

**FALL 2004 RAPTOR MIGRATION STUDIES AT
BONNEY BUTTE, OREGON**



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

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BONNEY BUTTE, OREGON**

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INTRODUCTION

The Bonney Butte Raptor Migration Project in north-central Oregon is an ongoing effort to monitor long-term trends in populations of raptors using the northern portion of the Pacific Coast Flyway (Smith and Hoffman 2000, Hoffman et al. 2002). HawkWatch International (HWI) initiated standardized counts of the autumn raptor migration through this region in 1994, and began a trapping and banding program at the project site in 1995. To date, HWI observers have recorded 18 species of migratory raptors at the site, with counts typically ranging between 2,000 and 4,000 migrants per season. The 2004 season marked the 11th consecutive count and the 10th consecutive season of trapping and banding conducted at the site by HWI. This report summarizes the 2004 count and banding results.

STUDY SITE

Bonney Butte is located approximately 9.5 km ESE of Government Camp, on the east side of the White River drainage within the Mt. Hood National Forest, Hood River County, Oregon (45°15'46.8" N, 121°35'31.2" W; elevation 1,754 m; Figure 1). The butte is the southern terminus of Surveyor's Ridge, which originates near Hood River, Oregon south of the Columbia River Gorge. The ridge extends southward for approximately 50 km and ends southeast of Mt. Hood. The central Oregon shrubsteppe region lies immediately to the east. The observation site is located on the highest point of the butte. The trapping station is located approximately 500 m north on a separate knoll and slightly lower in elevation. The intervening space is largely forested.

METHODS

COUNT

Weather permitting, two official or designated observers conducted standardized daily counts of migrating raptors from a single, traditional observation site from late August through late October. Observations typically began between 0800–0900 hrs and ended near 1700 hrs Pacific Standard Time (PST). This was the second full season of migration counting at this site for official observer David Haines. This was the first full season of counting for official observer Amy Scarpignato; however, she served as on-site educator at the site in 2003, and as such gained considerable experience counting and recording the migration (see Appendix A for a complete observer history). The on-site educator and visitors also assisted with the count.

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 B lists common and scientific names for all species, information about the applicability of age, sex, and color morph distinctions, and two-letter codes used to identify species in some tables and figures).
2. Hour of passage for each migrant; e.g., the 1000–1059 hrs PST.
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 follows Hoffman and Smith (2003). In comparing 2004 annual statistics against means and 95% confidence intervals for previous seasons, I equate significance with a 2004 value falling outside the bounds of the confidence interval for the associated mean.

TRAPPING AND BANDING

Weather permitting, the trappers operated a single traditional banding station daily from late August through late October, generally between 0900–1700 hrs PST. Capture devices included mist 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 unless outfitted with a satellite transmitter, which takes a bit longer.

RESULTS AND DISCUSSION

WEATHER SUMMARY

Inclement weather hampered observations and banding this season to the highest degree yet experienced on the project, with 20 potential days of observation entirely precluded and nine additional days reduced to less than 4 hours of observation due to weather (see Appendix C for daily weather records). Fog and low clouds that hovered on the ridge and severely obscured visibility were especially prevalent in 2004, but several heavy rain and snow events also hampered operations to an unprecedented degree. The first spate of difficult weather occurred during the first week of September, with heavy fog and rain reducing observations to a total of only nine hours between the 1st and 4th. A second spate of heavy fog and rain reduced observations to ~12 hours between 11 and 19 September. Thankfully, between 20 September and 15 October, generally the primary peak activity period for most species, the weather improved markedly, with fog and rain hampering only three days of observation during this period. But then the bad weather returned with a vengeance and limited observations during the remainder of October to a meager 17.5 hours. The prevalence of stormy weather and especially fog and low clouds was also reflected in weather data collected during actual observation periods, with a near record-high 32% of the active observation days featuring predominantly overcast skies and periods of fog, rain or snow. Another relatively high 20% of the active observation days featured transitional skies (i.e., changed from fair or partly cloudy to mostly cloudy or overcast during the day, or vice versa) but with visibility reducing fog and/or haze also present during a portion of the day. Overall, 55% of the active observation days featured predominantly fair skies (1997–2003 average of 50%), 23% transitional skies (average 24%), and 32% mostly cloudy to overcast skies (average 26%). The high prevalence of fog, low clouds and haze resulted in record-low average visibility estimates (40 km both east and west compared to averages of 69 and 67 km, respectively).

Average daily temperatures (averages of hourly values for each day) during periods of active observation ranged from 3.2–24.7°C, with an overall average of 14.4°C. The minimum value is the highest recorded for the project since 1997, the overall average matches the previous second highest value, and the maximum value is moderate compared to previous values. In terms of wind speeds, 2004 exactly matched 2003 in showing a high proportion of days where light winds (<12 kph) prevailed (98% vs. average of 82%), with the remaining 2% featuring predominantly moderate winds (12–29 kph). In terms of wind directions, 2004 featured higher than average proportions of days where variable SW–NW winds (43% of active days vs. average of 27%) or SE–SW winds (9% of active days vs. average of 5%) prevailed, whereas N–E winds were less common than usual (17% vs. average of 27%). Thermal lift was rated fair to poor on a record high 87% of the active observation days (average 56%).

In summary, similar to 2003, three extended periods of heavy fog, rain and snow resulted in a record-high number of reduced-observation periods during the 2004 season, and cloud cover was heavier and scattered fog/haze and rain/snow were more prevalent than usual at other times. Such conditions combined to reduce average visibility during active observation periods to new record lows. Otherwise, temperatures during active observation periods were slightly warmer, light winds prevailed throughout the season, and winds with a southerly component were more common than usual, while northerly and northeasterly winds were less common.

COUNT SUMMARY

The observers worked on 46 of 66 possible days between 27 August and 31 October 2004. The number of observation days was 9% below the 1994–2003 average of $51 \pm 95\%$ CI of 4.7 days, and the lowest since 1997. The number of observation hours (341.25) was 3% below the long-term average of $352.3 \pm 95\%$ CI of 39.68 hours. The 2004 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) also was a non-significant 3% below the long-term average of $2.3 \pm 95\%$ CI of 0.34 observers per hour.

The observers counted 3,821 migrant raptors of 17 species (Table 1, and see Appendix D for daily count records). This is the second highest total count recorded at the site to date (35% above average; see Appendix E for annual summaries), with last year's count ranking third and only four birds less. Counts reached new record highs for Sharp-shinned Hawks, Cooper's Hawks (second year in a row), Red-shouldered Hawks, and Merlins, but dropped to a new record low for American Kestrels (Appendix E). Given the high degree to which fog and low clouds hampered observations and reduced visibility at the site, in many cases precluding effective observations at the site when overall regional weather was probably still conducive to migration, it seems highly likely that the count would have been even higher had conditions been better suited to consistent observations.

The 2004 flight was composed of 61% accipiters, 20% buteos, 9% vultures, 4% eagles, 4% falcons, 2% Ospreys, and <1% harriers and unidentified raptors. The season featured a significantly higher than average proportion of accipiters, and significantly lower than average proportions of buteos, eagles, Ospreys, and unidentified raptors (Figure 2). As usual, Sharp-shinned and Red-tailed Hawks were the two most abundant species, followed by Cooper's Hawks, Turkey Vultures, Merlins, Golden Eagles, Ospreys, and Bald Eagles (Table 1, Appendix E).

Adjusted passage rates were significantly higher than average for eight species seen this season (all three accipiters, Red-shouldered and Red-tailed Hawks, Bald Eagles, Merlins, and Peregrine Falcons), whereas among commonly encountered species only American Kestrels showed a significantly lower than average adjusted passage rate (Table 1; Figures 3–8).

Regression analyses of adjusted passage rates through 2004 revealed a marginally significant linear increase for Red-shouldered Hawks (Figure 5); highly significant quadratic trends (accelerating

increases) for Bald Eagles (Figure 7) and Peregrine Falcons (Figure 8); significant linear decreasing trends for American Kestrels and adult Golden Eagles (Figure 7); and no significant trends for other species nor immature/subadult Golden Eagles (Figures 3–8). For several species, high passage rates in both 2003 and 2004 sharply reversed patterns of decline that had set in between 1998 and 2001/2002 coincident with the onset of widespread drought throughout much of the interior West (Hoffman and Smith 2003). Among eight species for which reasonable age-specific comparisons were possible, Sharp-shinned Hawks, Red-tailed Hawks, Bald Eagles also showed significantly above-average immature : adult ratios in 2004, in all cases at least partly due to an increase in the abundance of young birds (Table 2). This suggests that, for these species, increases in regional productivity may have contributed to the higher than average counts. Counts of positively identified immature Cooper's Hawks, Northern Goshawks, and Peregrine Falcons also were above average in 2004, but age-ratios for these species were 45-55% below average, suggesting that other factors may have led to high total counts for these species. One possibility is a shift in migration routes away from the drought-stricken Intermountain Flyway toward the more mesic Pacific Coast Flyway. Portions of the western Pacific Northwest were affected by drought in the late 1990s, but only the interior West has continued to suffer from prolonged drought. Counts have been well below average for the past three years in the Goshute Mountains of Nevada in the heart of the Intermountain Flyway (Smith 2005a). Curiously, however, unlike at Bonney Butte farther south in the central Cascades, counts have also been well below average for the past two years at Chelan Ridge in the northeastern Cascades of Washington (Smith 2005b).

For Peregrine Falcons, however, strong and often accelerating increasing trends have been the rule across much of the continent for the past 10–15 years, reflecting the species' successful and continuing recovery from the DDT era (Hoffman and Smith 2003).

For Golden Eagles, passage rates of adults oscillated up and down by ~50% each year from 1995–1999, but then dropped to a new record low for the project in 2000 and even farther in 2001. Since then, passage rates have climbed again each year, and by 2004 had regained the lower margins of the previous oscillation range; nevertheless, the regression analysis still captures a significant overall decreasing trend (Figure 7). Unlike for adults, passage rates of immature/subadult Golden Eagles were generally on a strong increasing trajectory through 2000 (save for an outlier low value in 1998), but then also dropped sharply in 2001 and to a new record low in 2002, before returning to moderate levels in 2003 and 2004 (Figure 7).

With a new record-high count of seven birds this year, a distinct increasing pattern—albeit still unsteady and involving small numbers of birds—has emerged for Red-shouldered Hawks at the site (Figure 5). Henny and Cornely (1985) documented the initial stages of a northward breeding-range expansion in this species, at that time already extending out of the heart of the species western range in central California into southwestern Oregon. Breeding records for the species are now scattered throughout much of western and central Oregon, and the number of sightings in Washington has grown steadily since 1992 (Wheeler 2003). It therefore appears that increasing counts at Bonney Butte reflect continued growth of the population in the Pacific Northwest.

The marked and continuing long-term decline of American Kestrel passage rates at Bonney Butte is notable. Hoffman and Smith (2003) reported mixed trends for this species through 2001 across seven long-term HWI monitoring sites in the West. As of 2004 at HWI western monitoring sites, declining patterns have emerged in the Wellsville Mountains of northern Utah since 1994, in the Goshute Mountains of northeastern Nevada since 1997, in the Bridger Mountains of southwest Montana since 1998 (but with a modest rebound in 2003 and 2004), and at Chelan Ridge in north-central Washington since 1998 (2003 technical reports for all projects currently available at www.hawkwatch.org; 2004 reports will become available between January and March 2005). In contrast, passage rates have remained comparatively stable since the mid-1980s and early 1990s in New Mexico and at the Grand Canyon, respectively. In no case is a distinct increasing trend evident for the species. These data suggest

that western kestrels may be experiencing significant regional variation in the productivity and stability of their populations.

The combined-species median passage date of 30 September matched the long-term average for the site (Table 3); however, the seasonal distribution of activity revealed greater complexity (Figure 9). Relative flight volume was significantly below average in mid-September, corresponding to an extended spate of inclement weather that allowed for only ~12 hours of observation between 11 and 19 September (Appendix C). In contrast, relative flight volume was significantly above average during the first half of October when the weather was generally more cooperative. At the species level, only Ospreys and Cooper's Hawks showed significantly later than average median passage dates in 2004, whereas seven species showed significantly early timing (Sharp-shinned Hawk, Red-tailed Hawk, both eagle species, and three of four falcon species; Table 3). The primary reason for the prevalence of apparently early timing is that inclement weather again plagued our observers in late October, allowing for only a very meager 17.5 hours of observation after 15 October. This is normally the peak passage period for especially eagles and adult Red-tailed Hawks and Merlins. High counts for most of these species in 2004, as well as for typically late-season Rough-legged Hawks, suggest, however, that the early onset of bad weather may have driven many birds to migrate south earlier than usual rather than having created a situation where our observers simply missed lots late birds due to poor conditions for observing.

Age-specific median dates revealed additional detail (Table 4). In all cases for which comparative data were available, adults, which usually migrate later than immature birds, showed at least slightly earlier than average timing in 2004. Similarly, among typically late-season eagles, immature/subadult birds of both species also showed significantly late timing. In contrast, immature birds of five other species showed later than average timing, with the differences significant for Northern Harriers and Sharp-shinned and Cooper's Hawks.

RESIDENT RAPTORS

A pair of light-morph adult Red-tailed Hawks and at least one immature light-morph bird were resident around Bonney Butte throughout the season. A single dark-morph adult was also seen in the area regularly after mid-October. At least one immature Cooper's Hawk was seen regularly during much of the season mostly to the west of the ridge. Similarly, an immature Northern Goshawk was frequently seen hunting in the White River drainage to the west, and in late October an adult female goshawk also was seen in the drainage acting like a local bird. The White River drainage was also frequented by a pair of local Ospreys. A pair of adult American Kestrels was regularly seen around the ridgetop throughout September. This is a typical local assemblage except that sightings of local Golden Eagles have diminished markedly since 2001, and in previous years apparently local, early season Bald Eagles were frequently seen patrolling the White River drainage.

TRAPPING AND BANDING SUMMARY

Trapping occurred on only 36 of 66 possible trapping days between 27 August and 31 October, with effort totaling 263 hours (see Appendix F for daily trapping records and Appendix G for annual trapping summaries). The number of trapping days was only 3% below the long-term 1995–2003 average of 37 days, but was considerably below average compared to the last four years. In contrast, the total hours of trapping effort was 17% above the long-term average, ranking fourth highest behind the previous three years.

Despite the high prevalence of inclement weather having limited the total effort, the 2004 capture total of 393 birds of 8 species (including the first two recaptures of Bonney Butte-banded birds ever recorded at the site, as well two new foreign recaptures of birds originally banded elsewhere) was the second largest total yet recorded for the project (Table 2, Appendix G). The captures included record highs for

Cooper's Hawks and Northern Goshawks (second year in a row). The 2004 effort raises the total number of birds captured since project inception to 2,606, including two recaptures and seven foreign recaptures (Appendix G). As usual, the three most frequently captured species were the Sharp-shinned Hawk (56% of captures), Cooper's Hawk (23%), and Red-tailed Hawk (16%; Appendix G).

Both capture totals and rates were significantly above average for all three accipiters and Prairie Falcons; however, capture success was significantly above average only for Prairie Falcons (Table 2). For all other species, all three metrics fell within normal ranges of variation.

ENCOUNTERS WITH BANDED BIRDS

To date, 30 birds banded at Bonney Butte have subsequently been encountered elsewhere; two new "foreign encounters" occurred in 2004 (Table 7). In addition, seven birds banded elsewhere have been recaptured at Bonney Butte, with two new "foreign recaptures" having occurred during the 2004 season (Table 8). All of the foreign encounter locations and known original banding locations of the foreign recaptures are located within the expected confines of the Pacific Coast Flyway between southern British Columbia and southern California (Hoffman et al. 2002). Of particular interest are six exchanges between different migration research projects: 1 Sharp-shinned Hawk and 1 Cooper's Hawk encountered at Bonney Butte and Golden Gate Raptor Observatory's project in the Marin Headlands of California; 2 Sharp-shinned Hawks and 1 Red-tailed Hawk encountered at Bonney Butte and HWI's Chelan Ridge project in north-central Washington; and 1 Sharp-shinned Hawk originally banded by the Falcon Research Group in central Washington at Diamond Head. It was also very gratifying this year to document the first ever recaptures of Bonney Butte-banded birds at the site, which included a Northern Goshawk banded as a juvenile the previous year, and Sharp-shinned Hawk banded as juvenile two years before (Table 9)

SATELLITE TELEMETRY

The 2004 crew succeeded in outfitting with a satellite transmitter the first Golden Eagle (a second-year male) ever equipped at the site. Since being outfitted in late September 2004, this bird has remained fairly close to the project site, and is currently residing just east of the northern section of the John Day River valley ~75 km NE of the project site. The two adult Northern Goshawks that we outfitted at the site in 2003 also ended up staying very close to the project, both having wintered in similar areas just south of the Dalles about 25 km NE of the project site. Unfortunately, the batteries on these two transmitters failed much more quickly than expected, both having ceased transmissions after only ~6 months instead of the expected 9–11 months. At that the time the signals ceased, sensor data indicated that the younger of the two female birds (second-year at the time of banding) was doing fine, whereas it appeared that the older bird (aged as after-second-year at banding) had either shed its transmitter or did not survive the winter. After having moved south for the winter to the Trinity Mountains area of northern California, the single adult Red-tailed Hawk outfitted at the site in 2003 also probably died sometime during the following February, but transmissions from this transmitter also failed before we could mount a recovery effort to confirm the bird's status.

Two of the three Red-tailed Hawks outfitted during fall 2002 provided useful data, the third having perished or shed its transmitter just west of the project site after only a few days. The other two birds wintered in northern California, one along the Calaveras River southeast of Sacramento and the other near the Russian River along the coast west of Santa Rosa. Unfortunately, the Calaveras River bird most likely did not survive the winter (signal ceased in January 2003). In contrast, the Russian River bird returned north the following spring and eventually settled for the summer near Juneau, Alaska. It then returned to the same basic wintering area in California for the second year in a row, and had just begun its return spring migration when the transmitter battery finally failed in April 2004.

Complete tracking summaries and maps for all of HWI's telemetry birds can be found at www.hawkwatch.org. An initial tracking summary and map for the fall 2004 eagle will likely be posted in February.

STABLE ISOTOPE RESEARCH

In 2004, we continued to collect feather samples from a variety of species to support our on-going stable-isotope research, which seeks to use analyses of hydrogen stable-isotope ratios to identify the approximate natal origins of migrants monitored at migration sites across the West (e.g., Meehan et al. 2001). HWI scientists currently have in a review at a respected ornithological journal a manuscript detailing a new GIS-based approach for mapping the origins of raptors based on this technique, and we hope to begin producing several other relevant publications in the next several months.

VISITATION

In 2004, the HWI visitor logs documented 660 visits to Bonney Butte, including 32 repeat visitors. This is the largest total visitation for the site to date, exceeding last year's total by 35 individuals, and is particularly gratifying given the prevalence of bad weather this year. The highest single visitation day was 3 October, when 106 individuals visited the site. A wonderful article on the project that appeared in the *Oregonian* newspaper was especially instrumental in drawing new visitors to the site. Organized groups included four Audubon groups from Portland, three high school groups, a group from the High Desert Museum, several employee groups from Mt. Hood National Forest, and reporters from both the *Oregonian* and *The Bulletin* newspaper in Bend. Most visitors originated in Oregon, but 61 visitors originated in several other states, and five in other countries.

In 2004, 352 hourly assessments by the primary observers of visitor disturbance resulted in the following ratings: 94% none, 5% low, 1% moderate, and <1% high.

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Table 1. Fall raptor migration unadjusted counts and adjusted passage rates by species at Bonney Butte, OR: 1994–2003 versus 2004.

| SPECIES | COUNT | | | RAPTORS / 100 HOURS | | |
|--------------------------------------|------------------------|-------|----------|------------------------|-------|----------|
| | 1994–2003 ¹ | 2004 | % CHANGE | 1994–2003 ¹ | 2004 | % CHANGE |
| Turkey Vulture | 291 ± 88.1 | 326 | +12 | 122.1 ± 36.65 | 116.7 | -4 |
| Osprey | 67 ± 14.2 | 70 | +5 | 26.4 ± 5.49 | 25.4 | -4 |
| Northern Harrier | 30 ± 9.3 | 29 | -2 | 9.6 ± 2.81 | 9.9 | +3 |
| Sharp-shinned Hawk | 1,059 ± 201.8 | 1,790 | +69 | 391.9 ± 67.25 | 667.5 | +70 |
| Cooper's Hawk | 334 ± 53.1 | 485 | +45 | 123.4 ± 26.38 | 167.7 | +36 |
| Northern Goshawk | 26 ± 7.2 | 33 | +28 | 8.1 ± 2.40 | 11.1 | +38 |
| Unknown small accipiter ² | 43 ± 42.4 | 27 | -37 | – | – | – |
| Unknown large accipiter ² | 1 ± 0.7 | 2 | +200 | – | – | – |
| Unknown accipiter | 71 ± 36.0 | 0 | -100 | – | – | – |
| TOTAL ACCIPITERS | 1,503 ± 251.4 | 2,337 | +56 | – | – | – |
| Red-shouldered Hawk | 1 ± 0.6 | 7 | +775 | 0.4 ± 0.29 | 2.8 | +670 |
| Broad-winged Hawk | 10 ± 14.4 | 2 | -79 | 5.9 ± 8.28 | 1.5 | -75 |
| Swainson's Hawk | 1 ± 0.5 | 1 | +67 | 0.3 ± 0.30 | 0.4 | +38 |
| Red-tailed Hawk | 602 ± 98.3 | 725 | +20 | 197.2 ± 34.67 | 242.5 | +23 |
| Ferruginous Hawk | 1 ± 0.3 | 0 | -100 | 0.2 ± 0.13 | 0.0 | -100 |
| Rough-legged Hawk | 14 ± 5.0 | 17 | +25 | 7.9 ± 3.04 | 10.0 | +27 |
| Unidentified buteo | 35 ± 8.3 | 9 | -75 | – | – | – |
| TOTAL BUTEOS | 663 ± 115.8 | 761 | 15 | – | – | – |
| Golden Eagle | 98 ± 22.0 | 93 | -5 | 33.2 ± 7.06 | 33.2 | 0 |
| Bald Eagle | 45 ± 7.0 | 61 | +35 | 14.0 ± 1.91 | 20.0 | +43 |
| Unidentified eagle | 3 ± 1.9 | 2 | -41 | – | – | – |
| TOTAL EAGLES | 146 ± 22.8 | 156 | +7 | – | – | – |
| American Kestrel | 24 ± 3.6 | 14 | -41 | 7.9 ± 1.83 | 3.9 | -50 |
| Merlin | 62 ± 15.3 | 105 | +70 | 24.2 ± 6.62 | 43.1 | +78 |
| Prairie Falcon | 5 ± 2.1 | 5 | +4 | 1.7 ± 0.68 | 1.8 | +3 |
| Peregrine Falcon | 5 ± 2.6 | 14 | +175 | 1.5 ± 0.78 | 4.8 | +215 |
| Unknown small falcon ² | 0 ± 0.7 | 1 | +200 | – | – | – |
| Unknown large falcon ² | 0 ± 0.0 | 0 | 0 | – | – | – |
| Unknown falcon | 3 ± 1.6 | 0 | -100 | – | – | – |
| TOTAL FALCONS | 98 ± 18.3 | 139 | +41 | – | – | – |
| Unidentified Raptor | 30 ± 15.5 | 3 | -90 | – | – | – |
| ALL SPECIES | 2,828 ± 444.7 | 3,821 | +35 | – | – | – |

¹ Mean of annual values ± 95% confidence interval.

² Designations used for the first time in 2001.

Table 2. Fall counts by age class and immature : adult ratios for selected species of migrating raptors at Bonney Butte, OR: 1994–2003 versus 2004.

| | TOTAL AND AGE-CLASSIFIED COUNTS | | | | | | IMMATURE : ADULT | | | |
|--------------------|---------------------------------|------|-------|-------|------|-------|------------------------|------|------------------------|------|
| | 1994–2003 AVERAGE | | | 2004 | | | % UNKNOWN AGE | | RATIO | |
| | TOTAL | IMM. | ADULT | TOTAL | IMM. | ADULT | 1994–2003 ¹ | 2004 | 1994–2003 ¹ | 2004 |
| Northern Harrier | 30 | 16 | 4 | 29 | 14 | 8 | 33 ± 6.2 | 24 | 4.7 ± 2.66 | 1.8 |
| Sharp-shinned Hawk | 1059 | 208 | 337 | 1790 | 387 | 566 | 49 ± 8.2 | 47 | 0.7 ± 0.18 | 0.7 |
| Cooper's Hawk | 334 | 92 | 68 | 485 | 127 | 144 | 52 ± 7.2 | 44 | 1.7 ± 0.93 | 0.9 |
| Northern Goshawk | 26 | 11 | 6 | 33 | 14 | 12 | 36 ± 10.5 | 21 | 2.6 ± 0.90 | 1.2 |
| Broad-winged Hawk | 10 | 1 | 1 | 2 | 1 | 1 | 31 ± 30.6 | 0 | 0.4 ± 0.41 | 1.0 |
| Red-tailed Hawk | 602 | 169 | 303 | 725 | 250 | 342 | 22 ± 5.1 | 18 | 0.6 ± 0.15 | 0.7 |
| Golden Eagle | 98 | 53 | 23 | 93 | 53 | 19 | 21 ± 3.2 | 23 | 2.8 ± 0.97 | 2.8 |
| Bald Eagle | 45 | 9 | 33 | 61 | 17 | 40 | 8 ± 3.2 | 7 | 0.3 ± 0.10 | 0.4 |
| Peregrine Falcon | 5 | 1 | 2 | 14 | 3 | 5 | 45 ± 4.7 | 43 | 1.1 ± 1.14 | 0.6 |

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

Table 3. First and last observed, bulk-passage, and median-passage dates by species for migrating raptors at Bonney Butte, OR in 2004, with a comparison of 2004 and 1994–2003 average median passage dates.

| SPECIES | 2004 | | | | 1994–2003 |
|---------------------|----------------|---------------|---------------------------------|----------------------------------|------------------------------------|
| | FIRST OBSERVED | LAST OBSERVED | BULK PASSAGE DATES ¹ | MEDIAN PASSAGE DATE ² | MEDIAN PASSAGE DATE ^{2,3} |
| Turkey Vulture | 27-Aug | 2-Oct | 31-Aug – 30-Sep | 24-Sep | 23-Sep ± 1.5 |
| Osprey | 27-Aug | 13-Oct | 3-Sep – 2-Oct | 22-Sep | 18-Sep ± 1.7 |
| Northern Harrier | 29-Aug | 14-Oct | 6-Sep – 5-Oct | 29-Sep | 28-Sep ± 3.9 |
| Sharp-shinned Hawk | 27-Aug | 27-Oct | 21-Sep – 11-Oct | 3-Oct | 05-Oct ± 1.8 |
| Cooper's Hawk | 27-Aug | 29-Oct | 14-Sep – 11-Oct | 28-Sep | 25-Sep ± 2.2 |
| Northern Goshawk | 30-Aug | 14-Oct | 14-Sep – 12-Oct | 2-Oct | 01-Oct ± 3.7 |
| Red-shouldered Hawk | 5-Sep | 13-Oct | 5-Sep – 13-Oct | 25-Sep | – |
| Broad-winged Hawk | 16-Sep | 28-Sep | – | – | 27-Sep ± 2.6 |
| Swainson's Hawk | 2-Oct | 2-Oct | – | – | – |
| Red-tailed Hawk | 27-Aug | 29-Oct | 6-Sep – 12-Oct | 26-Sep | 29-Sep ± 2.2 |
| Rough-legged Hawk | 25-Sep | 27-Oct | 10-Oct – 27-Oct | 13-Oct | 13-Oct ± 3.5 |
| Golden Eagle | 27-Aug | 29-Oct | 23-Sep – 19-Oct | 5-Oct | 13-Oct ± 2.1 |
| Bald Eagle | 27-Aug | 27-Oct | 21-Sep – 14-Oct | 29-Sep | 07-Oct ± 3.5 |
| American Kestrel | 28-Aug | 10-Oct | 29-Aug – 4-Oct | 6-Sep | 20-Sep ± 2.9 |
| Merlin | 27-Aug | 15-Oct | 23-Sep – 14-Oct | 3-Oct | 11-Oct ± 2.6 |
| Prairie Falcon | 6-Sep | 2-Oct | 6-Sep – 2-Oct | 10-Sep | 22-Sep ± 4.9 |
| Peregrine Falcon | 3-Sep | 27-Oct | 6-Sep – 15-Oct | 25-Sep | 24-Sep ± 7.3 |
| Total | 2-Sep | 29-Oct | 10-Sep – 11-Oct | 30-Sep | 30-Sep ± 1.8 |

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

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

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

⁴ Based on data for 1999 and 2000 only.

Table 4. Median passage dates by age for selected species of migrating raptors at Bonney Butte, OR: 1994–2003 versus 2004.

| SPECIES | ADULT | | IMMATURE | |
|--------------------|------------------------|--------|------------------------|--------|
| | 1994–2003 ¹ | 2004 | 1994–2003 ¹ | 2004 |
| Northern Harrier | 08-Oct ± 6.9 | 23-Sep | 26-Sep ± 2.6 | 1-Oct |
| Sharp-shinned Hawk | 10-Oct ± 2.5 | 5-Oct | 23-Sep ± 1.6 | 28-Sep |
| Cooper's Hawk | 02-Oct ± 2.3 | 30-Sep | 19-Sep ± 2.6 | 24-Sep |
| Northern Goshawk | 18-Oct ± 6.1 | 1-Oct | 27-Sep ± 5.5 | 2-Oct |
| Red-tailed Hawk | 03-Oct ± 3.1 | 1-Oct | 21-Sep ± 2.3 | 22-Sep |
| Golden Eagle | 13-Oct ± 1.7 | 13-Oct | 10-Oct ± 3.2 | 4-Oct |
| Bald Eagle | 07-Oct ± 4.1 | 26-Sep | 12-Oct ± 4.5 | 3-Oct |

Note: Median passage dates are dates by which 50% of species/age-specific flights had passed; values are based only on annual counts ≥5 birds.

¹ Mean ± 95% confidence interval in days; values are given only for species with annual counts ≥5 birds for ≥3 years.

Table 5. Fall capture totals, rates, and successes by species for migrating raptors at Bonney Butte, OR: 1995–2004.

| | CAPTURE TOTALS | | CAPTURE RATES ¹ | | CAPTURE SUCCESSES ² | |
|--------------------|------------------------|------|----------------------------|-------|--------------------------------|------|
| | 1995–2003 ³ | 2004 | 1995–2003 ³ | 2004 | 1995–2003 ³ | 2004 |
| Northern Harrier | 2 ± 1.3 | 2 | 0.6 ± 0.38 | 0.8 | 5.8 ± 5.04 | 6.9 |
| Sharp-shinned Hawk | 139 ± 46.9 | 218 | 61.9 ± 8.79 | 82.9 | 13.0 ± 5.01 | 12.0 |
| Cooper's Hawk | 42 ± 18.2 | 90 | 16.7 ± 5.35 | 34.2 | 12.8 ± 6.58 | 18.3 |
| Northern Goshawk | 7 ± 2.4 | 13 | 3.0 ± 0.79 | 4.9 | 35.8 ± 24.59 | 39.4 |
| Broad-winged Hawk | 0.1 ± 0.2 | 0 | 0.0 ± 0.09 | 0.0 | 1.7 ± 3.27 | 0.0 |
| Red-tailed Hawk | 48 ± 21.6 | 61 | 19.3 ± 5.35 | 23.2 | 8.0 ± 4.40 | 8.3 |
| Rough-legged Hawk | 0.3 ± 0.33 | 0 | 0.2 ± 0.18 | 0.0 | 2.6 ± 3.14 | 0.0 |
| Golden Eagle | 2 ± 0.7 | 1 | 0.9 ± 0.49 | 0.4 | 1.7 ± 0.91 | 1.1 |
| American Kestrel | 0.2 ± 0.29 | 0 | 0.1 ± 0.16 | 0.0 | 0.8 ± 1.04 | 0.0 |
| Merlin | 4 ± 2.0 | 4 | 2.0 ± 0.95 | 1.5 | 6.4 ± 3.01 | 3.8 |
| Prairie Falcon | 1 ± 0.9 | 4 | 0.5 ± 0.43 | 1.5 | 26.8 ± 23.35 | 80.0 |
| Peregrine Falcon | 0.3 ± 0.5 | 0 | 0.1 ± 0.18 | 0.0 | 4.5 ± 6.34 | 0.0 |
| All species | 246 ± 85.3 | 393 | 105.4 ± 15.82 | 149.4 | 10.6 ± 4.48 | 11.5 |

¹ Captures / 100 station hours.

² Number of birds captured / number of birds observed. The combined-species value was calculated excluding Ospreys, Turkey Vultures, 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.

³ Mean of annual values ± 95% confidence interval.

Table 6. Fall 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 at Bonney Butte, OR: 2004.

| SPECIES | FEMALE | | MALE | | FEMALE : MALE RATIO ¹ | IMMATURE : ADULT RATIO ¹ |
|--------------------|--------|-----|------|-----|-------------------------------------|--|
| | HY | AHY | HY | AHY | | |
| Sharp-shinned Hawk | | | | | | |
| 1994–2003 | 44 | 31 | 45 | 19 | 1.2 ± 0.22 | 1.8 ± 0.67 |
| 2004 | 73 | 64 | 54 | 28 | 1.7 | 1.4 |
| Cooper's Hawk | | | | | | |
| 1994–2003 | 19 | 10 | 11 | 3 | 2.2 ± 0.41 | 2.3 ± 0.66 |
| 2004 | 33 | 28 | 26 | 3 | 2.1 | 1.9 |
| Northern Goshawk | | | | | | |
| 1994–2003 | 2 | 1 | 2 | 1 | 1.4 ± 1.18 | 3.0 ± 1.57 |
| 2004 | 4 | 1 | 8 | 1 | 0.6 | 6.0 |

¹ Mean ± 95% Confidence Interval (CI) for 1994–2003.

Table 7. Foreign encounters in 2004 and early 2005 of raptors banded at the Bonney Butte Raptor Migration Project site in northern Oregon.

| BAND # | SPECIES ¹ - SEX | BANDING DATE | BANDING AGE ² | ENCOUNTER LOCATION | ENCOUNTER DATE | DISTANCE (KM) | STATUS |
|--------------|-------------------------------|-----------------|-----------------------------|-----------------------|-------------------|------------------|-----------------------------------|
| 1005 – 05857 | CH - F | 23-Sep-03 | HY | Camp Nelson, CA | 07-Feb-04 | 897 | hit stationary object deceased |
| 1483 – 55970 | SS - F | 10-Sep-04 | HY | Soquel, CA | 16-Oct-04 | 749 | trapped in pool house released |

¹ SS = Sharp-shinned Hawk, CH = Cooper's Hawk, NG = Northern Goshawk, RT = Red-tailed Hawk.

² HY = hatch year, SY = second year, TY = third year, AHY = after hatch year, ASY = after second year, ATY = after third year.

Table 8. Recaptures of foreign-banded raptors in 2004 at the Bonney Butte Raptor Migration Project site in northern Oregon.

| BAND # | SPECIES ¹ | SEX | BANDING LOCATION | BANDING DATE | BANDING AGE ² | RECAPTURE DATE | RECAPTURE AGE ² | DISTANCE (KM) |
|--------------|----------------------|-----|---------------------|-----------------|-----------------------------|-------------------|-------------------------------|------------------|
| 1443 – 32025 | SS | F | ? ³ | ? | ? | 07-Oct-04 | AHY | ? |
| 1483 – 55870 | SS | F | Chelan Ridge, WA | 13-Sep-04 | HY | 13-Oct-04 | HY | 288 |

¹ SS = Sharp-shinned Hawk.

² HY = hatch year, AHY = after hatch year.

³ Awaiting report from Bird Banding Lab.

Table 9. Recaptures in 2004 of raptors banded at the Bonney Butte Raptor Migration Project site in northern Oregon.

| BAND # | SPECIES ¹ | SEX | BANDING DATE | BANDING AGE ² | RECAPTURE DATE | RECAPTURE AGE ² |
|--------------|----------------------|-----|-----------------|-----------------------------|-------------------|-------------------------------|
| 2206 – 65209 | NG | M | 27-Sep-03 | HY | 28-Sep-04 | SY |
| 1593 – 02278 | SS | F | 08-Oct-02 | HY | 11-Oct-04 | TY |

¹ SS = Sharp-shinned Hawk.

² HY = hatch year, AHY = after hatch year.

³ Awaiting report from Bird Banding Lab.

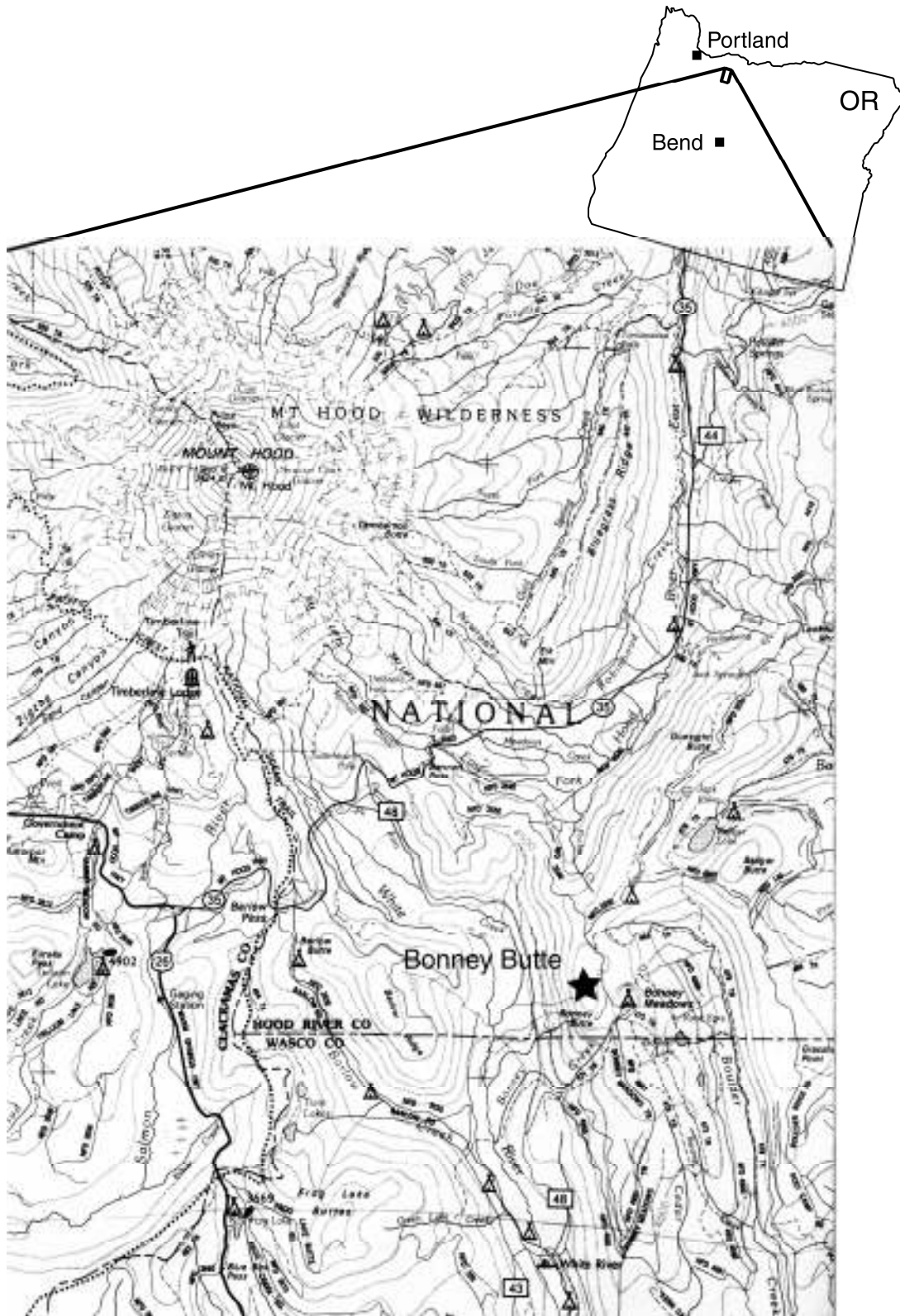


Figure 1. Location of the Bonney Butte Raptor Migration Project study site near Mt. Hood, Oregon.

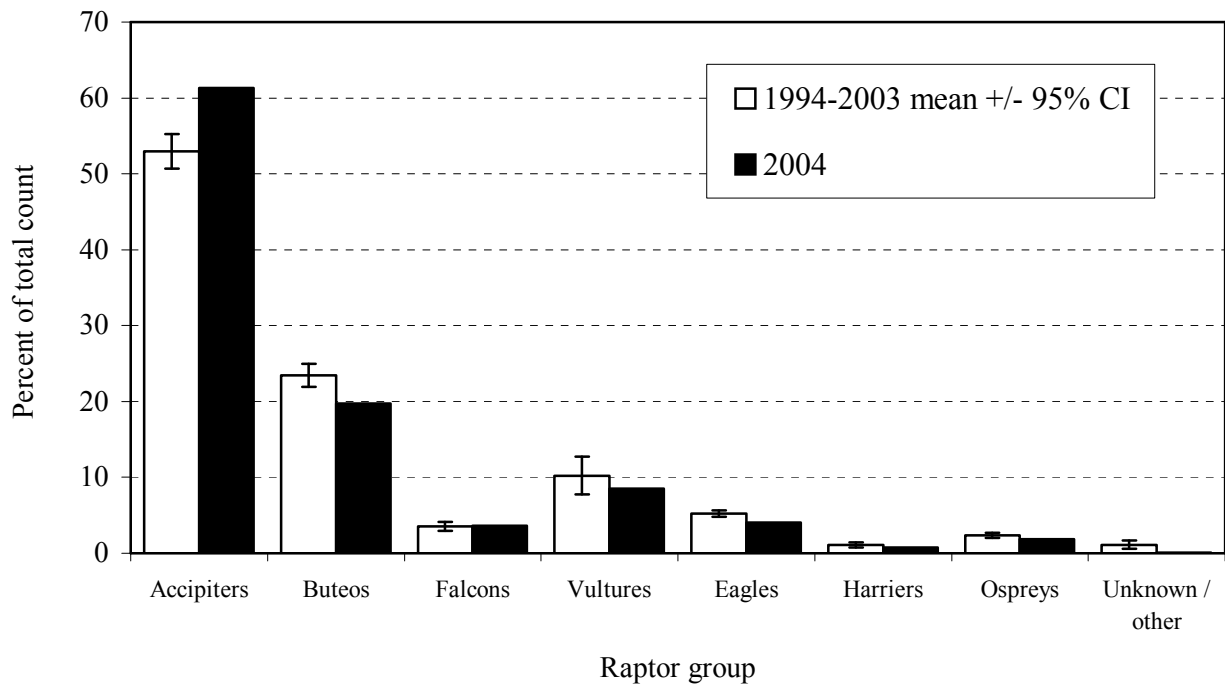


Figure 2. Fall raptor migration flight composition by major species groups at Bonney Butte, OR: 1994–2003 versus 2004.

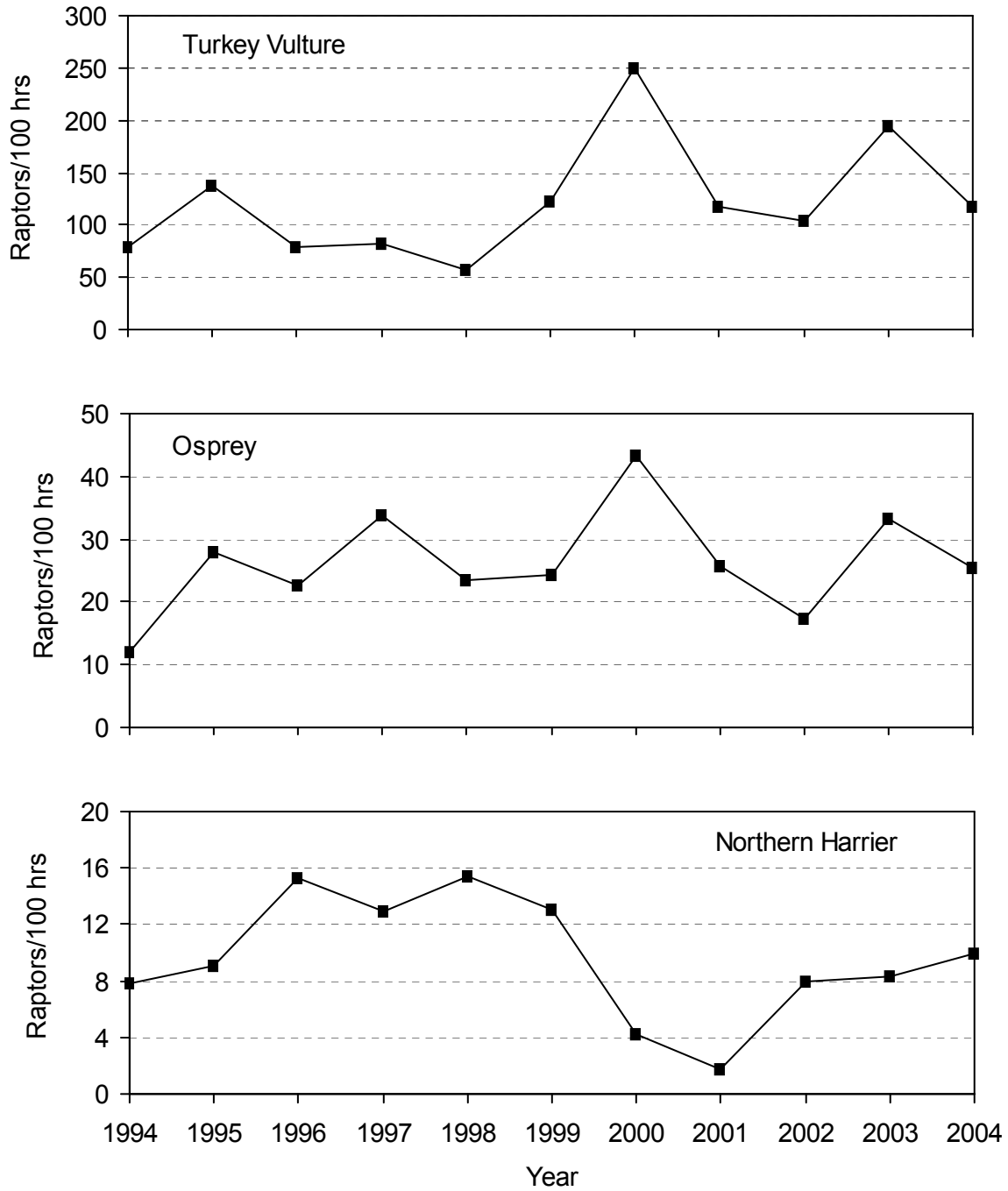


Figure 3. Adjusted, fall-migration passage rates for Turkey Vultures, Ospreys, and Northern Harriers at Bonney Butte, OR: 1994–2004. Dashed lines indicate significant ($P < 0.10$) regressions.

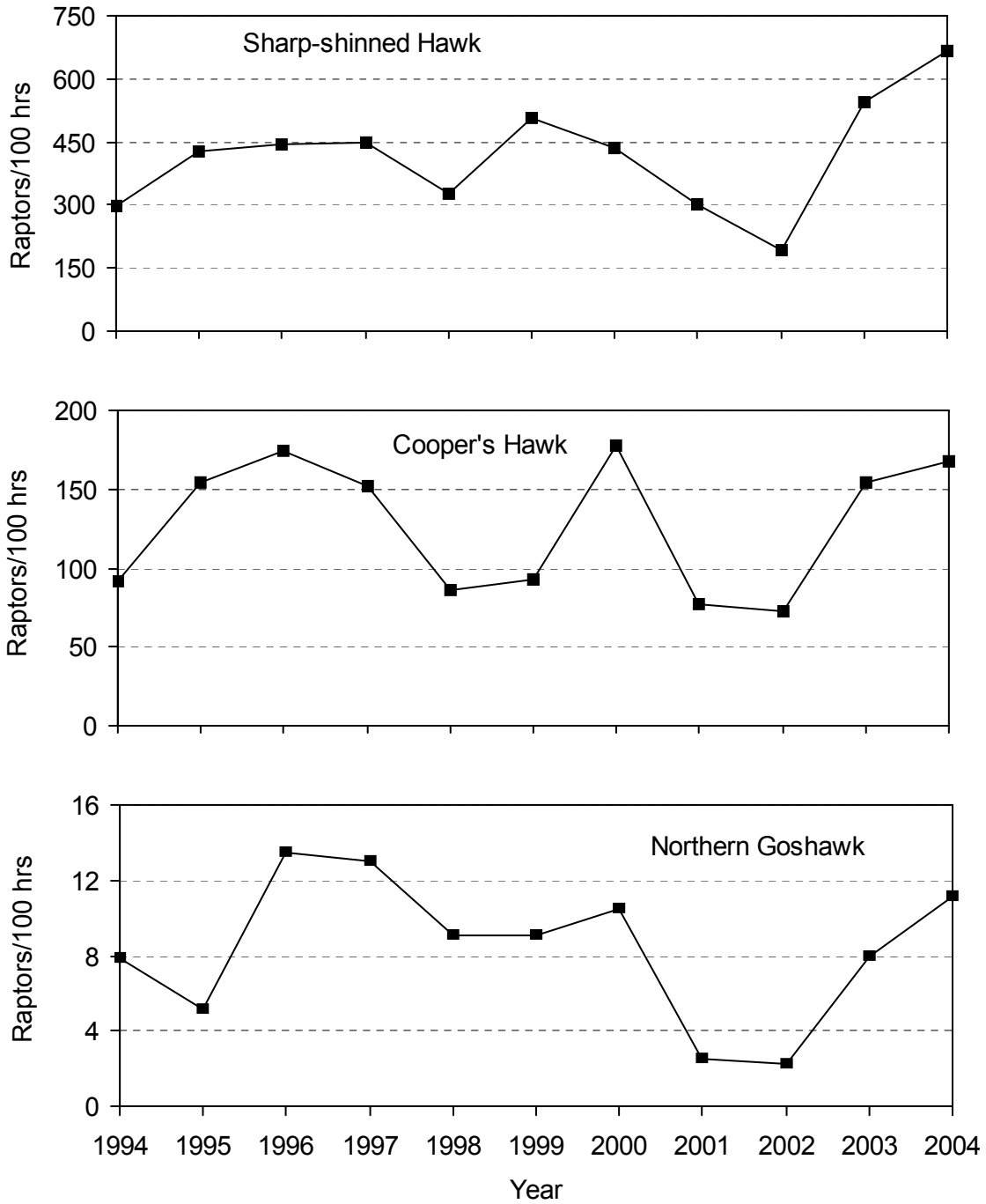


Figure 4. Adjusted, fall-migration passage rates for Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks at Bonney Butte, OR: 1994–2004. Dashed lines indicate significant ($P < 0.10$) regressions.

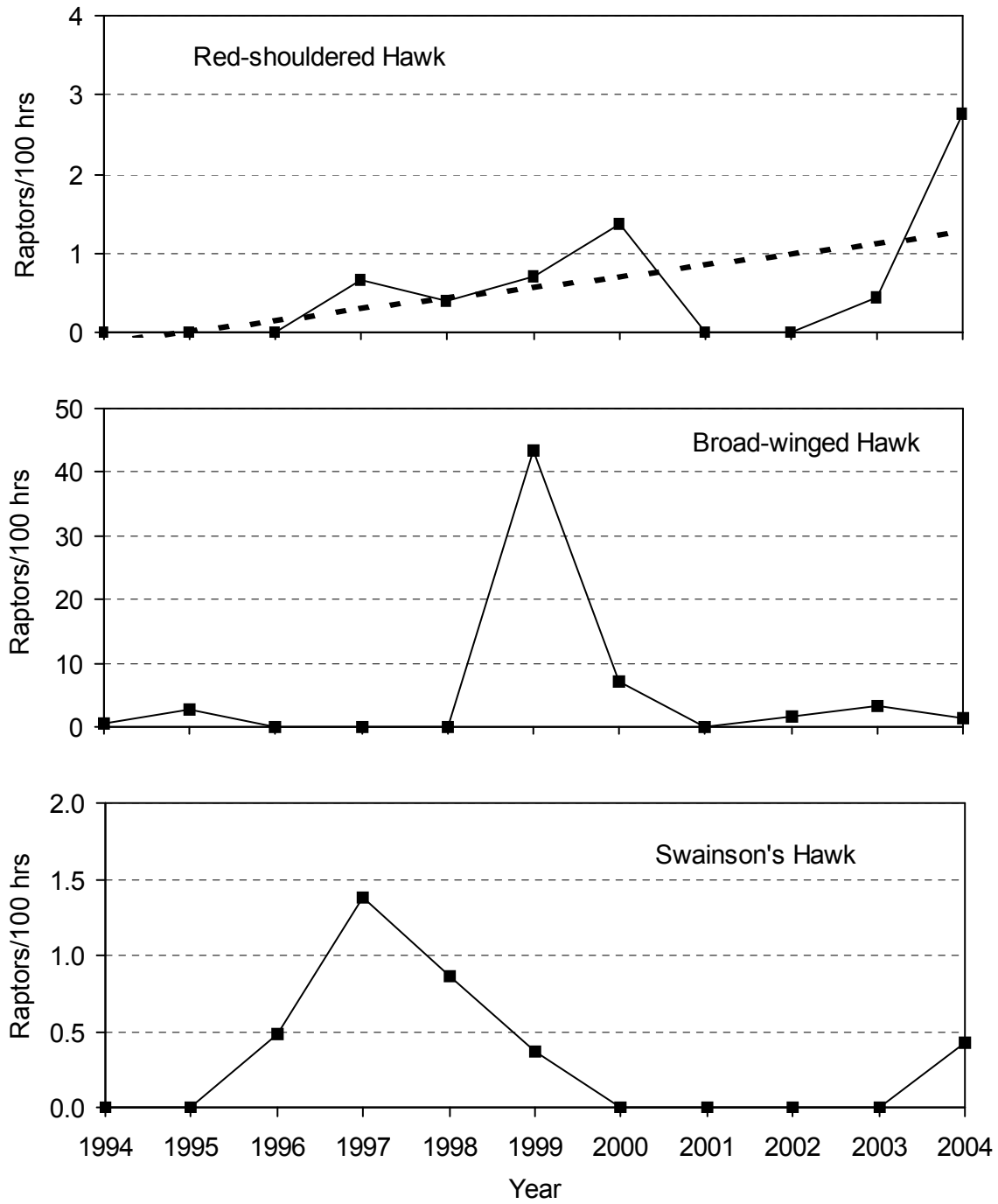


Figure 5. Adjusted, fall-migration passage rates for Red-shouldered, Broad-winged, and Swainson's Hawks at Bonney Butte, OR: 1994–2004. Dashed lines indicate significant ($P < 0.10$) regressions.

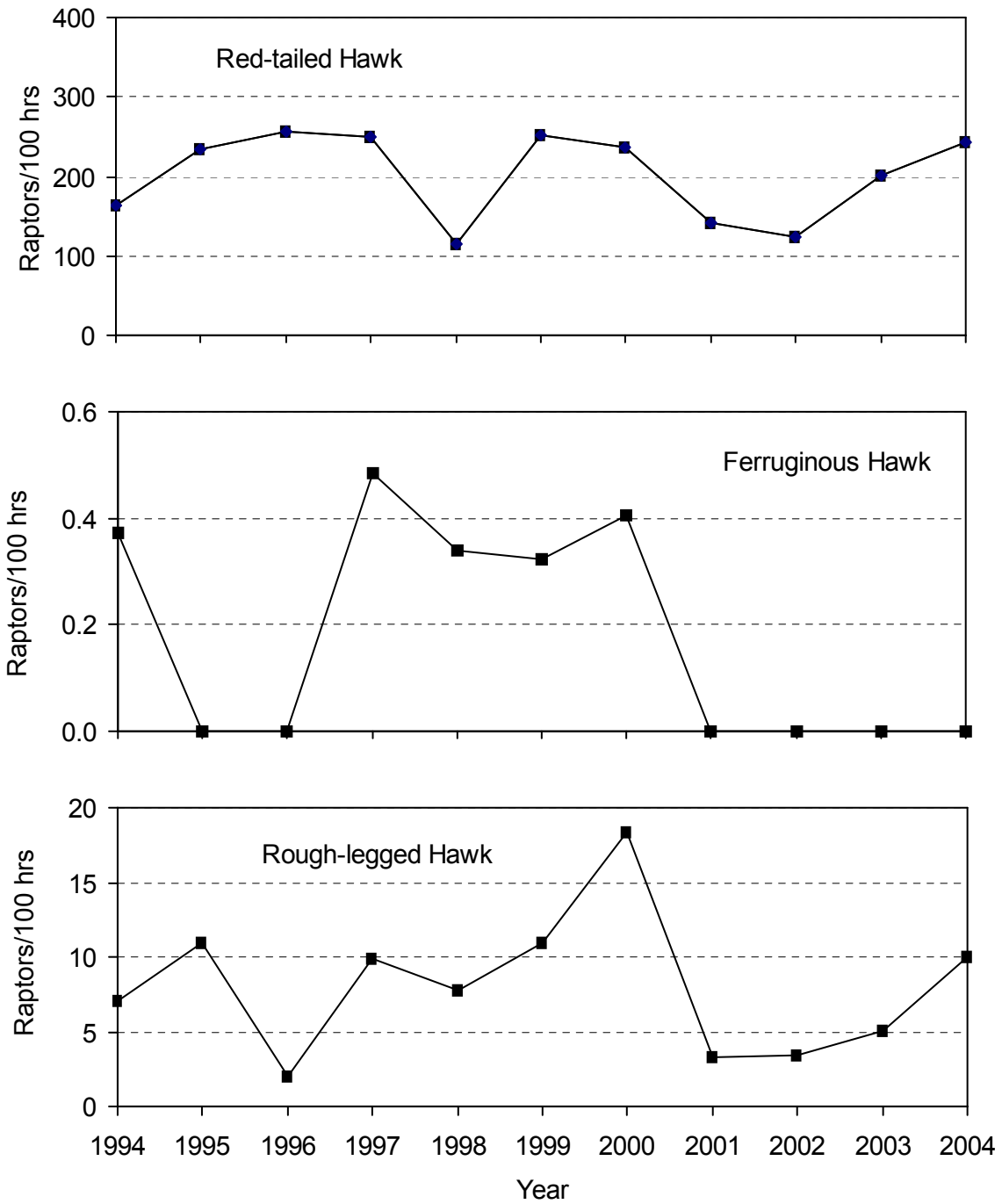


Figure 6. Adjusted, fall-migration passage rates for Red-tailed, Ferruginous, and Rough-legged Hawks at Bonney Butte, OR: 1994–2004. Dashed lines indicate significant ($P < 0.10$) regressions.

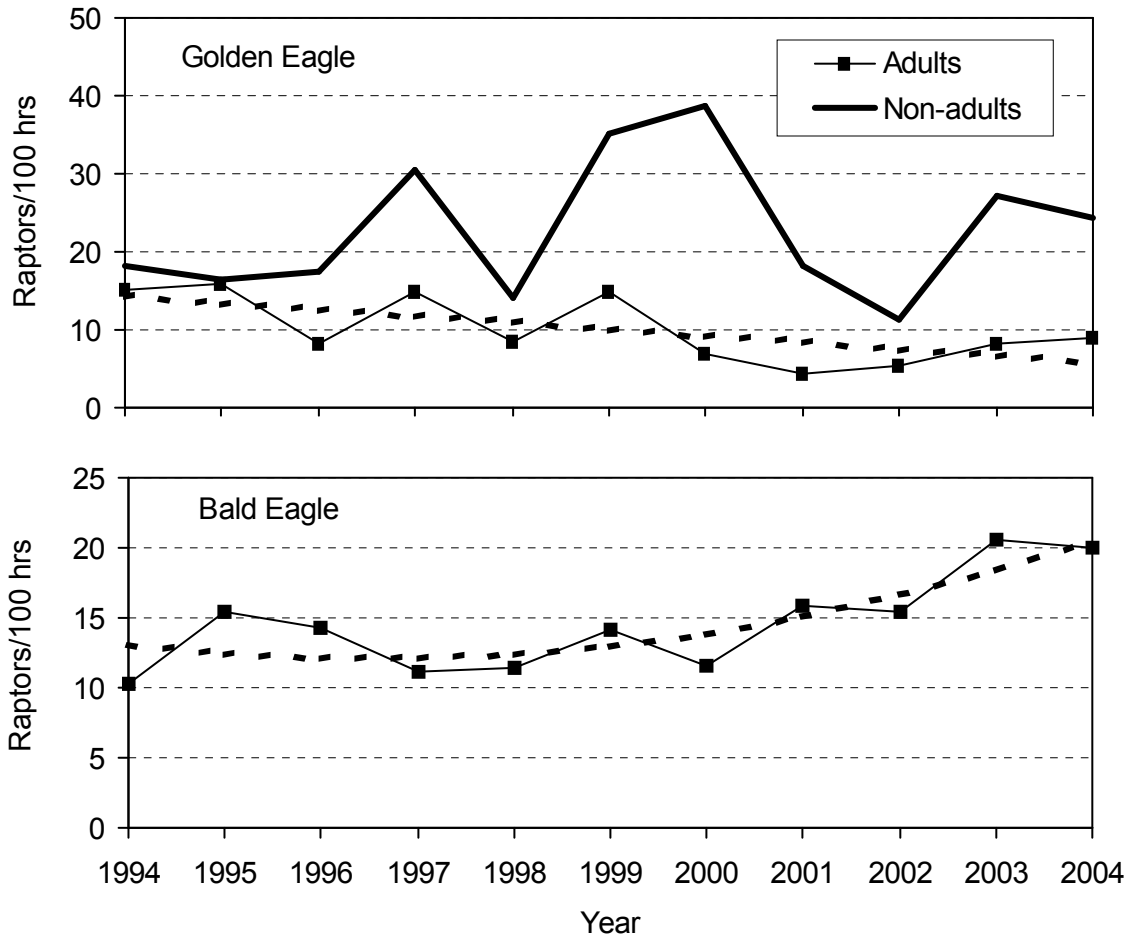


Figure 7. Adjusted, fall-migration passage rates for Golden and Bald Eagles at Bonney Butte, OR: 1994–2004. Dashed lines indicate significant ($P < 0.10$) regressions.

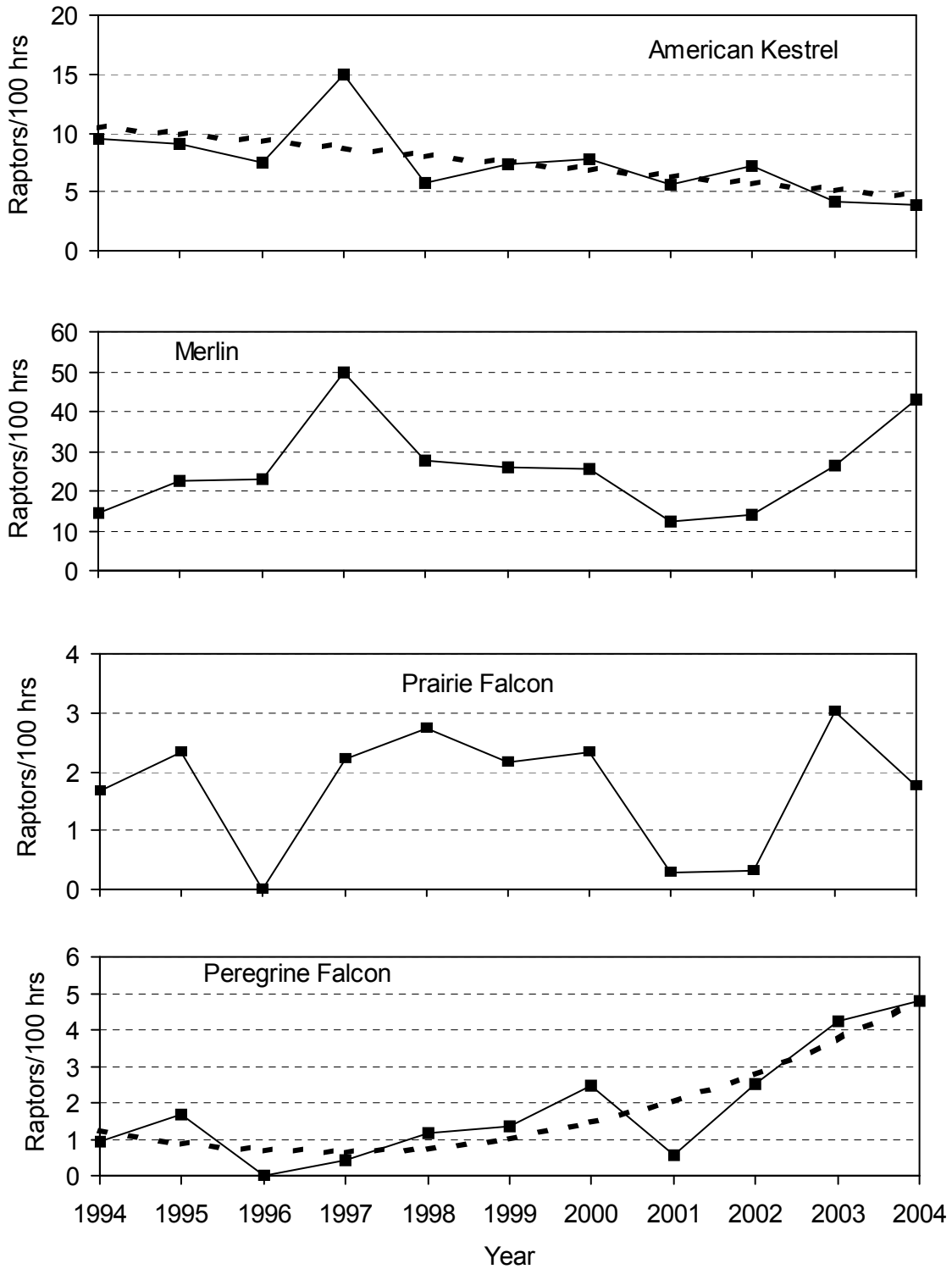


Figure 8. Adjusted, fall-migration passage rates for American Kestrels, Merlins, Prairie Falcons, Peregrine Falcons at Bonney Butte, OR: 1994–2004. Dashed lines indicate significant ($P < 0.10$) regressions.

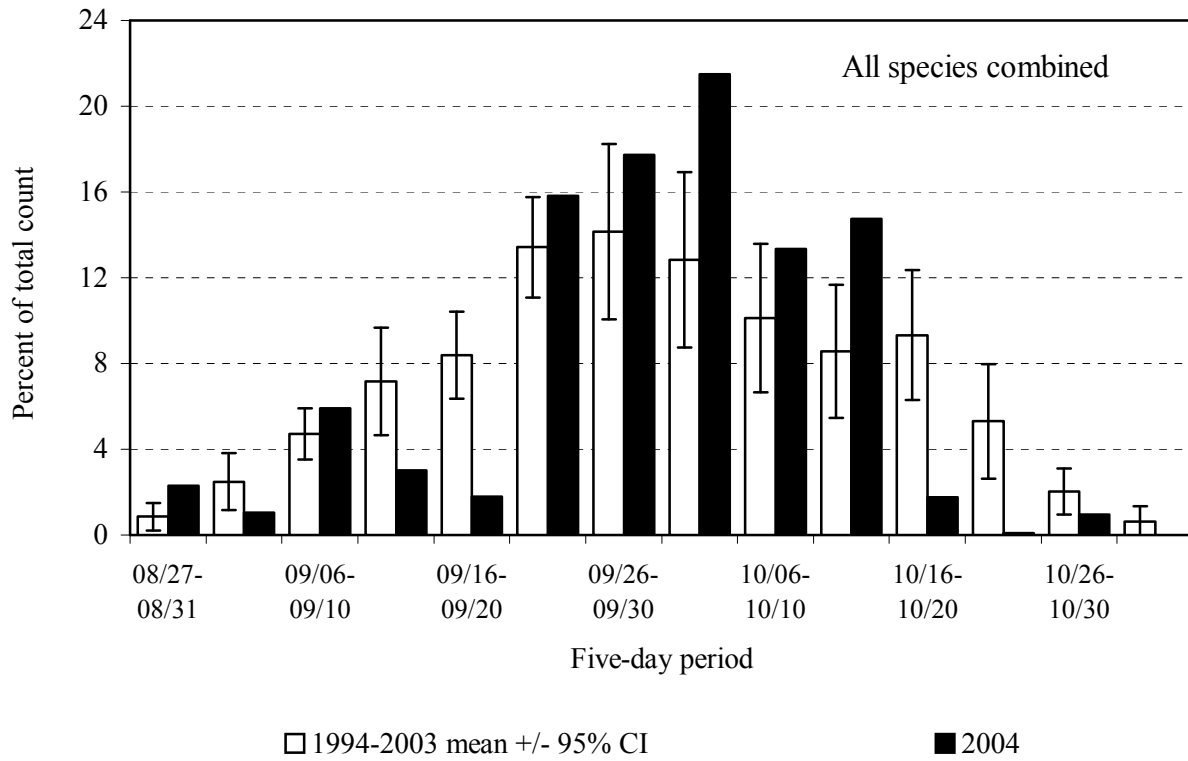


Figure 9. Combined-species passage volume by five-day periods for migrating raptors at Bonney Butte, OR: 1994–2003 versus 2004.

Appendix A. A history of observer participation in the Bonney Butte Raptor Migration Project.

- 1994:** Single observer throughout: David Schuetze (0) and Sean O'Connor (0)¹.
- 1995:** Two observers throughout: David Schuetze (1) and Alison Clark (0).
- 1996:** Two observers throughout: David Schuetze (2) and Alison Clark (1).
- 1997:** Two observers throughout: Rose Jaffe (0) and Sean Donaghy (0).
- 1998:** Two observers throughout: Nick Vulgares (1) and Jeremy Davit (0).
- 1999:** Two observers throughout: Nick Vulgares (3) and Sue Vulgares (0).
- 2000:** Two observers throughout: Nick Vulgares (5) and Sue Vulgares (2).
- 2001:** Two observers throughout: Alison Cebula Benedict (1) and Eric Hallingstad (0).
- 2002:** Two observers throughout: Eric Hallingstad (1) and Sue Bruner (1).
- 2003:** Two observers throughout: David Haines (0) and Lindsay Reynolds (0).
- 2004:** Two observers throughout: David Haines (1) and Amy Scarpignato (1 partial).

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

Appendix B. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications for all diurnal raptor species observed during fall migration at Bonney Butte, OR.

| COMMON NAME | SCIENTIFIC NAME | SPECIES CODE | AGE ¹ | SEX ² | COLOR MORPH ³ |
|-------------------------|--|--------------|----------------------------------|------------------|--------------------------|
| Turkey Vulture | <i>Cathartes aura</i> | TV | U | U | NA |
| Osprey | <i>Pandion haliaetus</i> | OS | U | U | NA |
| Northern Harrier | <i>Circus cyaneus</i> | NH | AM AF I Br U | AM AF U | NA |
| Sharp-shinned Hawk | <i>Accipiter striatus</i> | SS | A I U | U | NA |
| Cooper's Hawk | <i>Accipiter cooperii</i> | CH | A I U | U | NA |
| Northern Goshawk | <i>Accipiter gentilis</i> | NG | A I U | U | NA |
| Unknown small accipiter | <i>A. striatus</i> or <i>cooperii</i> | SA | U | U | NA |
| Unknown large accipiter | <i>A. cooperii</i> or <i>gentilis</i> | LA | U | U | NA |
| Unknown accipiter | <i>Accipiter</i> spp. | UA | U | U | NA |
| Red-shouldered Hawk | <i>Buteo lineatus</i> | RS | A, I, U | U | NA |
| Broad-winged Hawk | <i>Buteo platypterus</i> | BW | A I U | U | D L U |
| Swanson's Hawk | <i>Buteo swainsoni</i> | SW | U | U | D L U |
| Red-tailed Hawk | <i>Buteo jamaicensis</i> | RT | A I U | U | D L U |
| Ferruginous Hawk | <i>Buteo regalis</i> | FH | A I U | U | D L U |
| Rough-legged Hawk | <i>Buteo lagopus</i> | RL | U | U | D L U |
| Unknown buteo | <i>Buteo</i> spp. | UB | U | U | D L U |
| Golden Eagle | <i>Aquila chrysaetos</i> | GE | I, S, NA, A, U ⁴ | U | NA |
| Bald Eagle | <i>Haliaeetus leucocephalus</i> | BE | I, S1, S2, NA, A, U ⁵ | U | NA |
| Unknown eagle | <i>Aquila</i> or <i>Haliaeetus</i> spp. | UE | U | U | NA |
| American Kestrel | <i>Falco sparverius</i> | AK | U | M F U | NA |
| Merlin | <i>Falco columbarius</i> | ML | AM Br U | AM Br U | NA |
| Prairie Falcon | <i>Falco mexicanus</i> | PR | U | U | NA |
| Peregrine Falcon | <i>Falco peregrinus</i> | PG | A I U | U | NA |
| Unknown small falcon | <i>F. sparverius</i> or <i>columbarius</i> | SF | U | U | NA |
| Unknown large falcon | <i>F. mexicanus</i> or <i>peregrinus</i> | LF | U | U | NA |
| Unknown falcon | <i>Falco</i> spp. | UF | U | U | NA |
| Unknown raptor | Falconiformes | UU | U | U | NA |

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

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

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

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

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

Appendix C. Daily observation effort, visitor disturbance ratings, weather records, and flight summaries for the Bonney Butte Raptor Migration Project: 2004.

| DATE | OBS. HOURS | OBSRVR / HOUR ¹ | MEDIAN | PREDOMINANT WEATHER ³ | WIND | TEMP (°C) ¹ | BAROM. PRESS. | MEDIAN THERMAL LIFT ⁴ | VISIB. WEST (KM) ¹ | VISIB. EAST (KM) ¹ | MEDIAN FLIGHT DISTANCE ⁵ | BIRDS / HOUR | |
|--------|------------|----------------------------|------------------------------|----------------------------------|--------------------------|------------------------|----------------|----------------------------------|-------------------------------|-------------------------------|-------------------------------------|--------------|------|
| | | | VISITOR DISTURB ² | | SPEED (KPH) ¹ | | WIND DIRECTION | (IN HG) ¹ | | | | | |
| 27-Aug | 8.83 | 2.0 | 0 | pc-mc, AM fog | 4.8 | w | 15.9 | 30.00 | 4 | 82 | 33 | 3 | 2.4 |
| 28-Aug | 9.00 | 2.0 | 0 | pc | 4.4 | w-wnw | 17.6 | 29.97 | 3 | 100 | 93 | 2 | 2.7 |
| 29-Aug | 9.00 | 2.0 | 0 | clr-pc | 2.5 | w | 22.2 | 29.93 | 3 | 100 | 96 | 2 | 2.9 |
| 30-Aug | 9.00 | 2.0 | 0 | clr | 3.1 | w-wnw | 24.6 | 29.93 | 2 | 100 | 99 | 2 | 1.9 |
| 31-Aug | 9.00 | 2.0 | 0 | pc-mc, late PM haze | 4.2 | sw-nw | 24.7 | 29.90 | 3 | 98 | 96 | 3 | 2.6 |
| 1-Sep | 0.00 | | | weather day | | | | | | | | | |
| 2-Sep | 1.50 | 2.0 | 0 | ovc, fog/haze, PM rain | 6.7 | var | 10.0 | 29.79 | 4 | 61 | 3 | 2 | 0.7 |
| 3-Sep | 7.50 | 2.0 | 0 | mc, fog/haze | 8.2 | w-wnw | 12.2 | 29.88 | 4 | 8 | 4 | 3 | 2.1 |
| 4-Sep | 0.00 | | | weather day | | | | | | | | | |
| 5-Sep | 9.00 | 2.0 | 0 | clr/haze | 3.1 | w-wnw | 17.4 | 29.96 | 3 | 66 | 69 | 3 | 3.9 |
| 6-Sep | 9.00 | 2.0 | 0 | clr-pc | 3.6 | s, w | 20.2 | 29.93 | 3 | 85 | 87 | 2 | 9.8 |
| 7-Sep | 9.00 | 1.9 | 0 | pc/haze | 4.9 | w | 17.0 | 29.88 | 3 | 82 | 80 | 2 | 4.7 |
| 8-Sep | 9.00 | 1.6 | 0 | pc/haze | 3.7 | sw-w | 16.6 | 29.82 | 3 | 72 | 65 | 3 | 6.4 |
| 9-Sep | 8.00 | 2.0 | 0 | ovc/haze | 2.4 | sw-w | 11.0 | 29.81 | 4 | 60 | 21 | 3 | 0.4 |
| 10-Sep | 9.00 | 2.4 | 0 | pc-ovc/haze | 1.5 | sw-wnw | 17.5 | 29.82 | 3 | 85 | 68 | 2 | 11.7 |
| 11-Sep | 0.00 | | | weather day | | | | | | | | | |
| 12-Sep | 1.50 | 2.8 | 0 | ovc/haze | 3.0 | sw-w | 11.0 | 29.71 | 4 | 67 | 16 | 2 | 2.0 |
| 13-Sep | 0.00 | | | weather day | | | | | | | | | |
| 14-Sep | 2.75 | 2.0 | 0 | ovc, fog, PM rain | 5.5 | s-sw | 9.5 | 29.78 | 4 | 63 | 20 | 2 | 2.5 |
| 15-Sep | 0.00 | | | weather day | | | | | | | | | |
| 16-Sep | 4.67 | 2.0 | 0 | ovc, fog/haze, PM rain | 6.3 | w-wnw | 9.7 | 29.67 | 4 | 63 | 15 | 3 | 9.0 |
| 17-Sep | 0.00 | | | weather day | | | | | | | | | |
| 18-Sep | 0.00 | | | fog/rain | | | | | | | | | |
| 19-Sep | 3.50 | 2.0 | 0 | ovc/fog-rain | 2.6 | sw-w | 9.8 | 29.53 | 4 | 32 | 3 | 2 | 7.7 |
| 20-Sep | 6.75 | 2.0 | 0 | ovc/fog, PM haze | 5.4 | sse, sw-w | 6.8 | 29.91 | 4 | 46 | 6 | 3 | 11.1 |
| 21-Sep | 9.00 | 3.0 | 0 | clr/haze | 2.5 | sw-wnw | 11.3 | 29.93 | 3 | 64 | 55 | - | 17.7 |
| 22-Sep | 8.50 | 2.8 | 0 | clr, pc-ovc | 3.5 | ssw-wnw | 15.8 | 29.90 | 3 | 60 | 61 | - | 9.4 |
| 23-Sep | 9.00 | 2.0 | 0 | pc-mc/haze | 3.3 | sw-w | 15.6 | 29.93 | 3 | 59 | 46 | - | 13.3 |
| 24-Sep | 9.00 | 2.6 | 0 | clr/haze | 5.1 | ne-se, wnw | 19.2 | 29.94 | 2 | 35 | 45 | 2 | 19.0 |
| 25-Sep | 9.00 | 3.7 | 0 | clr/haze | 3.4 | s-sw, w-nw | 20.5 | 29.88 | 2 | 39 | 36 | 2 | 20.3 |
| 26-Sep | 9.00 | 3.1 | 0 | clr/haze, AM fog | 2.1 | n-ne | 19.4 | 29.91 | 3 | 15 | 45 | 2 | 15.4 |
| 27-Sep | 9.00 | 2.3 | 0 | clr/haze | 7.4 | n-nne | 17.8 | 29.92 | 3 | 12 | 29 | - | 10.1 |
| 28-Sep | 9.00 | 2.9 | 0 | clr-mc/haze | 4.4 | n, se-s | 20.6 | 29.84 | 3 | 11 | 30 | 2 | 15.9 |
| 29-Sep | 9.00 | 1.8 | 0 | pc-mc/haze, AM fog | 8.9 | w | 13.0 | 29.73 | 4 | 17 | 9 | 3 | 13.6 |
| 30-Sep | 9.00 | 2.1 | 0 | pc/haze | 3.7 | ne | 14.8 | 29.75 | 3 | 11 | 36 | - | 13.2 |
| 1-Oct | 9.00 | 2.5 | 0 | clr/haze | 10.2 | ne | 12.8 | 29.86 | 4 | 11 | 35 | 2 | 12.9 |
| 2-Oct | 9.00 | 2.8 | 0 | clr/haze | 2.9 | ne, wsw-nw | 16.9 | 29.94 | 2 | 11 | 27 | - | 27.6 |
| 3-Oct | 9.00 | 2.8 | 1 | clr/haze | 2.4 | var, nw | 17.9 | 30.08 | 3 | 11 | 36 | - | 27.3 |
| 4-Oct | 8.75 | 2.0 | 0 | clr/haze | 1.6 | sw-wnw | 18.8 | 29.94 | 2 | 16 | 41 | 3 | 10.5 |
| 5-Oct | 9.00 | 2.7 | 0 | clr-ovc/haze | 3.9 | wsw-wnw | 17.1 | 29.87 | 3 | 14 | 40 | 3 | 23.8 |
| 6-Oct | 0.00 | | | fog/rain | | | | | | | | | |
| 7-Oct | 7.50 | 2.3 | 0 | mc-ovc, haze, AM fog | 5.8 | var | 14.1 | 29.86 | 3 | 58 | 36 | 2 | 34.7 |
| 8-Oct | 4.00 | 1.8 | 0 | ovc, PM rain | 7.2 | sw-w | 13.6 | 29.70 | 4 | 66 | 24 | 2 | 9.0 |
| 9-Oct | 0.00 | | | fog/rain | | | | | | | | | |
| 10-Oct | 9.00 | 2.5 | 0 | mc, haze | 2.2 | var, w-wnw | 9.8 | 29.95 | 4 | 67 | 36 | 2 | 13.9 |
| 11-Oct | 9.00 | 2.0 | 0 | clr-pc | 2.2 | ne, sw-w | 13.8 | 29.99 | 3 | 75 | 54 | 3 | 19.2 |
| 12-Oct | 9.00 | 2.0 | 0 | pc-mc/haze | 3.2 | var | 15.7 | 30.08 | 3 | 63 | 42 | 3 | 13.8 |
| 13-Oct | 8.00 | 2.0 | 0 | clr/haze | 10.6 | nne-ene | 13.6 | 30.08 | 4 | 24 | 34 | 3 | 3.8 |
| 14-Oct | 9.00 | 2.7 | 0 | clr/haze | 4.2 | ne, sw-nw | 21.1 | 29.97 | 2 | 55 | 37 | 3 | 12.3 |
| 15-Oct | 8.00 | 2.5 | 0 | mc-ovc, fog/haze | 5.7 | w | 12.8 | 29.76 | 4 | 21 | 7 | 3 | 8.0 |

Appendix C. continued

| DATE | OBS. HOURS | OBSRVR / HOUR ¹ | MEDIAN VISITOR DISTURB ² | PREDOMINANT WEATHER ³ | WIND SPEED (KPH) ¹ | WIND DIRECTION | TEMP (°C) ¹ | BAROM. PRESS. (IN HG) ¹ | MEDIAN THERMAL LIFT ⁴ | VISIB. WEST (KM) ¹ | VISIB. EAST (KM) ¹ | MEDIAN FLIGHT DISTANCE ⁵ / HOUR | BIRDS / HOUR |
|--------|------------|----------------------------|-------------------------------------|----------------------------------|-------------------------------|----------------|------------------------|------------------------------------|----------------------------------|-------------------------------|-------------------------------|--|--------------|
| 16-Oct | 0.00 | | | fog | | | | | | | | | |
| 17-Oct | 0.00 | | | fog/rain/snow | | | | | | | | | |
| 18-Oct | 0.00 | | | fog/snow | | | | | | | | | |
| 19-Oct | 1.00 | 2.0 | 0 | ovc, fog/haze | 13.5 | e | 6.0 | 29.13 | 4 | 42 | 14 | 3 | 3.0 |
| 20-Oct | 4.00 | 2.0 | 0 | ovc/fog | 2.0 | sw-w | 6.8 | 29.48 | 4 | 4 | 1 | - | 0.8 |
| 21-Oct | 0.00 | | | fog | | | | | | | | | |
| 22-Oct | 0.00 | | | weather day | | | | | | | | | |
| 23-Oct | 0.00 | | | weather day | | | | | | | | | |
| 24-Oct | 0.00 | | | weather day | | | | | | | | | |
| 25-Oct | 3.50 | 1.8 | 0 | ovc, PM haze | 5.4 | sse | 3.8 | 29.40 | 4 | 46 | 59 | 3 | 2.3 |
| 26-Oct | 0.00 | | | fog | | | | | | | | | |
| 27-Oct | 5.00 | 2.0 | 0 | pc-mc/haze | 2.3 | n-nne | 5.0 | 29.58 | 4 | 12 | 37 | 2 | 5.0 |
| 28-Oct | 0.00 | | | fog | | | | | | | | | |
| 29-Oct | 4.00 | 2.0 | 0 | ovc, fog/haze | 7.8 | w | 3.2 | 29.85 | 4 | 10 | 3 | 2 | 0.8 |
| 30-Oct | 0.00 | | | snow | | | | | | | | | |
| 31-Oct | 0.00 | | | snow | | | | | | | | | |

¹ Average of hourly records.

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

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

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

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

Appendix D. Daily observation effort and fall raptor migration counts by species at Bonney Butte, OR: 2004.

| DATE | OBS | | SPECIES ¹ | | | | | | | | | | | | | | | | | | | | | | | | BIRDS | | | |
|--------|-------|----|----------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|-------|----|-------|--------|
| | HOURS | 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 |
| 27-Aug | 8.83 | 4 | 3 | 0 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 2.4 |
| 28-Aug | 9.00 | 13 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 2.7 |
| 29-Aug | 9.00 | 5 | 0 | 1 | 4 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 26 | 2.9 |
| 30-Aug | 9.00 | 2 | 0 | 0 | 4 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 1.9 |
| 31-Aug | 9.00 | 11 | 3 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 2.6 |
| 1-Sep | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2-Sep | 1.50 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.7 |
| 3-Sep | 7.50 | 2 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 16 | 2.1 |
| 4-Sep | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5-Sep | 9.00 | 2 | 3 | 1 | 12 | 5 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 3.9 |
| 6-Sep | 9.00 | 3 | 2 | 1 | 32 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 88 | 9.8 |
| 7-Sep | 9.00 | 2 | 0 | 1 | 7 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 4.7 |
| 8-Sep | 9.00 | 9 | 4 | 0 | 9 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 58 | 6.4 |
| 9-Sep | 8.00 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0.4 |
| 10-Sep | 9.00 | 13 | 0 | 2 | 56 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 105 | 11.7 |
| 11-Sep | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 12-Sep | 1.50 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 2.0 |
| 13-Sep | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 14-Sep | 2.75 | 0 | 3 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 2.5 |
| 15-Sep | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 16-Sep | 4.67 | 1 | 0 | 0 | 19 | 5 | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 13 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 9.0 |
| 17-Sep | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18-Sep | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19-Sep | 3.50 | 5 | 0 | 0 | 11 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 7.7 |
| 20-Sep | 6.75 | 6 | 5 | 1 | 14 | 9 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 75 | 11.1 |
| 21-Sep | 9.00 | 43 | 9 | 0 | 45 | 21 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 32 | 0 | 0 | 0 | 2 | 4 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 159 | 17.7 |
| 22-Sep | 8.50 | 10 | 1 | 1 | 27 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 80 | 9.4 |
| 23-Sep | 9.00 | 20 | 0 | 2 | 35 | 24 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 2 | 6 | 0 | 0 | 4 | 1 | 2 | 0 | 0 | 0 | 1 | 120 | 13.3 |
| 24-Sep | 9.00 | 37 | 3 | 2 | 67 | 28 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 171 | 19.0 |
| 25-Sep | 9.00 | 30 | 7 | 1 | 69 | 31 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 25 | 0 | 1 | 1 | 2 | 6 | 0 | 1 | 5 | 0 | 2 | 0 | 0 | 0 | 1 | 183 | 20.3 |
| 26-Sep | 9.00 | 32 | 2 | 0 | 49 | 22 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 1 | 3 | 6 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 139 | 15.4 |
| 27-Sep | 9.00 | 13 | 0 | 0 | 37 | 22 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 0 | 1 | 0 | 0 | 0 | 0 | 91 | 10.1 |
| 28-Sep | 9.00 | 16 | 4 | 1 | 69 | 20 | 2 | 3 | 0 | 0 | 0 | 1 | 0 | 21 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 143 | 15.9 |
| 29-Sep | 9.00 | 10 | 1 | 1 | 78 | 15 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 0 | 122 | 13.6 |
| 30-Sep | 9.00 | 15 | 5 | 3 | 40 | 14 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 27 | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 4 | 0 | 1 | 0 | 0 | 0 | 1 | 119 | 13.2 |

Appendix D. continued

| DATE | OBS | | | SPECIES ¹ | | | | | | | | | | | | | | | | | | | | | | | | BIRDS | | |
|--------|--------|-----|----|----------------------|------|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|----|----|-----|----|----|----|----|----|-------|-------|--------|
| | HOURS | 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 |
| 1-Oct | 9.00 | 3 | 4 | 1 | 39 | 9 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 49 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 116 | 12.9 |
| 2-Oct | 9.00 | 19 | 3 | 6 | 127 | 27 | 4 | 2 | 0 | 0 | 0 | 0 | 1 | 33 | 0 | 0 | 2 | 10 | 5 | 0 | 0 | 7 | 1 | 1 | 0 | 0 | 0 | 0 | 248 | 27.6 |
| 3-Oct | 9.00 | 0 | 1 | 1 | 178 | 15 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 7 | 4 | 0 | 1 | 13 | 0 | 0 | 1 | 0 | 0 | 246 | 27.3 | |
| 4-Oct | 8.75 | 0 | 0 | 0 | 54 | 14 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 2 | 0 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 92 | 10.5 | |
| 5-Oct | 9.00 | 0 | 1 | 1 | 130 | 27 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 0 | 10 | 6 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 214 | 23.8 | |
| 6-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7-Oct | 7.50 | 0 | 0 | 0 | 194 | 40 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 260 | 34.7 | |
| 8-Oct | 4.00 | 0 | 0 | 1 | 22 | 4 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 36 | 9.0 | |
| 9-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 10-Oct | 9.00 | 0 | 0 | 0 | 88 | 10 | 3 | 1 | 2 | 0 | 0 | 0 | 0 | 13 | 0 | 2 | 0 | 1 | 0 | 0 | 1 | 4 | 0 | 0 | 0 | 0 | 0 | 125 | 13.9 | |
| 11-Oct | 9.00 | 0 | 2 | 0 | 112 | 24 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 17 | 0 | 1 | 0 | 5 | 4 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 173 | 19.2 | |
| 12-Oct | 9.00 | 0 | 1 | 0 | 51 | 16 | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 36 | 0 | 3 | 1 | 7 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 124 | 13.8 | |
| 13-Oct | 8.00 | 0 | 1 | 0 | 15 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 6 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 30 | 3.8 | |
| 14-Oct | 9.00 | 0 | 0 | 1 | 56 | 14 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 1 | 0 | 3 | 1 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 111 | 12.3 | |
| 15-Oct | 8.00 | 0 | 0 | 0 | 21 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 2 | 0 | 8 | 4 | 0 | 0 | 3 | 0 | 1 | 0 | 0 | 0 | 64 | 8.0 | |
| 16-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 17-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 18-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 19-Oct | 1.00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 3.0 | |
| 20-Oct | 4.00 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0.8 | |
| 21-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 22-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 23-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 24-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25-Oct | 3.50 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 2.3 | |
| 26-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 27-Oct | 5.00 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 3 | 1 | 5 | 1 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 25 | 5.0 | |
| 28-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 29-Oct | 4.00 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0.8 | |
| 30-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 31-Oct | 0.00 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 341.25 | 326 | 70 | 29 | 1790 | 485 | 33 | 27 | 2 | 0 | 7 | 2 | 1 | 725 | 0 | 17 | 9 | 93 | 61 | 2 | 14 | 105 | 5 | 14 | 1 | 0 | 0 | 3 | 3821 | 11.2 |

¹ See Appendix B for full names associated with species codes.

Appendix E. Annual observation effort and fall raptor migration counts by species at Bonney Butte, OR: 1994–2004.

| | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | MEAN |
|--------------------------------------|---------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Start date | 2-Sep | 4-Sep | 1-Sep | 1-Sep | 1-Sep | 27-Aug | 27-Aug | 27-Aug | 27-Aug | 27-Aug | 27-Aug | 28-Aug |
| End date | 25-Oct | 31-Oct | 2-Nov | 3-Nov | 30-Oct | 28-Oct | 30-Oct | 28-Oct | 31-Oct | 31-Oct | 29-Oct | 29-Oct |
| Observation days | 47 | 38 | 46 | 45 | 52 | 63 | 48 | 58 | 59 | 51 | 46 | 50 |
| Observation hours | 327.74 | 251.51 | 285.82 | 286.25 | 384.91 | 416.00 | 328.50 | 415.75 | 423.67 | 402.65 | 341.25 | 351.28 |
| Raptors / 100 hours | 688.4 | 939.9 | 959.7 | 953.7 | 631.8 | 993.5 | 1029.5 | 601.1 | 453.7 | 948.0 | 1119.7 | 847.18 |
| SPECIES | RAPTOR COUNTS | | | | | | | | | | | |
| Turkey Vulture | 204 | 235 | 165 | 133 | 160 | 349 | 553 | 338 | 286 | 488 | 326 | 294 |
| Osprey | 32 | 49 | 55 | 60 | 67 | 74 | 107 | 78 | 50 | 97 | 70 | 67 |
| Northern Harrier | 25 | 22 | 39 | 30 | 56 | 49 | 13 | 7 | 27 | 28 | 29 | 30 |
| Sharp-shinned Hawk | 857 | 871 | 1027 | 912 | 1018 | 1660 | 1105 | 957 | 600 | 1578 | 1790 | 1125 |
| Cooper's Hawk | 282 | 310 | 420 | 317 | 266 | 331 | 456 | 256 | 233 | 473 | 485 | 348 |
| Northern Goshawk | 25 | 12 | 40 | 34 | 33 | 36 | 31 | 10 | 8 | 29 | 33 | 26 |
| Unknown small accipiter ¹ | – | – | – | – | – | – | – | 84 | 11 | 33 | 27 | 39 |
| Unknown large accipiter ¹ | – | – | – | – | – | – | – | 0 | 1 | 1 | 2 | 1 |
| Unknown accipiter | 27 | 67 | 85 | 156 | 99 | 155 | 98 | 0 | 21 | 1 | 0 | 64 |
| TOTAL ACCIPITERS | 1191 | 1260 | 1572 | 1419 | 1416 | 2182 | 1690 | 1307 | 874 | 2115 | 2337 | 1578 |
| Red-shouldered Hawk | 0 | 0 | 0 | 1 | 1 | 2 | 3 | 0 | 0 | 1 | 7 | 1 |
| Broad-winged Hawk | 1 | 3 | 1 | 0 | 0 | 75 | 10 | 0 | 1 | 6 | 2 | 9 |
| Swainson's Hawk | 0 | 0 | 1 | 2 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 1 |
| Red-tailed Hawk | 516 | 528 | 649 | 626 | 411 | 932 | 680 | 513 | 425 | 744 | 725 | 614 |
| Ferruginous Hawk | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 |
| Rough-legged Hawk | 12 | 11 | 4 | 20 | 15 | 21 | 30 | 7 | 6 | 10 | 17 | 14 |
| Unidentified buteo | 23 | 30 | 40 | 52 | 30 | 58 | 26 | 29 | 48 | 18 | 9 | 33 |
| TOTAL BUTEOS | 553 | 572 | 695 | 702 | 460 | 1090 | 750 | 549 | 480 | 779 | 761 | 672 |
| Golden Eagle | 96 | 81 | 65 | 106 | 81 | 176 | 132 | 75 | 56 | 108 | 93 | 97 |
| Bald Eagle | 33 | 40 | 42 | 33 | 40 | 53 | 37 | 52 | 55 | 68 | 61 | 47 |
| Unidentified eagle | 3 | 2 | 1 | 9 | 4 | 2 | 0 | 6 | 7 | 0 | 2 | 3 |
| TOTAL EAGLES | 132 | 123 | 108 | 148 | 125 | 231 | 169 | 133 | 118 | 176 | 156 | 147 |
| American Kestrel | 29 | 18 | 18 | 35 | 22 | 30 | 21 | 23 | 21 | 19 | 14 | 23 |
| Merlin | 36 | 49 | 46 | 104 | 78 | 83 | 65 | 33 | 38 | 84 | 105 | 66 |
| Prairie Falcon | 5 | 4 | 0 | 5 | 10 | 8 | 6 | 1 | 1 | 8 | 5 | 5 |
| Peregrine Falcon | 3 | 4 | 0 | 1 | 4 | 5 | 8 | 3 | 9 | 14 | 14 | 6 |
| Unknown small falcon ¹ | – | – | – | – | – | – | – | 0 | 1 | 0 | 1 | 1 |
| Unknown large falcon ¹ | – | – | – | – | – | – | – | 0 | 0 | 0 | 0 | 0 |
| Unknown falcon | 8 | 3 | 2 | 3 | 4 | 0 | 0 | 7 | 2 | 2 | 0 | 3 |
| TOTAL FALCONS | 81 | 78 | 66 | 148 | 118 | 126 | 100 | 67 | 72 | 127 | 139 | 102 |
| Unidentified raptor | 38 | 25 | 43 | 90 | 30 | 32 | 0 | 20 | 15 | 7 | 3 | 28 |
| GRAND TOTAL | 2256 | 2364 | 2743 | 2730 | 2432 | 4133 | 3382 | 2499 | 1922 | 3817 | 3821 | 2918 |

¹ Designations used for the first time in 2001.

Appendix F. Daily capture totals of migrating raptors at Bonney Butte, OR: 2004.

| Date | Hours | Species ¹ | | | | | | | | | | | Total | Captures/hr | |
|--------|--------|----------------------|-----|----|----|----|----|----|----|----|----|----|-------|-------------|-----|
| | | NH | SS | CH | NG | BW | RT | RL | GE | AK | ML | PR | | | PG |
| 27-Aug | 4.75 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.8 |
| 28-Aug | 7.75 | 0 | 1 | 6 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1.2 |
| 29-Aug | 8.00 | 0 | 1 | 0 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0.8 |
| 30-Aug | 7.75 | 0 | 1 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 1.0 |
| 31-Aug | 7.75 | 0 | 3 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 1.3 |
| 01-Sep | 0.00 | | | | | | | | | | | | | | |
| 02-Sep | 0.00 | | | | | | | | | | | | | | |
| 03-Sep | 6.00 | 0 | 1 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0.5 |
| 04-Sep | 0.00 | | | | | | | | | | | | | | |
| 05-Sep | 8.25 | 0 | 3 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1.1 |
| 06-Sep | 8.25 | 0 | 6 | 5 | 3 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 18 | 2.2 |
| 07-Sep | 8.25 | 0 | 1 | 4 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 1.2 |
| 08-Sep | 7.75 | 1 | 0 | 5 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 1 | 0 | 10 | 1.3 |
| 09-Sep | 7.00 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0.1 |
| 10-Sep | 7.75 | 0 | 20 | 3 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 1 | 0 | 31 | 4.0 |
| 11-Sep | 0.00 | | | | | | | | | | | | | | |
| 12-Sep | 0.00 | | | | | | | | | | | | | | |
| 13-Sep | 0.00 | | | | | | | | | | | | | | |
| 14-Sep | 0.00 | | | | | | | | | | | | | | |
| 15-Sep | 0.00 | | | | | | | | | | | | | | |
| 16-Sep | 3.50 | 0 | 3 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 1.4 |
| 17-Sep | 0.00 | | | | | | | | | | | | | | |
| 18-Sep | 0.00 | | | | | | | | | | | | | | |
| 19-Sep | 0.00 | | | | | | | | | | | | | | |
| 20-Sep | 6.00 | 0 | 0 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.7 |
| 21-Sep | 7.75 | 0 | 7 | 7 | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 2.1 |
| 22-Sep | 7.75 | 0 | 3 | 5 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 1.5 |
| 23-Sep | 7.75 | 1 | 7 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 12 | 1.5 |
| 24-Sep | 7.50 | 0 | 7 | 8 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 2.8 |
| 25-Sep | 8.00 | 0 | 6 | 6 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 1.6 |
| 26-Sep | 7.25 | 0 | 2 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.6 |
| 27-Sep | 7.75 | 0 | 3 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0.9 |
| 28-Sep | 7.75 | 0 | 10 | 4 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | 2.1 |
| 29-Sep | 7.00 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0.6 |
| 30-Sep | 8.00 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 5 | 0.6 |
| 01-Oct | 7.75 | 0 | 5 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0.8 |
| 02-Oct | 7.75 | 0 | 15 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 17 | 2.2 |
| 03-Oct | 7.75 | 0 | 16 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 19 | 2.5 |
| 04-Oct | 7.00 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 1.9 |
| 05-Oct | 8.00 | 0 | 14 | 1 | 2 | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 0 | 21 | 2.6 |
| 06-Oct | 0.00 | | | | | | | | | | | | | | |
| 07-Oct | 6.50 | 0 | 32 | 2 | 1 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 6.0 |
| 08-Oct | 0.00 | | | | | | | | | | | | | | |
| 09-Oct | 0.00 | | | | | | | | | | | | | | |
| 10-Oct | 6.25 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1.0 |
| 11-Oct | 7.75 | 0 | 18 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 19 | 2.5 |
| 12-Oct | 7.75 | 0 | 4 | 1 | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 1.0 |
| 13-Oct | 6.75 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0.4 |
| 14-Oct | 7.25 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 0 | 4 | 0.6 |
| 15-Oct | 7.25 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0.3 |
| Total | 263.00 | 2 | 219 | 90 | 14 | 0 | 61 | 0 | 1 | 0 | 4 | 4 | 0 | 395 | 1.5 |

¹ See Appendix B for full names associated with species codes.

Appendix G. Annual trapping effort and capture totals by species for migrating raptors at Bonney Butte, OR: 1995–2004.

| | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | MEAN | TOTAL |
|---------------------------------|-----------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-------|
| First trapping day | 7-Oct | 18-Sep | 31-Aug | 6-Sep | 5-Sep | 28-Aug | 25-Aug | 27-Aug | 26-Aug | 27-Aug | | |
| Last trapping day | 28-Oct | 10-Oct | 1-Nov | 30-Oct | 24-Oct | 24-Oct | 28-Oct | 27-Oct | 27-Oct | 15-Oct | | |
| Number of stations | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | |
| Trapping days | 10 | 21 | 39 | 34 | 22 | 39 | 50 | 55 | 47 | 36 | 37 | |
| Trapping hours | 44.50 | 127.20 | 202.80 | 199.95 | 142.75 | 239.75 | 320.50 | 357.75 | 345.35 | 263.00 | 224.36 | |
| Captures / hour | 4.9 | 10.0 | 11.0 | 12.8 | 10.0 | 13.0 | 10.3 | 10.4 | 12.4 | 14.9 | 11.0 | |
| SPECIES | RAPTOR CAPTURES | | | | | | | | | | | |
| Northern Harrier | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 6 | 4 | 2 | 2 | 17 |
| Sharp-shinned Hawk | 18 | 80 | 139 | 163 | 82 | 161 | 171 | 172 | 268 | 218 | 147 | 1472 |
| Cooper's Hawk | 0 | 20 | 29 | 43 | 14 | 67 | 74 | 71 | 64 | 90 | 47 | 472 |
| Northern Goshawk | 1 | 7 | 7 | 3 | 3 | 8 | 11 | 7 | 12 | 13 | 7 | 72 |
| Broad-winged Hawk | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Red-tailed Hawk | 2 | 14 | 39 | 29 | 36 | 66 | 66 | 108 | 73 | 61 | 49 | 494 |
| Rough-legged Hawk | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | <1 | 3 |
| Golden Eagle | 0 | 3 | 2 | 1 | 2 | 3 | 2 | 0 | 2 | 1 | 2 | 16 |
| American Kestrel | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| Merlin | 1 | 2 | 5 | 11 | 3 | 1 | 4 | 5 | 4 | 4 | 4 | 40 |
| Prairie Falcon | 0 | 0 | 1 | 4 | 0 | 1 | 0 | 1 | 3 | 4 | 1 | 14 |
| Peregrine Falcon | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 3 |
| All species | 22 | 127 | 223 | 256 | 143 | 311 | 330 | 371 | 430 | 393 | 261 | 2606 |
| Recaptures ¹ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 2 |
| Foreign Recaptures ² | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 2 | 2 | 1 | 7 |
| Foreign Encounters ³ | 1 | 0 | 1 | 2 | 6 | 3 | 2 | 5 | 8 | 2 | 3 | 30 |

¹ Recaptures at Bonney Butte of birds originally banded at Bonney Butte.

² Recaptures at Bonney Butte of birds originally banded elsewhere.

³ Birds originally banded at Bonney Butte and subsequently encountered elsewhere.