	0	0	0	0	0	4	0.5
11-Sep	6.25	0	6	1	0	0	0	0	0	0	1	0	0	0	8	1.3
12-Sep	8.00	0	0	1	0	0	0	0	0	0	2	0	0	1	4	0.5
13-Sep	7.50	0	5	1	0	0	0	0	0	0	0	0	0	0	6	0.8
14-Sep	7.75	0	3	6	0	0	0	0	0	0	0	0	0	0	9	1.2
15-Sep	8.41	0	4	1	0	0	0	0	0	0	0	0	0	0	5	0.6
16-Sep	14.80	0	9	3	0	0	0	0	0	1	0	0	0	0	14	0.9
17-Sep	6.75	0	2	0	0	0	0	0	0	0	1	0	0	0	3	0.4
18-Sep	7.00	0	7	5	0	0	0	0	0	0	1	0	0	0	13	1.9
19-Sep	7.75	1	12	10	0	0	0	0	0	0	0	0	0	0	23	3.0
20-Sep	0.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
21-Sep	7.25	1	5	3	0	0	0	0	0	0	1	0	0	1	11	1.5
22-Sep	8.00	0	18	11	0	0	0	0	0	0	0	0	0	0	29	3.6
23-Sep	9.85	0	6	6	0	0	0	0	0	0	1	0	0	0	13	1.3
24-Sep	7.30	0	0	5	0	0	0	0	0	0	0	0	0	1	6	0.8
25-Sep	7.75	0	1	4	0	0	0	1	0	0	0	0	0	1	7	0.9
26-Sep	7.25	0	9	7	0	0	0	0	0	0	1	0	0	0	17	2.3
27-Sep	7.60	0	2	11	0	0	0	0	0	0	0	0	0	0	13	1.7
28-Sep	7.75	0	4	5	0	1	0	0	0	0	0	0	0	0	10	1.3
29-Sep	7.00	0	1	11	0	0	0	0	0	0	0	0	0	0	12	1.7
30-Sep	14.70	0	6	6	0	0	0	0	0	0	0	0	0	0	12	0.8
1-Oct	7.75	0	4	1	0	0	0	0	0	0	0	0	0	0	5	0.6
2-Oct	12.75	0	3	1	0	0	0	0	0	0	0	0	1	1	6	0.5
3-Oct	15.33	0	6	4	0	0	0	2	0	0	0	0	0	0	12	0.8
4-Oct	13.82	0	8	6	0	0	0	0	0	0	0	1	0	0	15	1.1
5-Oct	7.41	0	7	4	0	0	0	0	0	0	0	0	0	0	11	1.5

## Appendix F. continued

DATE	STN.		SPECIES <sup>1</sup>												CAPTURES		
	HOURS		NH	SS	CH	NG	BW	SW	RT	ZT	GE	AK	ML	PR	PG	TOTAL	/STN HR
6-Oct	15.38		0	7	9	0	0	0	1	0	0	0	0	1	0	18	1.2
7-Oct	15.50		0	3	3	0	0	0	0	0	0	0	0	0	0	6	0.4
8-Oct	7.50		0	8	6	0	0	0	0	0	0	0	0	0	0	14	1.9
9-Oct	8.00		0	7	3	0	0	0	1	0	0	0	0	0	0	11	1.4
10-Oct	0.00																
11-Oct	0.00																
12-Oct	0.00																
13-Oct	0.00																
14-Oct	0.00																
15-Oct	0.00																
16-Oct	0.00																
17-Oct	0.00																
18-Oct	14.75		0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.1
19-Oct	15.00		0	4	0	0	0	0	0	0	0	0	0	0	0	4	0.3
20-Oct	14.75		0	3	1	0	0	0	0	0	0	0	0	0	0	4	0.3
21-Oct	15.25		0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
22-Oct	14.50		0	4	0	1	0	0	0	0	0	1	0	0	6	0.4	
23-Oct	15.10		0	4	0	1	0	0	1	0	0	1	0	0	7	0.5	
24-Oct	15.16		0	5	2	0	0	0	0	0	0	0	0	0	7	0.5	
25-Oct	15.33		0	5	0	0	0	0	0	0	0	1	0	0	6	0.4	
26-Oct	12.50		1	5	0	0	0	0	0	0	0	1	0	0	7	0.6	
27-Oct	4.83		0	2	0	0	0	0	1	0	0	0	0	0	3	0.6	
Total	452.97		3	196	142	3	1	0	9	0	1	9	5	2	6	377	0.8

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

**Appendix G. Annual trapping and banding effort and capture totals of migrating raptors by species in the Manzano Mountains, NM: 1990–2007.**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	TOTAL	MEAN
Start date	28-Aug	05-Sep	31-Aug	03-Sep	01-Sep	04-Sep	02-Sep	31-Aug	29-Aug	31-Aug	02-Sep	01-Sep	03-Sep	07-Sep	05-Sep	04-Sep	04-Sep	02-Sep		01-Sep
End date	27-Oct	29-Oct	30-Oct	24-Oct	25-Oct	31-Oct	19-Oct	28-Oct	29-Oct	16-Oct	27-Oct	25-Oct	25-Oct	24-Oct	28-Oct	28-Oct	24-Oct	27-Oct		25-Oct
Blinds in operation	1	3	3	3	3	4	4	4	3	3	3	3	3	2	2	2	2	2		2.9
Trapping days	47	54	57	50	48	53	45	54	58	46	50	55	51	45	45	51	48	47		50.1
Station days	47	95	131	120	121	136	132	151	165	94	119	145	131	84	84	99	94	105		116.2
Station hours	511	693	967	889	926	1041	1030	1211	1352	664	791	1037	957	633	756.15	707.77	677.67	452.97		849.8
Captures / 100 stn hrs	47.7	72.4	108.2	100.8	110.7	85.7	137.0	95.0	148.2	115.7	121.7	85.9	135.3	152.7	136.0	163.0	96.5	83.2		110.9
RAPTOR COUNTS																				
Northern Harrier	1	2	2	3	9	2	1	8	14	0	5	7	6	3	0	3	6	3	75	4.2
Sharp-shinned Hawk	124	262	589	430	502	493	778	612	987	321	495	426	635	458	566	562	299	196	8735	485.3
Cooper's Hawk	95	195	335	374	353	310	460	427	772	323	330	337	510	400	378	495	280	142	6516	362.0
Northern Goshawk	1	7	6	6	7	1	5	3	6	6	16	1	10	1	2	3	3	3	87	4.8
Broad-winged Hawk	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	1	6	0.3
Swainson's Hawk	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0	0	1	0	5	0.3
Red-tailed Hawk	8	18	61	55	83	50	50	46	112	56	76	39	56	38	43	35	35	9	870	48.3
Zone-tailed Hawk	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0.1
Golden Eagle	1	3	4	4	4	4	6	4	5	2	4	5	7	8	2	2	1	1	67	3.7
American Kestrel	10	13	42	14	59	28	92	32	75	44	25	56	37	43	18	37	10	9	644	35.8
Merlin	1	0	2	4	1	1	11	6	7	2	8	2	12	3	10	3	2	5	80	4.4
Prairie Falcon	1	1	3	5	3	1	3	5	13	6	3	7	5	4	3	4	4	2	73	4.1
Peregrine Falcon	2	1	2	1	4	2	5	7	12	8	1	10	13	7	5	10	12	6	108	6.0
All Species	244	502	1046	896	1025	892	1411	1150	2006	768	963	891	1295	966	1028	1154	654	377	17267	959.3
Recaptures <sup>1</sup>	0	0	1	1	2	2	1	2	4	4	3	2	3	2	2	3	2	0	33	2.0
Foreign recaptures <sup>2</sup>	2	1	1	1	2	0	5	1	2	2	0	0	3	2	0	0	1	0	23	1.4
Foreign encounters <sup>3</sup>	0	2	2	3	6	6	7	8	13	12	6	7	10	7	5	3	4	6	112	6.2

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

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

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