

**FALL 2005 RAPTOR MIGRATION STUDIES AT
BONNEY BUTTE, OREGON**



*Hawk*WATCH
INTERNATIONAL

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INTRODUCTION

The Bonney Butte Raptor Migration Project in the northern Cascade Mountains of Oregon is an ongoing effort to monitor long-term trends in populations of raptors using the Cascade Mountains 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 at Bonney Butte 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 2005 season marked the 12th consecutive count and the 11th consecutive season of trapping and banding conducted at the site by HWI. This report summarizes the 2005 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 first season of migration counting experience for the three individuals that served as official counters in 2005 (see Appendix A for a complete observer history). On-site education specialist James Cederstrom, who also served as an official counter at the beginning of the season and continued assisting the other counters throughout the season, received preseason training in both education and observation skills. All also benefited from visits by former site observers David Haines and Amy Scarpinato. Other visitors also periodically 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 2005 annual statistics against means and 95% confidence intervals for previous seasons, we equate significance with a 2005 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 longer.

RESULTS AND DISCUSSION

WEATHER SUMMARY

Inclement weather entirely precluded observations on 17 days between the targeted operation dates of 27 August and 31 October, including forcing final shut down four days earlier than hoped (see Appendix C for daily weather records). This total is higher than the 1997–2004 (the period for which detailed summary data have been compiled) average of 13.0 days, but ranks as only the fourth highest since 1997 (highest: 20 days in 2004). Moreover, the number of days where observations occurred but inclement weather reduced observation time to less than 4 hours (1) was substantially lower than average (6.1 days). The overall number of days where inclement weather entirely or severely precluded observations (17) was slightly below average (19.1).

Fog and low clouds that hovered on the ridge and severely obscured visibility were prevalent in 2005, but several heavy rain and snow events also hampered operations. The first spate of difficult weather occurred during the first week of operations, with heavy fog and rain precluding observations on 29 August. A second spate of heavy fog and rain reduced observations to ~6 hours from 9–11 September. Between 12 and 29 September, during the primary peak activity period for most species, the weather improved markedly, with fog and rain hampering only one day of observation during this period. Difficult weather then returned, bringing the first snow of the season and limiting observations to a meager 7.0 hours between 30 September and 5 October. The snow came to stay on 27 October and shut down operations four days earlier than hoped.

Weather data collected on site during active observation periods reflected a slight increase in the prevalence of unsettled weather, with 41% of the active days featuring predominantly fair skies

compared to the 1997–2004 average of 50%, 31% transitional skies (i.e., changed from fair or partly cloudy to mostly cloudy or overcast during the day, or vice versa; average 24%), and 29% mostly cloudy to overcast skies (average 27%). However, the proportions of active days that featured noteworthy levels of visibility reducing fog/haze (12%) and rain/snow (2%) were markedly below the 1997–2004 averages (71% and 11%, respectively). In other words, when stormy or reduced-visibility conditions occurred in 2005, more often than usual it kept the crew away for entire days, but periods in between bouts of difficult weather were atypically unencumbered by haze and lingering pockets of fog and rain.

The daily-average temperature (averages of hourly values for each day) during periods of active observation averaged of 15.3°C, ranging from 5.2–27.5°C. The minimum and average are the second highest and highest values, respectively, recorded by the project since 1997, and the maximum ranks third highest. In terms of wind speeds, 2005 showed a high proportion of days where light winds (<12 kph) prevailed (93% vs. average of 85%), with another 7% featuring predominantly moderate winds (12–29 kph; average 14%), and no days featuring predominantly stronger winds (average 1%). In terms of wind directions, 2005 was quite different from 2004 and featured a record-high prevalence of relatively consistent SW–W winds (63% of the active days vs. average of 26%) and record-low proportions of days where more variable N–E (2% vs. average of 18%) and SW–NW (2% vs. average of 22%) winds prevailed. Thermal lift was rated good to excellent on a record-high proportion of the active observations days (69% vs. average of 40%).

In summary, similar to 2003 and 2004, three extended periods of heavy fog, rain and snow resulted in a high number of completely precluded-observation days during the 2005 season, but otherwise conditions during active observation periods were only slightly cloudier than usual, featured low amounts of additional fog/haze or rain/snow, were warmer than average, and light winds and especially relatively consistent SW–W winds prevailed more often than usual.

COUNT SUMMARY

The observers worked on 49 of 66 possible days between 27 August and 31 October 2005, with the season ending on 27 October, 4 days earlier than hoped due to heavy snowfall. The number of observation days was 2% below the 1994–2004 average of $50 \pm 95\%$ CI of 3.9 days; however, the number of observation hours (392.92) was 11% above the long-term average of $354.6 \pm 95\%$ CI of 35.87 hours. The 2005 average of 2.4 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) was a non-significant 3% above the long-term average of $2.3 \pm 95\%$ CI of 0.31 observers per hour.

The observers counted 2,749 migrant raptors of 16 species, with the count a non-significant 6% below the 1994–2004 average (Table 1, and see Appendix D for daily count records). Counts dropped to record lows for Rough-legged Hawks, American Kestrels, and incompletely identified buteos, whereas the count of incompletely identified falcons rose to a record high (see Appendix E for annual count summaries).

The 2005 flight was composed of 52% accipiters, 21% buteos, 14% vultures, 5% eagles, 5% falcons, 2% Ospreys, 1% harriers and <1% unidentified raptors. The season featured significantly higher than average proportions of falcons and vultures, but significantly lower than average proportions of buteos, eagles, and unidentified raptors (Figure 2). As usual, Sharp-shinned and Red-tailed Hawks were the two most abundant species, followed by Turkey Vultures, Cooper’s Hawks, Merlins, Golden Eagles, Ospreys, and Bald Eagles (Table 1, Appendix E).

Adjusted passage rates were significantly above average in 2005 only for Turkey Vultures and Peregrine Falcons, whereas six commonly encountered species showed significantly below average passage rates (Ospreys, Cooper’s Hawks, Red-tailed Hawk, Rough-legged Hawks, Golden Eagles, and American Kestrels; Table 1; Figures 3–8). Regression analyses of adjusted passage rates through 2005, revealed a

marginally significant ($P \leq 0.10$) linear increase for Turkey Vultures (Figure 3); a significant ($P \leq 0.05$) linear increase for Bald Eagles (Figure 7); a highly significant ($P \leq 0.01$) quadratic trend (accelerating increase) for Peregrine Falcons (Figure 8); significant or highly 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). For most such species, and others, passage rates dropped back down again in 2005, often to below average levels. Northern Harriers, adult Golden Eagles, and Peregrine Falcons are notable exceptions in this regard, with each showing increases each year since 2001.

In last year's report, we speculated that the high counts of many species at Bonney Butte in 2003 and 2004 may have been indicative of a route shift among migrants that typically travel along the Intermountain Flyway (*sensu* Hoffman and Smith 2003). After three years of severe drought, counts in the Goshute Mountains of Nevada in the heart of the Great Basin plummeted in 2002 from ~20,000 to ~12,000 migrants per season (Smith and Neal 2006a), coincident with near-record high counts commencing at Bonney Butte in 2003 and 2004, at the same time that counts in the northern Cascades of Washington remained at low levels (Smith and Neal 2006b). We suspected that a logical diversion path for migrants moving south through eastern Washington and northern Idaho to avoid the parched Great Basin would be to veer west through the Blue and Wallowa Mountains and over to the Cascades with Mt. Hood as a navigation target. This would result in those migrants intersecting the Cascades just north of Bonney Butte, and might explain the high counts at Bonney Butte despite low counts farther north in the Washington Cascades. Counts at Idaho Bird Observatory's site near Boise have also remained high in the last few years (G. Kaltenecker personal communication) while the counts dropped in the Goshutes several hundred kilometers farther south, again suggesting the possibility that some migrants have been diverting west out of Idaho before passing down through the heart of the Great Basin. Winter/spring moisture levels in the northern Great Basin increased significantly in 2004 and especially 2005, whereas drought conditions intensified in 2005 in the northern Cascades. It is therefore possible that the 2005-drop in the Bonney Butte count signaled a shift in activity back towards the Great Basin. However, although the count at Boise Ridge was well-above average again in 2005, no corresponding increase occurred at the Goshutes, so it appears we will need to await additional years of data to clarify our understanding of regional dynamics.

The marked and continuing long-term decline of American Kestrel passage rates at Bonney Butte is particularly conspicuous. Hoffman and Smith (2003) reported mixed trends for this species through 2001 across seven long-term HWI monitoring sites in the West. Across HWI's western network, kestrels have shown declining patterns at Bonney Butte since 1994, at Chelan Ridge in north-central Washington since 1998, in the Bridger Mountains of southwest Montana since 1998, in the Wellsville Mountains of northern Utah since 1994, in the Goshute Mountains of northeastern Nevada since 1997, and in the Grand Canyon of northern Arizona since 1991 (see www.hawkwatch.org for relevant technical reports). In contrast, kestrel passage rates have remained relatively stable in the southern Rocky Mountains of northern and central New Mexico since 1985, and counts at HWI's newest migration site in southwest Wyoming increased steadily from 2002–2004 then dropped back to a moderate level in 2005. These data suggest that, outside of the central and southern Rocky Mountains, many western kestrel populations may be in decline, especially since widespread drought began plaguing much of the interior West in the late 1990s.

Among eight species for which reasonable age-specific comparisons were possible, Sharp-shinned Hawks and Northern Harriers showed significantly above-average immature: adult ratios in 2005, whereas all six other species showed at least slightly below-average age ratios (Table 2). Both of the former two species showed slightly above average counts of identified immature birds, but in both cases the very

high 2005 age ratios appear to reflect primarily low counts of identified adults. Note that for both species the proportions of unaged birds were significantly above average, so comparisons of actual counts may be misleading. Nevertheless, given the below-average overall count for Sharp-shinned Hawks and high proportion of unaged birds, the slightly above average count of immature birds suggests that productivity among northwestern source populations was probably at least average in 2005, while the very low count of adult birds suggests that either adult mortality was high during 2005 for some unknown reason or many adults substantially altered their migration behavior in 2005 such that they did not pass by Bonney Butte in typical numbers. In contrast, age ratios were significantly below average for Northern Goshawks, Red-tailed Hawks, and Golden Eagles. In all cases, this was due to a both absolute and relative (to numbers of adults) reductions in the numbers of identified immature/subadult birds (Table 2), which suggests reduced regional productivity for these species.

The 2005 combined-species median passage date of 26 September was significantly earlier than the long-term average for the site of 30 September (Table 3). The seasonal distribution of activity also was unusual (Figure 9). Relative flight volume was significantly below average in early September corresponding to the brief spate of inclement weather that allowed for only 6 hours of observation from 9–11 September, and during the first week of October corresponding to the first prolonged rain/snow event that shut down observation for four days (Appendix C). In contrast, relative flight volume was significantly above average during the second half of September, when the weather was generally more cooperative. At the species level, Ospreys, American Kestrels, and especially Northern Goshawks showed significantly later than average median passage dates in 2005, whereas Turkey Vultures, Northern Harriers, and Golden Eagles showed significantly early timing (Table 3). There were, however, no distinct multi-species patterns of variation in seasonal timing. Age-specific median dates added complexity to the picture, but again revealed no distinct multi-species patterns (Table 4).

TRAPPING AND BANDING SUMMARY

Trapping occurred on 48 of 66 possible trapping days between 27 August and 31 October, with effort totaling 342 hours (see Appendix F for daily trapping records and Appendix G for annual trapping summaries). The number of trapping days was a non-significant 13% above the 1997–2004 (period of comparable seasonal effort) average of $43 \pm 95\%$ CI of 8.4 days, whereas the hours of effort was a significant 32% above the long-term average of 258.98 ± 53.38 hours.

The 2005 capture total of 522 birds of 8 species was the largest total yet recorded for the project (Table 2, Appendix G). The captures included one recapture of a bird previously banded at Bonney Butte; three recaptures of birds originally banded elsewhere; new record-high capture totals for Northern Harriers, Sharp-shinned Hawks, Cooper's Hawks, Merlins, and Peregrine Falcons; the fourth Rough-legged Hawk ever captured at the site; three Golden Eagles, which ties the record high for that species; and the first ever Bald Eagle captured at the site (Appendix G). The 2005 effort raises the total number of birds captured since project inception to 3,127. As usual, the three most frequently captured species were the Sharp-shinned Hawk (59% of captures), Cooper's Hawk (19%), and Red-tailed Hawk (13%).

Capture totals, rates, and successes were all above average for all species except Red-tailed Hawks, Broad-winged Hawks, and American Kestrels (the latter two rarely captured at his site), with all values significantly above average for Northern Harriers, Sharp-shinned Hawks, Cooper's Hawks, Bald Eagles, Merlins, and Peregrine Falcons (Table 2). Moreover, both the capture total and capture success for Red-tailed Hawks were above average, but the capture rate for this species was negligibly below average.

At this site, compared to the counts, banding data yield unique and useful sex–age specific data only for the three accipiters. In 2005, the immature : adult count ratio for Sharp-shinned Hawks of 1.2 was 85% higher than the 1994–2004 average of $0.7 \pm 95\%$ CI of 0.16 (Table 2), whereas the 2005 age ratio based on captures of 1.7 was slightly below the 1995–2004 average of 1.8 ± 0.60 (Table 6). As usual, the fact

that the capture age ratio was substantially higher than the count age ratio suggests that immature birds were more susceptible to capture than adults; however, in this case a near average 2005 capture age ratio but a much higher than usual 2005 count age ratio suggests that this was less true than usual in 2005. The capture data further indicated a significantly below-average female : male ratio, suggesting that either females were proportionately less abundant than usual or were less susceptible to capture than usual (Table 6).

For Cooper's Hawks, the 2005 count age ratio of 1.5 was only slightly below the 1994–2004 average of $1.6 \pm 95\%$ CI of 0.85 (Table 2), whereas the 2005 capture age ratio of 3.6 was 57% higher than the 1995–2004 average of 2.3 ± 0.59 (Table 6). So again, a higher capture compared to count age ratio suggests that immature birds were more susceptible to capture than adults in 2005, but unlike for Sharp-shinned Hawks an average count age ratio but high capture age ratio suggest that immature Cooper's Hawks were more susceptible than usual to capture in 2005. Counts and passage rates of both species were below average in 2005, but significantly so only for Cooper's Hawks. Therefore, the proportionately greater reduction in Cooper's Hawk abundance, at least slightly below average count age ratio, and indication of greater than usual susceptibility of young birds to capture may all be indicators of greater population stress in 2005 for northwestern populations of this species compared to Sharp-shinned Hawks. Further, like for Sharp-shinned Hawks, a reduced female : male capture ratio in 2005 for Cooper's Hawks suggests that either females were proportionately less abundant than usual or were less susceptible to capture than usual (Table 6).

For Northern Goshawks, the 2005 count age ratio of 0.5 was 80% below the 1994–2004 average of $2.5 \pm 95\%$ CI of 0.86 (Table 2) and the 2005 capture age ratio of 2.0 was 40% below the 1995–2004 average of 3.3 ± 1.52 (Table 6). Thus, like for both the smaller accipiters, these data indicate the usual situation of immature birds being more susceptible to capture than adults, but otherwise suggest that immature birds were both less common than usual and more susceptible to capture than usual in 2005. Thus, similar to Cooper's Hawks, the data suggest that the 5–10% reduction in overall abundance of goshawks in 2005 correlated with indicators of reduced regional productivity (low immature : adult ratio) and greater susceptibility of young birds to capture (greater food stress).

Another way to assess the relative condition of the three species is examining measures of body condition collected during banding; i.e., crop fullness, keel muscle, and wing-pit fat ratings (Table 7). For Sharp-shinned and Cooper's Hawks, all three measures indicated at least a slight shift toward poorer than usual condition, most notably for keel muscle and wing-pit fat indices. For keel muscle mass, both species showed noticeably higher than average proportions of birds with moderate keel muscles and lower proportions of birds with robust keels. Similar, both species showed noticeably higher than average proportions of birds with no or limited wing-pit fat and lower proportions of birds with moderate to heavy wing-pit fat. The keel muscle and wing-pit fat data for goshawks showed similar trends but an even more pronounced shift toward birds of poor condition; however, the goshawk crop data showed a shift toward more birds with half-full and full crops. Thus, except for proportionately more goshawks having recently eaten before being captured by our crew, in general these data suggest that all three accipiter species averaged poorer body condition in 2005 than usual.

ENCOUNTERS WITH BANDED BIRDS

To date, 39 birds banded at Bonney Butte have subsequently been encountered elsewhere, with nine new “foreign encounters” having occurred in 2005 involving 4 Red-tailed Hawks, 1 Sharp-shinned Hawk, 3 Cooper's Hawks, and 1 Northern Goshawk (Table 8). In addition, 10 birds banded elsewhere have been recaptured at Bonney Butte; three new “foreign recaptures” occurred during the 2005 season (2 after-hatch-year Cooper's Hawks and 1 after-hatch-year Sharp-shinned Hawk) but we have yet to receive reports to confirm where these birds were originally banded. All of the foreign encounter locations and

known original banding locations of the foreign recaptures recorded to date have been 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 both Bonney Butte and Golden Gate Raptor Observatory's (GGRO) project in the Marin Headlands of California; 2 Sharp-shinned Hawks and 1 Red-tailed Hawk encountered at both Bonney Butte and HWI's Chelan Ridge project in north-central Washington; and 1 Sharp-shinned Hawk originally banded by the Falcon Research Group at Diamond Head in central Washington and later recaptured at Bonney Butte. We suspect that the three new 2005 foreign recaptures will eventually add to this list.

Among the nine new foreign encounters recorded in 2005, 2 Red-tailed Hawks, 2 Cooper's Hawks, and the Sharp-shinned Hawk were reported simply as "found dead" with no specific cause of mortality known (Table 8). The other Cooper's Hawk was a GGRO recapture in California. The two remaining Red-tailed Hawks were both injured and brought into a rehabilitation facility for care, one having been hit by a car and the other injured in some unknown manor. The Northern Goshawk was less fortunate, having been killed after colliding with a car.

This year marked the second season in a row that recaptures of birds originally banded at Bonney Butte occurred, in this case involving a Sharp-shinned Hawk originally banded as an after-hatch year bird in 2002 six days earlier than it was recaptured this year (22 October). This brings the recapture total for the site to three birds, involving 2 Sharp-shinned Hawks and 1 Northern Goshawk.

SATELLITE TRACKING

The 2005 crew succeeded in outfitting with satellite transmitters the second Golden Eagle equipped at the site and two new Northern Goshawks (increasing to 8 birds the total goshawks tracked from the site). The eagle, a hatch-year male outfitted on 23 October, immediately proceeded to travel south along the eastern Cascades to near Klamath Falls, Oregon, then veered southeast across Nevada and the heart of the Great Basin. He stopped off in the Dixie National Forest of south-central Utah from 8-24 November, but then continued southeast and by late November had reached northern New Mexico. Since then this eagle has been wandering around in the vicinity of Santa Fe National Forest, most recently located in mid-February in the Cañada Larga area just west of Lindrith, between Los Alamos to the southeast and Farmington to the northwest.

One of the goshawks, a hatch-year female outfitted on 6 October, initially wandered back forth east and west of the project site over about a 10 km stretch of terrain, but by late November settled in an area southeast of Grasshopper Point, ~6 km southeast of the project site, and has remained in this area since then. The second goshawk, a second-year female outfitted on 10 October, initially moved ~20 km west of the project site, but then veered northeast up onto the northeastern flank of Mt Hood. It remained active in this area for about 10 days but unfortunately, sensor data then indicated that the transmitter was no longer on a live bird. If the bird were in fact dead (as opposed to having shed its transmitter), its' quick demise would suggest that it was killed by a predator or suffered a fatal accident. Heavy snow cover and a remote wilderness location have thus far precluded a recovery attempt, but hopefully the signals will last until the spring thaw occurs and we can then get into the area and confirm the bird's fate. Regardless, because we have continued to experience high mortality rates among the goshawks we have tracked to date, even among the older birds we have sought to track in the past two years for comparative purposes, we will no longer seek to track any more goshawks with satellite transmitters. We are of the mind that the severe drought that has plagued much of the interior West since we began our satellite tracking studies in 1999 has been a major contributor to the high mortality rates we have documented among especially the young goshawks we have tracked. Nevertheless, among the three species we have been tracking, the goshawk mortality rate has been much higher, suggesting that the extra burden of

carrying a transmitter may simply be too much for this species to handle when population stress is already high due to other factors such as drought.

The only other bird outfitted at Bonney Butte that was still alive and transmitting at the time last year's annual report was prepared was a young male eagle outfitted during fall 2004. After being released in late September, this eagle moved ~75 km northeast of the project site to just east of the northern section of the John Day River valley. It remained in this area through the winter and into May, but then the signals from this transmitter abruptly ceased in late May for unknown reasons. Sensor data indicated that the bird was alive and active at this time, so either the transmitter sustained critical damage at that point, perhaps due to the eagle damaging the antenna or a predation event that resulted in fatal damage to both the bird and the transmitter, or the transmitter battery failed much sooner than expected.

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

STABLE ISOTOPE RESEARCH

In 2005, 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 in feathers of juvenile birds to identify the approximate natal origins of migrants monitored at migration sites in North America (e.g., Meehan et al. 2001, Lott et al. 2003, Lott and Smith in press).

VISITATION

In 2005, the HWI visitor logs documented 444 visits to Bonney Butte, including repeat visitors, which represents a significant decline compared to the last two years (over 600). The lower visitation was probably due to a couple of factors. Last year the Oregonian (Portland newspaper) ran an article that produced more than 200 visitors in just one weekend. In addition, a few large groups slated to visit in 2005 had to cancel due to inclement weather (most expressed interest in trying again next year). The composition of visitors was diverse. The butte saw visitors of all different ages ranging from infants brought up by their parents to folks in their eighties. Most visitors derived from the nearby Portland and Vancouver, Washington metropolitan areas or other areas of Oregon and Washington, but others came from California, Alaska, Massachusetts, and Hawaii. In addition, the farthest travelers were a family from Israel who had previously experienced the great raptor migrations in the Middle East. Organized groups that visited the site in 2005 included five high school classes from nearby communities, two groups from the Portland Audubon Society, and a group from the High Desert Museum in Bend, Oregon.

In 2005, 396 hourly assessments by the primary observers of visitor disturbance, resulted in the following ratings: 91% none, 8% low, 1% moderate, and 0% high.

ACKNOWLEDGMENTS

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individuals who assisted the crew in various ways during the season: Kim Boddie, Perry Cabot, David Haines, Carole Hallett, Tom Jordan, Peter Low, and Amy Scarpignato.

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Table 1. Fall raptor migration unadjusted counts and adjusted passage rates by species at Bonney Butte, OR: 1994–2004 versus 2005.

SPECIES	COUNT			RAPTORS / 100 HOURS		
	1994–2004 ¹	2005	% CHANGE	1994–2004 ¹	2005	% CHANGE
Turkey Vulture	294 ± 79.9	389	+32	129.8 ± 34.27	166.4	+28
Osprey	67 ± 12.8	60	-11	25.7 ± 4.99	19.4	-24
Northern Harrier	30 ± 8.4	38	+29	9.6 ± 2.55	10.9	+13
Sharp-shinned Hawk	1,125 ± 224.3	1,067	-5	414.2 ± 78.17	354.4	-14
Cooper's Hawk	348 ± 55.0	269	-23	126.3 ± 25.12	90.3	-28
Northern Goshawk	26 ± 6.7	24	-9	8.7 ± 2.38	8.1	-6
Unknown small accipiter ²	18 ± 14.7	14	-21	–	–	–
Unknown large accipiter ²	1 ± 0.8	13	+1200	–	–	–
Unknown accipiter	72 ± 32.7	46	-36	–	–	–
TOTAL ACCIPITERS	1,579 ± 271.6	1,433	-9	–	–	–
Red-shouldered Hawk	1 ± 1.2	0	-100	0.6 ± 0.50	0.0	-100
Broad-winged Hawk	9 ± 13.1	2	-78	5.5 ± 7.53	1.4	-74
Swainson's Hawk	1 ± 0.5	0	-100	0.3 ± 0.27	0.0	-100
Red-tailed Hawk	614 ± 91.6	562	-8	201.4 ± 31.88	155.2	-23
Ferruginous Hawk	0 ± 0.3	1	+120	0.1 ± 0.10	0.0	-100
Rough-legged Hawk	14 ± 4.6	3	-78	10.4 ± 3.59	2.1	-80
Unidentified buteo	33 ± 8.9	4	-88	–	–	–
TOTAL BUTEOS	672 ± 106.2	572	-15	–	–	–
Golden Eagle	97 ± 19.9	72	-26	34.6 ± 6.68	24.9	-28
Bald Eagle	47 ± 6.9	55	+18	14.8 ± 2.11	15.8	+7
Unidentified eagle	3 ± 1.7	1	-69	–	–	–
TOTAL EAGLES	147 ± 20.7	128	-13	–	–	–
American Kestrel	23 ± 3.7	9	-60	7.4 ± 1.74	2.9	-61
Merlin	66 ± 15.8	80	+22	26.3 ± 6.78	30.0	+14
Prairie Falcon	5 ± 1.9	3	-38	1.7 ± 0.62	2.2	+29
Peregrine Falcon	6 ± 2.8	14	+137	1.8 ± 0.92	6.8	+273
Unknown small falcon ²	1 ± 0.6	2	+300	–	–	–
Unknown large falcon ²	0 ± 0.0	10	–	–	–	–
Unknown falcon	3 ± 1.6	6	+113	–	–	–
TOTAL FALCONS	102 ± 18.1	124	+22	–	–	–
Unidentified Raptor	28 ± 14.8	5	-82	–	–	–
ALL SPECIES	2,918 ± 439.4	2,749	-6	–	–	–

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: 1994–2004 versus 2005.

	TOTAL AND AGE-CLASSIFIED COUNTS						IMMATURE : ADULT			
	1994–2004 AVERAGE			2005			% UNKNOWN AGE		RATIO	
	TOTAL	IMM.	ADULT	TOTAL	IMM.	ADULT	1994–2004 ¹	2005	1994–2004 ¹	2005
Northern Harrier	30	15	5	38	17	2	32 ± 5.8	50	4.4 ± 2.46	8.5
Sharp-shinned Hawk	1125	224	358	1067	241	195	49 ± 7.5	59	0.7 ± 0.16	1.2
Cooper's Hawk	348	95	75	269	82	54	52 ± 6.6	49	1.6 ± 0.85	1.5
Northern Goshawk	26	11	6	24	6	12	35 ± 9.8	25	2.5 ± 0.86	0.5
Broad-winged Hawk	9	1	1	2	0	0	27 ± 27.5	100	0.4 ± 0.39	–
Red-tailed Hawk	614	177	307	562	116	251	22 ± 4.7	35	0.6 ± 0.14	0.5
Golden Eagle	97	53	23	72	39	25	21 ± 2.9	11	2.8 ± 0.87	1.6
Bald Eagle	47	10	34	55	10	41	8 ± 2.9	7	0.3 ± 0.09	0.2
Peregrine Falcon	6	1	2	14	1	4	45 ± 4.7	64	1.0 ± 1.01	0.3

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 2005, with a comparison of 2005 and 1994–2004 average median passage dates.

SPECIES	2005				1994–2004
	FIRST OBSERVED	LAST OBSERVED	BULK PASSAGE DATES ¹	MEDIAN PASSAGE DATE ²	MEDIAN PASSAGE DATE ^{2,3}
Turkey Vulture	27-Aug	8-Oct	14-Sep – 27-Sep	21-Sep	23-Sep ± 1.4
Osprey	1-Sep	23-Oct	8-Sep – 9-Oct	22-Sep	19-Sep ± 1.7
Northern Harrier	2-Sep	22-Oct	14-Sep – 22-Oct	24-Sep	28-Sep ± 3.6
Sharp-shinned Hawk	31-Aug	27-Oct	19-Sep – 22-Oct	4-Oct	05-Oct ± 1.7
Cooper's Hawk	28-Aug	27-Oct	19-Sep – 14-Oct	26-Sep	26-Sep ± 2.0
Northern Goshawk	13-Sep	27-Oct	24-Sep – 25-Oct	14-Oct	01-Oct ± 3.4
Broad-winged Hawk	23-Sep	26-Sep	–	–	27-Sep ± 2.6
Red-tailed Hawk	28-Aug	27-Oct	11-Sep – 22-Oct	26-Sep	28-Sep ± 2.0
Ferruginous Hawk	31-Aug	31-Aug	–	–	–
Rough-legged Hawk	14-Oct	22-Oct	–	–	12-Oct ± 3.5
Golden Eagle	20-Sep	25-Oct	25-Sep – 23-Oct	9-Oct	12-Oct ± 2.3
Bald Eagle	31-Aug	25-Oct	22-Sep – 23-Oct	6-Oct	06-Oct ± 3.5
American Kestrel	1-Sep	25-Sep	1-Sep – 25-Sep	24-Sep	19-Sep ± 3.6
Merlin	6-Sep	27-Oct	19-Sep – 23-Oct	8-Oct	10-Oct ± 2.7
Prairie Falcon	7-Sep	25-Sep	–	–	20-Sep ± 5.2
Peregrine Falcon	22-Sep	23-Oct	22-Sep – 23-Oct	26-Sep	24-Sep ± 5.7
Total	2-Sep	27-Oct	17-Sep – 21-Oct	26-Sep	30-Sep ± 1.6

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: 1994–2004 versus 2005.

SPECIES	ADULT		IMMATURE	
	1994–2004 ¹	2005	1994–2004 ¹	2005
Northern Harrier	05-Oct ± 7.8	0-Jan	27-Sep ± 2.6	24-Sep
Sharp-shinned Hawk	10-Oct ± 2.4	14-Oct	23-Sep ± 1.8	23-Sep
Cooper's Hawk	02-Oct ± 2.1	8-Oct	20-Sep ± 2.6	23-Sep
Northern Goshawk	15-Oct ± 8.1	14-Oct	27-Sep ± 5.1	23-Oct
Red-tailed Hawk	03-Oct ± 2.8	28-Sep	21-Sep ± 2.1	23-Sep
Golden Eagle	13-Oct ± 1.6	9-Oct	10-Oct ± 3.0	8-Oct
Bald Eagle	06-Oct ± 4.2	5-Oct	11-Oct ± 4.4	6-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 versus 2005.

	CAPTURE TOTALS		CAPTURE RATES ¹		CAPTURE SUCCESSES ²	
	1995–2004 ³	2005	1995–2004 ³	2005	1995–2004 ³	2005
Northern Harrier	2 ± 1.2	7	0.6 ± 0.35	2.0	5.8 ± 5.04	18.4
Sharp-shinned Hawk	147 ± 44.7	309	64.0 ± 8.87	90.3	13.0 ± 5.01	27.7
Cooper's Hawk	47 ± 18.7	101	18.5 ± 5.89	29.5	12.8 ± 6.58	34.5
Northern Goshawk	7 ± 2.5	12	3.2 ± 0.80	3.5	35.8 ± 24.59	46.2
Broad-winged Hawk	0.1 ± 0.2	0	0.04 ± 0.08	0.0	1.7 ± 3.27	0.0
Red-tailed Hawk	49 ± 19.5	67	19.7 ± 4.85	19.6	8.0 ± 4.40	11.8
Rough-legged Hawk	0.3 ± 0.3	1	0.2 ± 0.16	0.3	2.6 ± 3.14	33.3
Golden Eagle	2 ± 0.7	3	0.8 ± 0.45	0.9	1.7 ± 0.91	4.1
Bald Eagle	0 ± 0.0	1	0.0 ± 0.00	0.3	0.0 ± 0.00	1.8
American Kestrel	0.2 ± 0.3	0	0.1 ± 0.14	0.0	0.8 ± 1.04	0.0
Merlin	4 ± 1.8	13	2.0 ± 0.85	3.8	6.4 ± 3.01	14.9
Prairie Falcon	1 ± 1.0	3	0.6 ± 0.44	0.9	26.8 ± 23.35	60.0
Peregrine Falcon	0.3 ± 0.4	4	0.1 ± 0.17	1.2	4.5 ± 6.34	17.4
All species	261 ± 81.6	521	109.8 ± 16.57	152.2	10.6 ± 4.48	19.0

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: 1995–2004 versus 2005.

SPECIES	FEMALE		MALE		FEMALE : MALE	IMMATURE : ADULT
	HY	AHY	HY	AHY	RATIO	RATIO
Sharp-shinned Hawk						
1995–2004	47	34	46	20	1.3 ± 0.21 ¹	1.8 ± 0.60 ¹
2005	93	64	102	51	1.0	1.7
Cooper's Hawk						
1995–2004	20	12	13	3	2.2 ± 0.36	2.3 ± 0.59
2005	46	15	33	7	1.5	3.6
Northern Goshawk						
1995–2004	3	1	3	1	1.3 ± 1.07	3.3 ± 1.52
2005	7	2	1	2	3.0	2.0

¹ Mean ± 95% Confidence Interval (CI).

Table 7. Fall body condition indices for migrant accipiters captured at Bonney Butte, OR: 1995–2004 versus 2005.

Species	Years	Crop Fullness					Keel Muscle ¹			Wing-pit Fat			
		E	1/4	1/2	3/4	F	0	1	2	0	1	2	3
Sharp-shinned Hawk	1995-2004 mean	50	24	12	6	8	1	66	33	10	56	25	10
Hawk	2005	51	28	13	0	8	3	94	3	16	74	9	1
Cooper's Hawk	1995-2004 mean	54	17	13	7	8	9	72	18	18	59	17	7
Hawk	2005	55	19	17	0	9	8	92	0	22	68	10	0
Northern Goshawk	1995-2004 mean	62	21	2	6	10	14	80	6	13	70	18	0
Hawk	2005	33	8	25	0	33	25	75	0	42	58	0	0

¹ Subjective rating based on visual and tactile assessment of keel muscle mass, with 0 indicating a skinny bird, 1 indicating a moderately healthy bird, and 2 indicating a bird with a robust keel muscle.

² Subjective rating based on visual assessment of fat deposit in the "wing-pit" hollow directly under the wing, with 0 indicating no fat, 1 indicating a modest fat deposit, 2 indicating a deposit that mostly fills the wing-pit, and 3 indicating a bulging deposit.

Table 8. Foreign encounters in 2005 of raptors banded during migration at Bonney Butte, Oregon.

BAND #	SPECIES-SEX ¹	BANDING DATE	BANDING AGE ²	ENCOUNTER DATE	ENCOUNTER LOCATION	DISTANCE (KM)	STATUS
1807–81479	RT-U	13-Sep-00	HY	01-Jan-05	Bonanza, CA	280	found dead
0804–22165	CH-M	24-Sep-04	HY	26-Jan-05	Loleta, CA	531	found dead
2206–55548	NG-M	07-Sep-04	HY	27-Jan-05	Welches, OR	49	collision kill
0804–22150	CH-M	31-Aug-04	HY	15-Feb-05	San Bernardino, CA	1054	found dead
1807–81141	RT-U	13-Oct-04	HY	03-Mar-05	Occidental, CA	646	injured/rehab
1177–06200	RT-U	18-Oct-03	HY	08-Mar-05	Bend, OR	118	found dead
1523–71453	SS-F	27-Sep-00	ASY	16-Mar-05	Paradise Valley, AZ	1513	found dead
1005–18175	CH-F	21-Sep-05	HY	30-Sep-05	Marin Headlands, CA	678	research recap
1177–06476	RT-U	31-Aug-05	HY	05-Nov-05	Sauvie Island Bridge, CA	144	car collision/rehab

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.

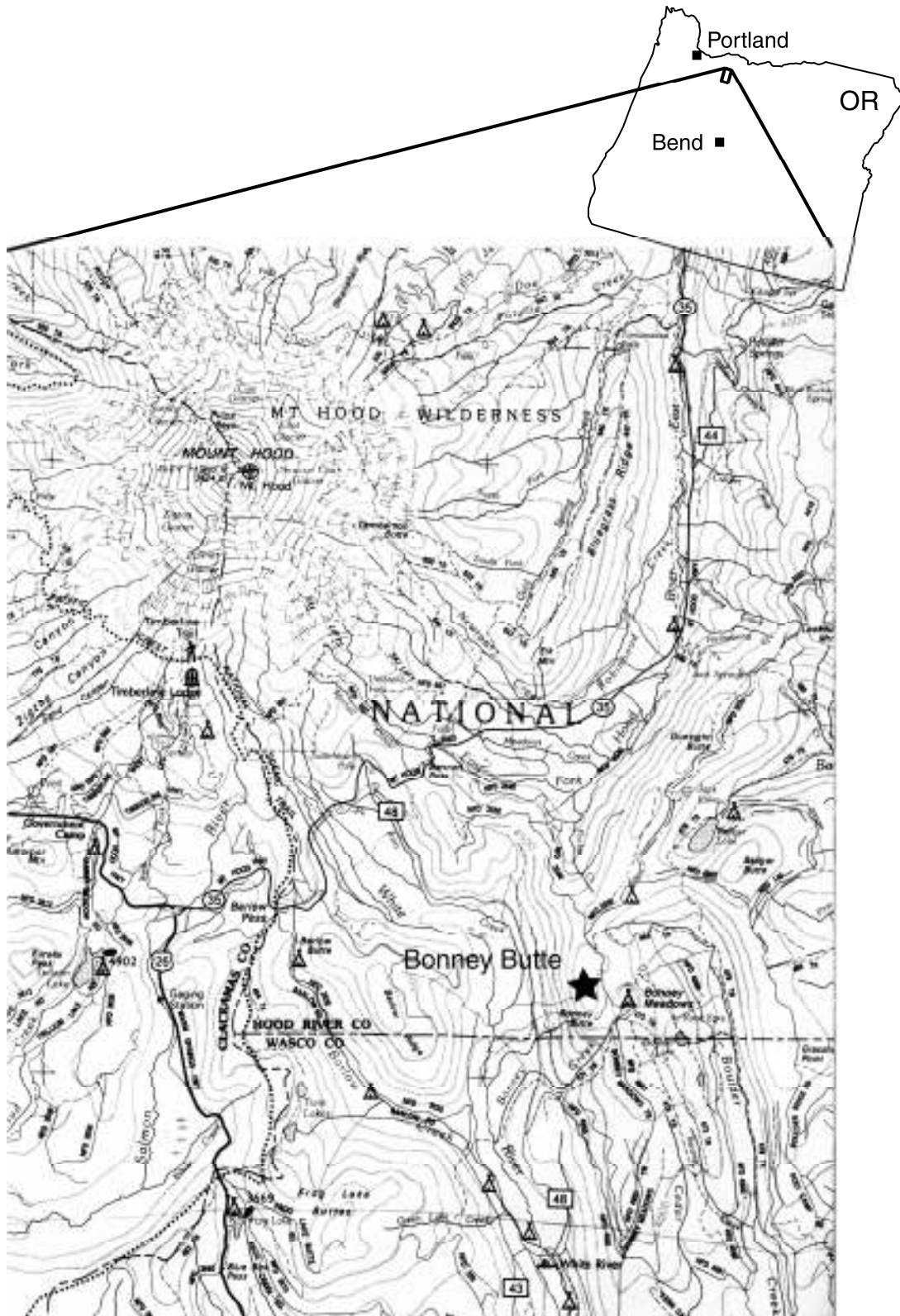


Figure 1. Location of the Bonney Butte Raptor Migration Project study site near Mt. Hood, Oregon.

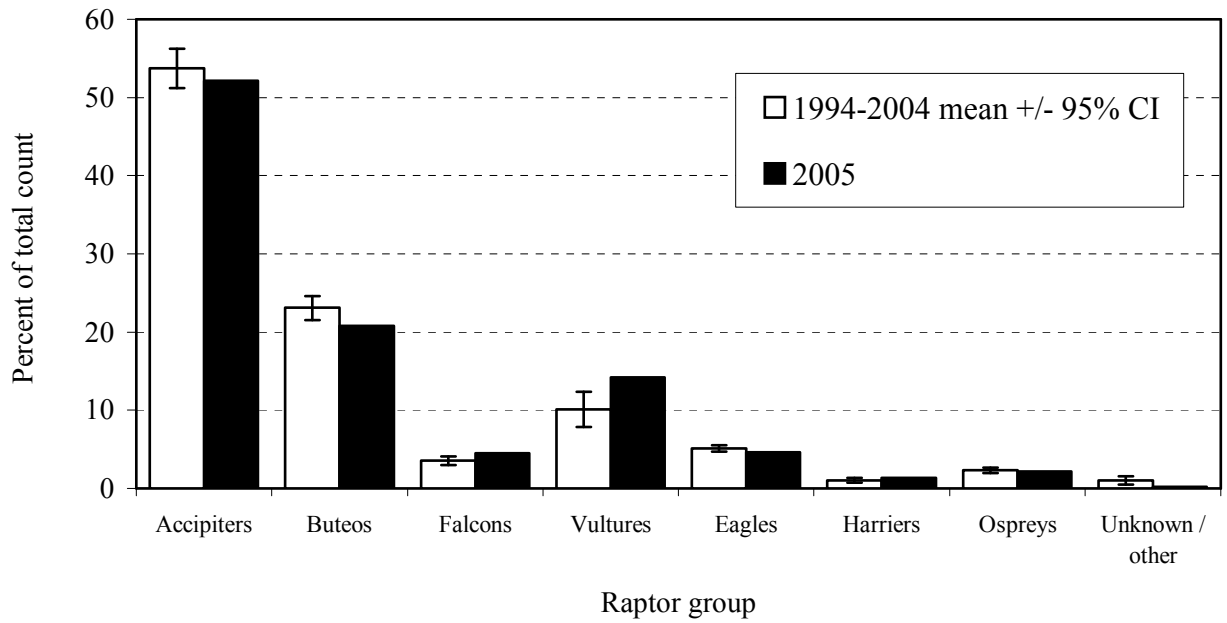


Figure 2. Fall raptor migration flight composition by major species groups at Bonney Butte, Oregon: 1994–2004 versus 2005.

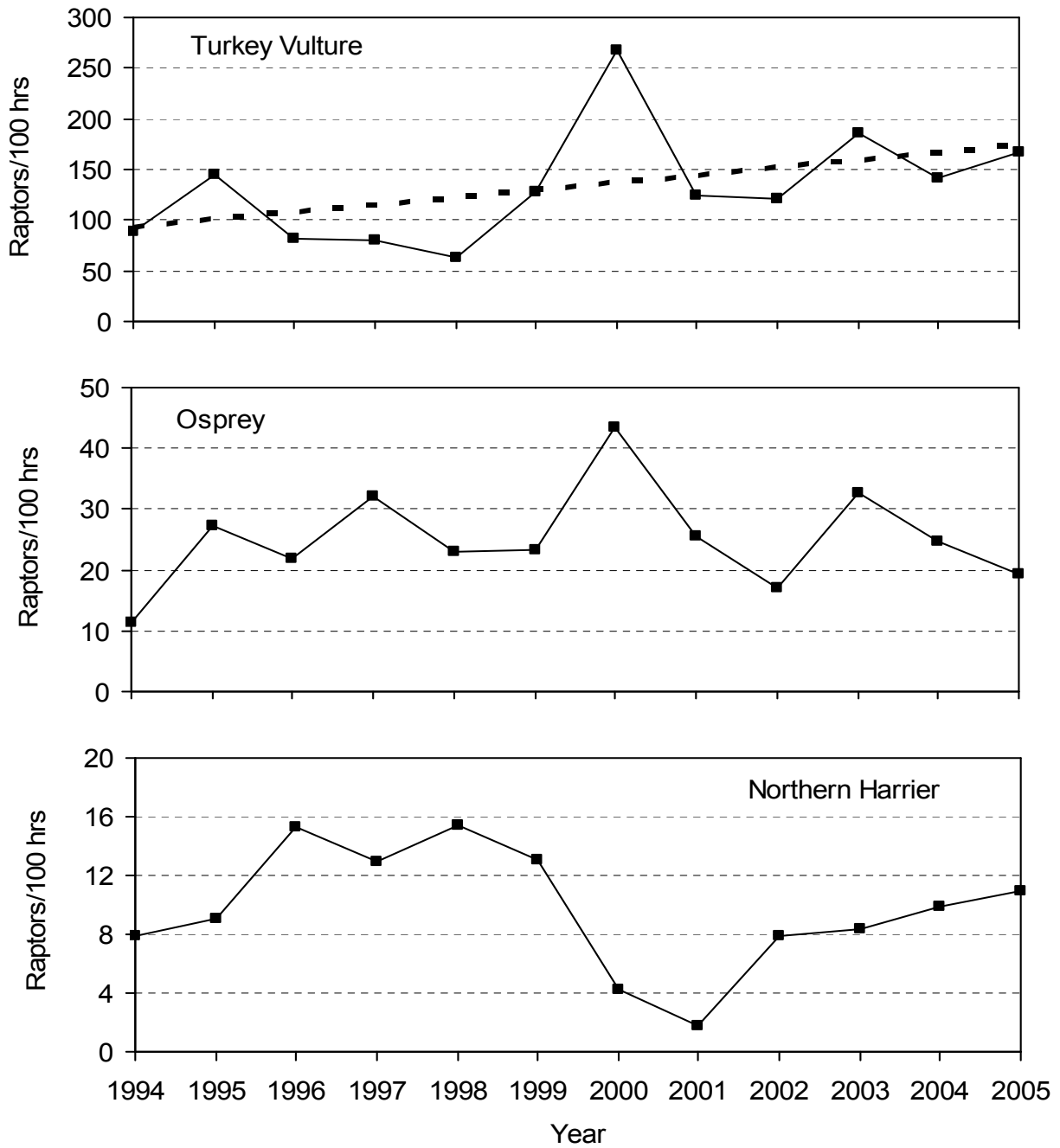


Figure 3. Adjusted, fall-migration passage rates for Turkey Vultures, Ospreys, and Northern Harriers at Bonney Butte, Oregon: 1994–2005. Dashed lines indicate significant ($P < 0.10$) regressions.

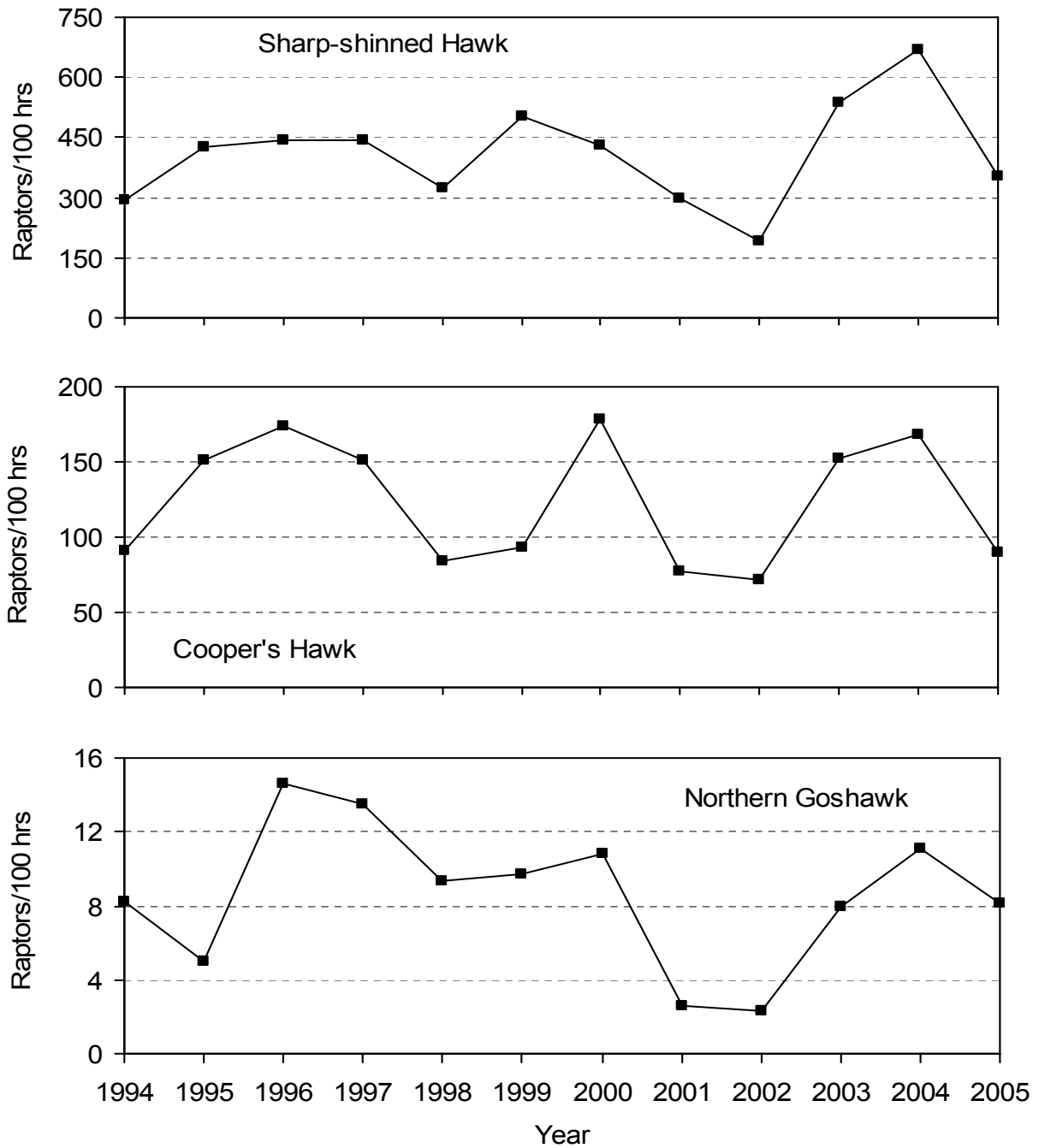


Figure 4. Adjusted, fall-migration passage rates for Sharp-shinned Hawks, Cooper’s Hawks, and Northern Goshawks at Bonney Butte, Oregon: 1994–2005. Dashed lines indicate significant ($P < 0.10$) regressions.

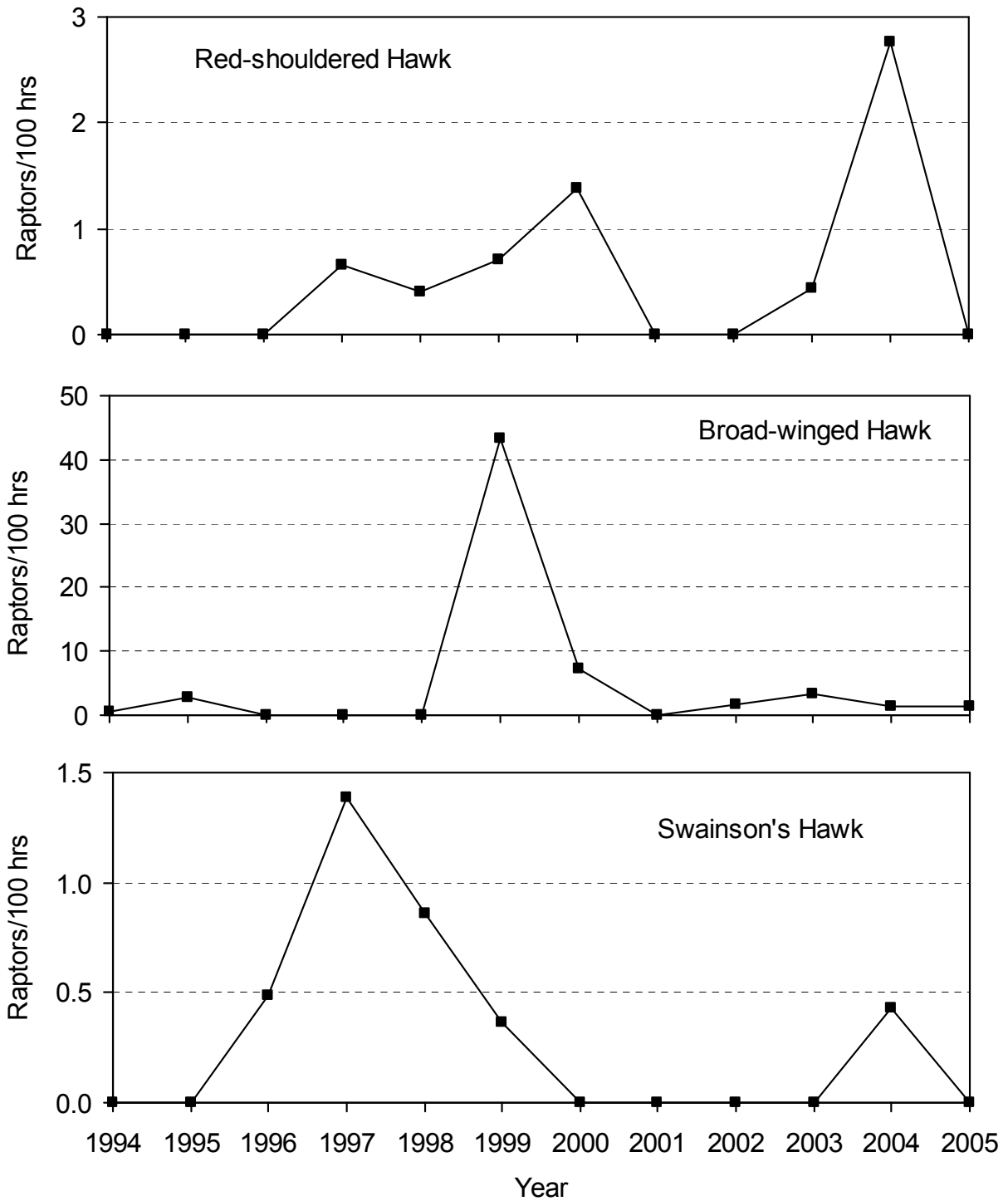


Figure 5. Adjusted, fall-migration passage rates for Red-shouldered, Broad-winged, and Swainson's Hawks at Bonney Butte, Oregon: 1994–2005. Dashed lines indicate significant ($P < 0.10$) regressions.

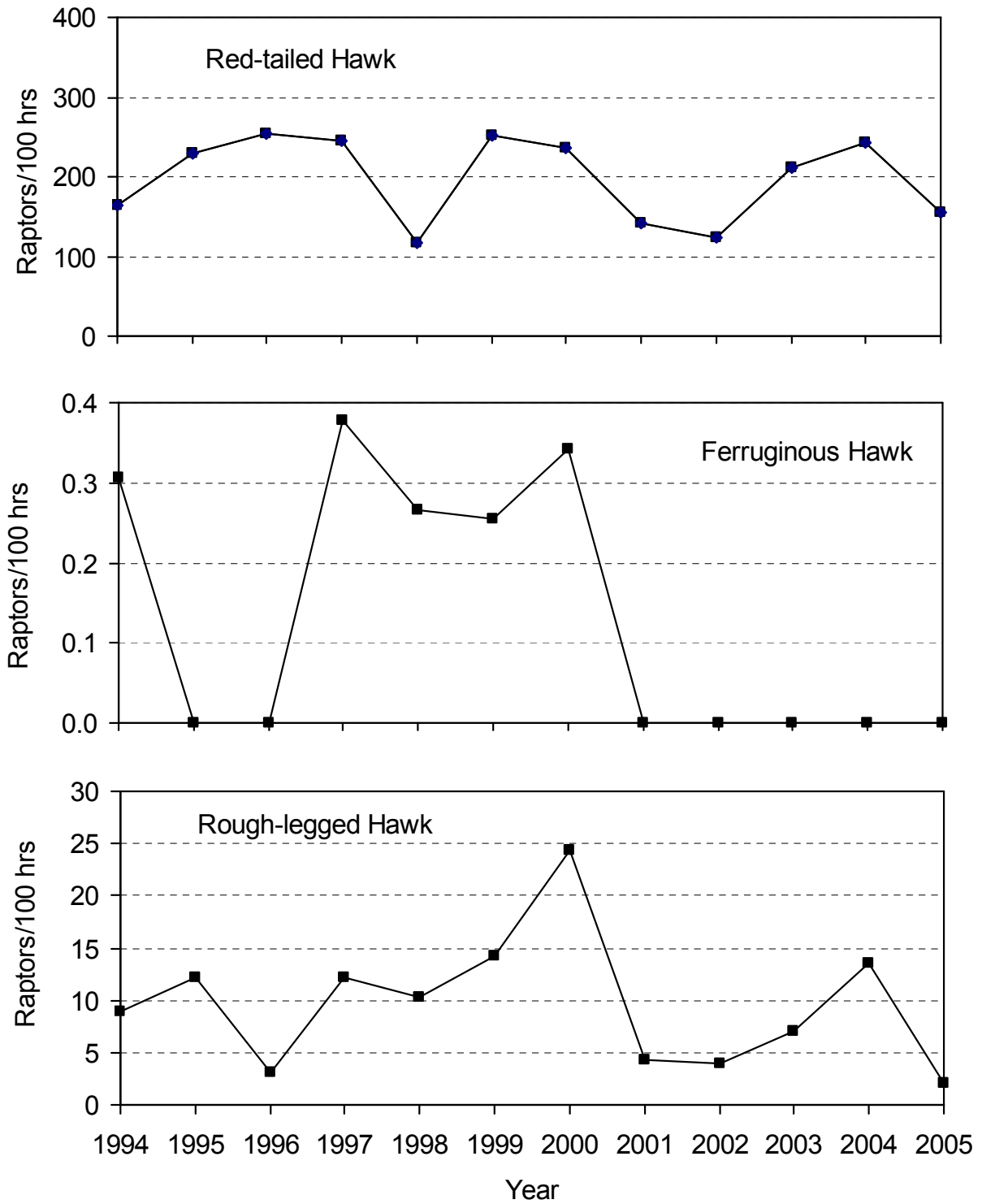


Figure 6. Adjusted, fall-migration passage rates for Red-tailed, Ferruginous, and Rough-legged Hawks at Bonney Butte, Oregon: 1994–2005. Dashed lines indicate significant ($P < 0.10$) regressions.



Figure 7. Adjusted, fall-migration passage rates for Golden and Bald Eagles at Bonney Butte, Oregon: 1994–2005. Dashed lines indicate significant ($P < 0.10$) regressions.

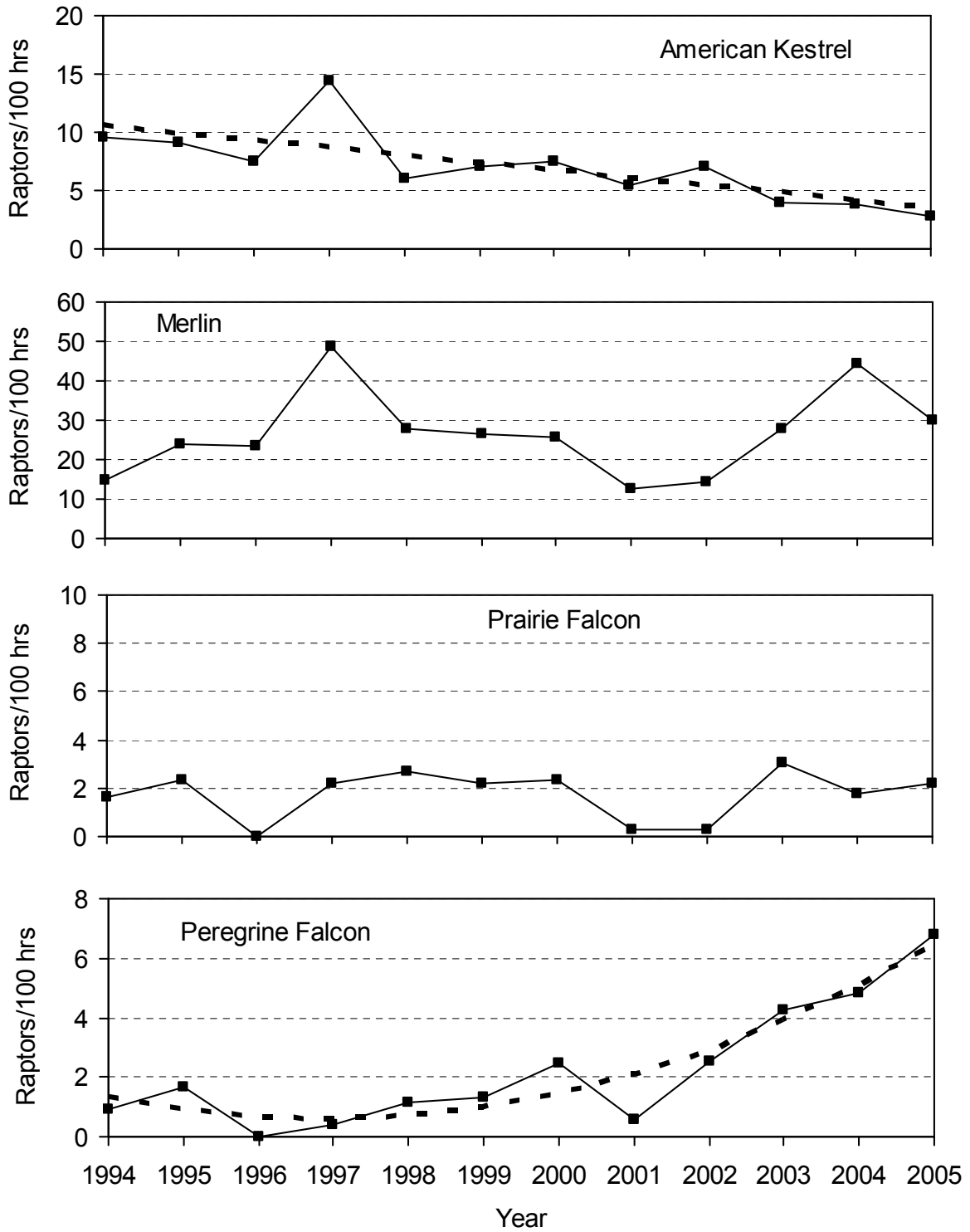


Figure 8. Adjusted, fall-migration passage rates for American Kestrels, Merlins, Prairie Falcons, Peregrine Falcons at Bonney Butte, Oregon: 1994–2005. Dashed lines indicate significant ($P < 0.10$) regressions.

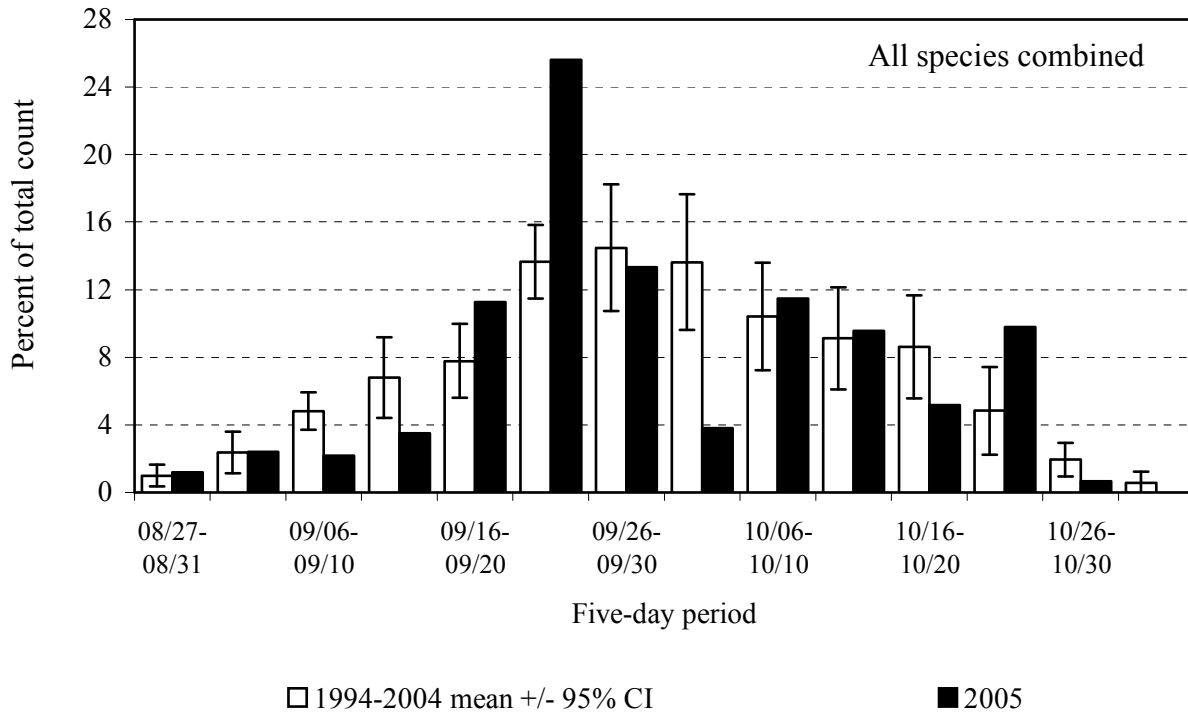


Figure 9. Combined-species passage volume by five-day periods for migrating raptors at Bonney Butte, Oregon: 1994–2004 versus 2005.

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

- 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).
- 2005:** Two observers throughout: Sean Wolfe (0), Jim DeStaebler (0), and James Cederstrom (0)

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, Oregon.

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 in northern Oregon: 2005.

DATE	OBS. HOURS	OBSRVR / HOUR ¹	MEDIAN	PREDOMINANT WEATHER ³	WIND	TEMP (°C) ¹	BAROM. PRESS. (IN HG) ¹	MEDIAN	VISIB. WEST (KM) ¹	VISIB. EAST (KM) ¹	MEDIAN	BIRDS / HOUR	
			VISITOR DISTURB ²		SPEED (KPH) ¹			WIND DIRECTION			THERMAL LIFT ⁴		FLIGHT DISTANCE ⁵
27-Aug	8.00	2.0	0	clr		25.7	30.34	1	50	50	2	0.6	
28-Aug	8.83	2.0	0	clr-pc		23.3	30.18	2	50	50	2	1.5	
29-Aug	0.00			rain/fog									
30-Aug	6.00	1.7	0	clr-pc		18.0	30.45	2	50	50	3	0.5	
31-Aug	9.00	1.9	0	clr-mc		23.9	30.40	1	50	50	2	1.3	
1-Sep	8.00	1.9	0	pc		25.7	30.28	2	50	50	4	1.1	
2-Sep	7.00	2.3	0	ovc-pc		19.9	30.22	4	50	50	2	1.1	
3-Sep	8.50	1.6	0	mc		16.4	30.26	2	25	27	3	0.9	
4-Sep	9.00	2.3	0	mc		13.5	30.29	2	50	50	4	1.9	
5-Sep	9.00	1.8	0	clr-mc		16.9	30.38	1	50	50	2	2.7	
6-Sep	9.00	1.0	0	clr-pc	0.3	19.1	30.37	1	40	40	2	2.6	
7-Sep	8.50	1.0	0	clr	1.0	24.2	30.40	1	50	50	2	1.8	
8-Sep	9.00	1.8	0	clr-mc	7.6	27.5	30.21	1	42	47	3	2.4	
9-Sep	0.00			rain/fog									
10-Sep	0.00			rain/fog									
11-Sep	6.00	2.0	0	mc	3.5	14.0	30.24	3	45	45	2	3.0	
12-Sep	9.00	2.2	0	clr-mc	4.9	12.7	30.27	2	47	50	3	1.6	
13-Sep	9.00	2.7	0	clr-mc	3.0	s-wsw, calm, w	16.9	30.32	2	37	47	2	3.2
14-Sep	9.00	2.0	0	clr	12.2	w	15.2	30.29	2	50	50	2	3.3
15-Sep	7.00	1.9	1	ovc-pc, AM fog	7.2	sw-wsw	12.1	30.22	2	44	27	1	0.7
16-Sep	0.00			rain/fog									
17-Sep	4.67	2.2	0	mc-ovc	10.0	w	12.3	30.31	4	45	45	3	5.6
18-Sep	9.00	3.0	1	clr-pc	3.9	wsw-w	14.6	30.32	1	50	50	-	12.0
19-Sep	9.00	2.4	0	clr	8.5	wsw-w	16.8	30.38	2	50	50	4	11.6
20-Sep	9.00	2.0	0	pc	6.1	wsw	13.7	30.40	2	50	50	2	8.0
21-Sep	9.00	2.0	1	clr	5.4	calm/var	15.8	30.38	2	36	42	4	14.6
22-Sep	9.00	2.2	0	pc-ovc	8.4	wsw	10.9	30.24	2	40	50	3	13.3
23-Sep	9.00	4.6	1	mc-pc	3.7	e, wsw	10.7	30.21	2	41	40	4	12.6
24-Sep	9.00	5.0	0	clr	7.0	w	12.5	30.28	1	40	40	3	19.7
25-Sep	9.00	3.7	0	clr	4.5	se, s, e	16.2	30.41	1	50	50	3	18.1
26-Sep	9.00	2.9	0	clr-pc	7.4	w	17.5	30.28	2	46	50	3	12.3
27-Sep	9.00	2.8	0	clr	5.6	wsw-w	15.8	30.41	2	50	50	2	9.8
28-Sep	8.67	2.8	0	clr	6.5	wsw-w	18.4	30.55	2	41	50	3	15.2
29-Sep	7.00	2.7	0	ovc	10.8	sw	15.7	30.30	3	14	14	2	5.1
30-Sep	0.00			rain/fog									
1-Oct	0.00			rain/fog									
2-Oct	0.00			rain/fog									
3-Oct	0.00			snow									

Appendix C. continued

DATE	OBS. HOURS	OBSRVR / HOUR ¹	MEDIAN		PREDOMINANT WEATHER ³	WIND		TEMP (°C) ¹	BAROM. PRESS. (IN HG) ¹	MEDIAN THERMAL LIFT ⁴	VISIB. WEST (KM) ¹	VISIB. EAST (KM) ¹	MEDIAN	
			VISITOR DISTURB ²	FLIGHT DISTANCE ⁵		BIRDS / HOUR								
4-Oct	7.00	2.0	0		ovc-pc	1.0	sw-w	9.1	30.43	3	44	37	2	8.6
5-Oct	8.00	3.0	0		ovc	2.6	e-se, s	13.0	30.40	3	40	40	3	5.6
6-Oct	7.50	2.5	0		mc-ovc/fog	8.0	w-sw	15.1	30.19	2	44	44	2	16.0
7-Oct	0.00				rain/fog									
8-Oct	7.00	1.9	0		ovc, PM rain	4.2	w-sw	9.7	30.01	2	46	34	3	9.0
9-Oct	8.00	3.0	0		mc-ovc	3.3	sw-w, s	13.8	30.41	3	31	24	3	11.0
10-Oct	8.50	2.4	0		clr-ovc	5.0	w-sw	13.4	30.33	2	50	50	2	5.3
11-Oct	9.00	2.0	0		clr-pc	3.4	var, w	10.8	30.32	1	48	35	2	7.8
12-Oct	7.75	1.8	0		mc-ovc	10.4	w	12.9	30.32	4	40	44	2	6.5
13-Oct	0.00				fog									
14-Oct	9.00	2.4	0		clr-ovc	4.6	sw-w	15.7	29.99	2	31	35	2	15.9
15-Oct	0.00				rain/fog									
16-Oct	6.00	3.0	0		mc-ovc	7.7	w-wnw	11.7	30.42	2	50	31	4	4.5
17-Oct	9.00	2.8	0		clr-ovc	11.7	w	13.1	30.26	3	40	40	3	9.7
18-Oct	7.50	3.0	0		ovc	8.3	ese	14.9	30.10	3	50	50	2	2.1
19-Oct	0.00				fog									
20-Oct	2.50	1.0	0		pc	6.7	sw	9.0	30.41	3	45	38	2	4.8
21-Oct	8.00	2.5	0		clr	6.4	sw, e	12.4	30.43	3	44	50	2	3.9
22-Oct	8.50	3.3	0		clr	4.3	se, e, w	14.1	30.25	2	30	39	3	7.5
23-Oct	8.00	3.1	0		ovc	3.0	sse, w	13.7	30.22	3	30	37	3	10.0
24-Oct	7.00	2.6	0		pc-mc, fog	4.5	e-sse	14.1	30.27	2	23	25	3	7.4
25-Oct	7.00	1.7	0		mc-ovc, AM haze	18.7	sw-w	13.3	30.06	3	30	30	3	6.0
26-Oct	0.00				fog									
27-Oct	7.50	2.4	0		pc-ovc, AM fog	4.6	ssw	5.2	29.96	3	41	50	2	2.4
28-Oct	0.00				snow									
29-Oct	0.00				snow									
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, Oregon: 2005.

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	8.00	4	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	1	5	0.6
28-Aug	8.83	7	0	0	0	1	0	0	0	1	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	1.5
29-Aug	0.00																														
30-Aug	6.00	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.5	
31-Aug	9.00	1	0	0	1	0	0	0	0	1	0	0	0	5	1	0	2	0	1	0	0	0	0	0	0	0	0	0	12	1.3	
1-Sep	8.00	0	2	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	1	0	0	0	0	0	0	1	9	1.1	
2-Sep	7.00	2	0	2	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1.1	
3-Sep	8.50	1	1	0	1	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0.9	
4-Sep	9.00	2	2	0	2	2	0	0	0	1	0	0	0	6	0	0	0	0	2	0	0	0	0	0	0	0	0	0	17	1.9	
5-Sep	9.00	1	0	0	17	2	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	2.7	
6-Sep	9.00	5	0	0	6	0	0	0	1	1	0	0	0	8	0	0	0	0	0	0	0	1	0	0	0	0	1	0	23	2.6	
7-Sep	8.50	1	0	0	7	1	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	1	0	0	0	0	0	15	1.8	
8-Sep	9.00	5	2	0	6	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	2.4	
9-Sep	0.00																														
10-Sep	0.00																														
11-Sep	6.00	3	5	0	4	2	0	0	1	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	3.0	
12-Sep	9.00	1	1	0	5	0	0	0	0	2	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0	0	0	14	1.6	
13-Sep	9.00	2	1	0	14	5	1	0	1	2	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	29	3.2	
14-Sep	9.00	11	0	3	4	1	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	1	0	0	0	0	0	0	30	3.3	
15-Sep	7.00	2	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	0	5	0.7	
16-Sep	0.00																														
17-Sep	4.67	17	1	0	2	0	0	1	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	5.6	
18-Sep	9.00	32	9	1	30	10	0	1	0	2	0	0	0	18	0	0	0	0	0	0	1	3	0	0	0	0	1	0	108	12.0	
19-Sep	9.00	39	1	2	18	6	0	0	1	0	0	0	0	33	0	0	0	0	1	0	0	2	0	0	0	0	0	1	104	11.6	
20-Sep	9.00	28	4	2	14	2	0	0	0	0	0	0	0	19	0	0	0	1	0	0	0	1	0	0	0	1	0	0	72	8.0	
21-Sep	9.00	33	0	2	58	18	1	1	0	0	0	0	0	16	0	0	0	0	0	0	0	1	0	0	1	0	0	0	131	14.6	
22-Sep	9.00	19	5	1	32	16	0	1	0	4	0	0	0	34	0	0	0	0	4	0	0	2	0	2	0	0	0	0	120	13.3	
23-Sep	9.00	30	3	1	24	15	0	0	0	1	0	1	0	26	0	0	0	0	5	0	0	4	1	1	0	1	0	0	113	12.6	
24-Sep	9.00	49	1	9	41	32	1	1	0	3	0	0	0	25	0	0	0	5	1	0	2	3	0	2	0	0	0	2	177	19.7	
25-Sep	9.00	26	3	0	70	21	1	2	0	2	0	0	0	21	0	0	0	7	1	0	4	3	1	1	0	0	0	0	163	18.1	
26-Sep	9.00	12	3	2	48	14	0	2	3	4	0	1	0	17	0	0	1	2	1	0	0	0	0	1	0	0	0	0	111	12.3	
27-Sep	9.00	18	3	1	42	2	1	1	0	3	0	0	0	14	0	0	0	0	2	0	0	0	0	0	1	0	0	0	88	9.8	
28-Sep	8.67	11	1	2	64	10	0	2	2	2	0	0	0	26	0	0	0	2	2	0	0	3	0	2	0	2	1	0	132	15.2	
29-Sep	7.00	13	0	1	11	1	1	0	0	0	0	0	0	2	0	0	0	1	3	0	0	3	0	0	0	0	0	0	36	5.1	
30-Sep	0.00																														

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	0.00																															
2-Oct	0.00																															
3-Oct	0.00																															
4-Oct	7.00	11	3	0	28	6	0	0	0	0	0	0	0	8	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	60	8.6	
5-Oct	8.00	1	0	3	18	9	0	0	0	0	0	0	0	11	0	0	0	0	1	0	0	2	0	0	0	0	0	0	45	5.6		
6-Oct	7.50	1	1	0	70	14	2	0	1	1	0	0	0	9	0	0	0	6	9	0	0	6	0	0	0	0	0	0	120	16.0		
7-Oct	0.00																															
8-Oct	7.00	1	1	0	19	18	0	0	0	0	0	0	0	10	0	0	0	9	1	0	0	2	0	2	0	0	0	0	63	9.0		
9-Oct	8.00	0	1	0	52	6	0	1	1	0	0	0	0	20	0	0	0	3	1	1	0	1	0	0	0	1	0	0	88	11.0		
10-Oct	8.50	0	0	0	22	8	0	0	0	0	0	0	0	7	0	0	0	2	0	0	0	5	0	0	0	0	1	0	45	5.3		
11-Oct	9.00	0	1	0	25	11	0	0	0	1	0	0	0	26	0	0	0	4	1	0	0	1	0	0	0	0	0	0	70	7.8		
12-Oct	7.75	0	0	0	25	2	2	0	1	0	0	0	0	9	0	0	0	3	1	0	0	2	0	1	0	3	1	0	50	6.5		
13-Oct	0.00																															
14-Oct	9.00	0	0	0	81	15	3	1	0	4	0	0	0	21	0	1	0	5	5	0	0	6	0	0	0	0	1	0	143	15.9		
15-Oct	0.00																															
16-Oct	6.00	0	0	0	10	2	0	0	0	0	0	0	0	9	0	0	0	3	2	0	0	1	0	0	0	0	0	0	27	4.5		
17-Oct	9.00	0	2	1	51	2	1	0	0	0	0	0	0	20	0	0	0	2	0	0	0	6	0	0	0	2	0	0	87	9.7		
18-Oct	7.50	0	0	1	6	2	1	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16	2.1		
19-Oct	0.00																															
20-Oct	2.50	0	0	0	4	0	0	0	0	1	0	0	0	2	0	0	1	3	0	0	0	1	0	0	0	0	0	0	12	4.8		
21-Oct	8.00	0	0	0	9	4	0	0	1	2	0	0	0	8	0	1	0	1	1	0	0	4	0	0	0	0	0	0	31	3.9		
22-Oct	8.50	0	2	4	26	2	0	0	0	1	0	0	0	25	0	1	0	1	0	0	0	2	0	0	0	0	0	0	64	7.5		
23-Oct	8.00	0	1	0	36	3	4	0	0	4	0	0	0	13	0	0	0	3	7	0	0	7	0	2	0	0	0	0	80	10.0		
24-Oct	7.00	0	0	0	40	2	1	0	0	0	0	0	0	4	0	0	0	1	1	0	0	3	0	0	0	0	0	0	52	7.4		
25-Oct	7.00	0	0	0	13	1	2	0	0	0	0	0	0	18	0	0	0	6	2	0	0	0	0	0	0	0	0	0	42	6.0		
26-Oct	0.00																															
27-Oct	7.50	0	0	0	8	1	2	0	0	0	0	0	0	6	0	0	0	0	0	0	0	1	0	0	0	0	0	0	18	2.4		
28-Oct	0.00																															
29-Oct	0.00																															
30-Oct	0.00																															
31-Oct	0.00																															
Total	392.92	389	60	38	1067	269	24	14	13	46	0	2	0	562	1	3	4	72	55	1	9	80	3	14	2	10	6	5	2749	7.0		

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, Oregon: 1994–2005.

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	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	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	27-Oct	28-Oct
Observation days	47	38	46	45	52	63	48	58	59	51	46	49	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	392.92	354.64
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	699.6	835.15
SPECIES	RAPTOR COUNTS												
Turkey Vulture	204	235	165	133	160	349	553	338	286	488	326	389	302
Osprey	32	49	55	60	67	74	107	78	50	97	70	60	67
Northern Harrier	25	22	39	30	56	49	13	7	27	28	29	38	30
Sharp-shinned Hawk	857	871	1027	912	1018	1660	1105	957	600	1578	1790	1067	1120
Cooper's Hawk	282	310	420	317	266	331	456	256	233	473	485	269	342
Northern Goshawk	25	12	40	34	33	36	31	10	8	29	33	24	26
Unknown small accipiter ¹	–	–	–	–	–	–	–	84	11	33	27	14	17
Unknown large accipiter ¹	–	–	–	–	–	–	–	0	1	1	2	13	3
Unknown accipiter	27	67	85	156	99	155	98	0	21	1	0	46	70
TOTAL ACCIPITERS	1191	1260	1572	1419	1416	2182	1690	1307	874	2115	2337	1433	1566
Red-shouldered Hawk	0	0	0	1	1	2	3	0	0	1	7	0	1
Broad-winged Hawk	1	3	1	0	0	75	10	0	1	6	2	2	8
Swainson's Hawk	0	0	1	2	2	1	0	0	0	0	1	0	1
Red-tailed Hawk	516	528	649	626	411	932	680	513	425	744	725	562	609
Ferruginous Hawk	1	0	0	1	1	1	1	0	0	0	0	1	1
Rough-legged Hawk	12	11	4	20	15	21	30	7	6	10	17	3	13
Unidentified buteo	23	30	40	52	30	58	26	29	48	18	9	4	31
TOTAL BUTEOS	553	572	695	702	460	1090	750	549	480	779	761	572	664
Golden Eagle	96	81	65	106	81	176	132	75	56	108	93	72	95
Bald Eagle	33	40	42	33	40	53	37	52	55	68	61	55	47
Unidentified eagle	3	2	1	9	4	2	0	6	7	0	2	1	3
TOTAL EAGLES	132	123	108	148	125	231	169	133	118	176	156	128	146
American Kestrel	29	18	18	35	22	30	21	23	21	19	14	9	22
Merlin	36	49	46	104	78	83	65	33	38	84	105	80	67
Prairie Falcon	5	4	0	5	10	8	6	1	1	8	5	3	5
Peregrine Falcon	3	4	0	1	4	5	8	3	9	14	14	14	7
Unknown small falcon ¹	–	–	–	–	–	–	–	0	1	0	1	2	1
Unknown large falcon ¹	–	–	–	–	–	–	–	0	0	0	0	10	2
Unknown falcon	8	3	2	3	4	0	0	7	2	2	0	6	3
TOTAL FALCONS	81	78	66	148	118	126	100	67	72	127	139	124	104
Unidentified raptor	38	25	43	90	30	32	0	20	15	7	3	5	26
GRAND TOTAL	2256	2364	2743	2730	2432	4133	3382	2499	1922	3817	3821	2749	2904

¹ Designations used for the first time in 2001.

Appendix F. Daily capture totals of migrating raptors at Bonney Butte, Oregon: 2005.

DATE	STATION														TOTAL CAPTURES/HR	
	HOURS	NH	SS	CH	NG	BW	RT	RL	GE	BE	AK	ML	PR	PG		
27-Aug	6.75	0	0	2	0	0	4	0	0	0	0	0	0	1	7	1.0
28-Aug	7.00	0	2	4	0	0	5	0	0	0	0	0	0	0	11	1.6
29-Aug	0.00															
30-Aug	5.25	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0.2
31-Aug	8.00	0	10	3	0	0	1	0	0	0	0	0	0	0	14	1.8
01-Sep	7.50	0	4	3	0	0	2	0	0	0	0	0	0	0	9	1.2
02-Sep	8.25	0	2	2	0	0	1	0	1	0	0	0	0	0	6	0.7
03-Sep	7.50	0	1	3	1	0	3	0	0	0	0	0	0	0	8	1.1
04-Sep	8.00	0	0	2	0	0	2	0	0	0	0	0	0	0	4	0.5
05-Sep	8.00	0	12	1	0	0	1	0	0	0	0	0	1	0	15	1.9
06-Sep	8.00	1	5	3	0	0	1	0	0	0	0	0	0	0	10	1.3
07-Sep	8.00	0	4	7	0	0	0	0	0	0	0	0	0	0	11	1.4
08-Sep	8.00	0	4	3	0	0	2	0	0	0	0	0	0	0	9	1.1
09-Sep	0.00															
10-Sep	0.00															
11-Sep	5.50	0	8	1	0	0	0	0	0	0	0	0	0	0	9	1.6
12-Sep	8.00	1	5	1	0	0	5	0	0	0	0	0	0	0	12	1.5
13-Sep	8.00	0	16	4	1	0	0	0	0	0	0	0	0	0	21	2.6
14-Sep	8.25	0	2	3	0	0	1	0	0	0	0	0	1	0	7	0.8
15-Sep	7.00	0	1	0	0	0	4	0	0	0	0	0	0	0	5	0.7
16-Sep	0.00															
17-Sep	4.50	0	4	1	0	0	1	0	0	0	0	1	0	2	9	2.0
18-Sep	8.00	1	10	9	0	0	1	0	0	0	0	1	0	0	22	2.8
19-Sep	8.00	0	6	4	0	0	4	0	0	0	0	0	1	0	15	1.9
20-Sep	8.25	0	10	6	0	0	5	0	0	0	0	1	0	0	22	2.7
21-Sep	7.75	1	13	6	0	0	1	0	0	0	0	0	0	0	21	2.7
22-Sep	8.00	0	2	6	0	0	1	0	0	0	0	0	0	0	9	1.1
23-Sep	7.50	0	2	1	1	0	0	0	0	0	0	0	0	0	4	0.5
24-Sep	7.50	1	8	2	1	0	1	0	0	0	0	0	0	0	13	1.7
25-Sep	7.75	0	18	3	0	0	2	0	0	0	0	0	0	0	23	3.0
26-Sep	7.50	0	7	2	0	0	1	0	0	0	0	1	0	1	12	1.6
27-Sep	8.00	0	13	2	0	0	2	0	0	0	0	0	0	0	17	2.1
28-Sep	7.00	0	11	3	0	0	0	0	0	0	0	1	0	0	15	2.1

Appendix F. continued

DATE	STATION														TOTAL CAPTURES/HR	
	HOURS	NH	SS	CH	NG	BW	RT	RL	GE	BE	AK	ML	PR	PG		
29-Sep	6.00	0	6	1	0	0	0	0	0	0	0	1	0	0	8	1.3
30-Sep	0.00															
01-Oct	0.00															
02-Oct	0.00															
03-Oct	0.00															
04-Oct	6.50	0	14	0	1	0	1	0	0	0	0	0	0	0	16	2.5
05-Oct	6.50	0	10	3	0	0	0	0	0	0	0	0	0	0	13	2.0
06-Oct	6.25	0	22	3	2	0	1	0	0	0	0	1	0	0	29	4.6
07-Oct	0.00															
08-Oct	5.00	0	7	1	0	0	1	0	0	0	0	0	0	0	9	1.8
09-Oct	5.00	0	9	1	0	0	2	0	0	0	0	0	0	0	12	2.4
10-Oct	7.75	0	7	2	1	0	1	0	1	0	0	0	0	0	12	1.5
11-Oct	7.50	0	1	1	0	0	3	0	0	0	0	0	0	0	5	0.7
12-Oct	7.75	0	8	0	0	0	2	0	0	1	0	1	0	0	12	1.5
13-Oct	0.00															
14-Oct	7.25	0	14	0	0	0	0	1	0	0	0	0	0	0	15	2.1
15-Oct	0.00															
16-Oct	5.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
17-Oct	7.75	1	2	0	0	0	1	0	0	0	0	3	0	0	7	0.9
18-Oct	6.25	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.2
19-Oct	0.00															
20-Oct	0.00															
21-Oct	7.25	0	5	0	0	0	0	0	0	0	0	1	0	0	6	0.8
22-Oct	7.25	1	4	1	0	0	1	0	0	0	0	0	0	0	7	1.0
23-Oct	7.75	0	4	0	2	0	0	0	1	0	0	0	0	0	7	0.9
24-Oct	7.00	0	6	0	0	0	2	0	0	0	0	1	0	0	9	1.3
25-Oct	6.75	0	9	0	1	0	1	0	0	0	0	0	0	0	11	1.6
26-Oct	0.00															
27-Oct	5.00	0	1	0	1	0	0	0	0	0	0	0	0	0	2	0.4
Total	342.25	7	310	101	12	0	67	1	3	1	0	13	3	4	522	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, Oregon: 1995–2005.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	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	27-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	27-Oct	–	27-Oct
Number of stations	1	1	1	1	1	1	1	1	1	1	1	1	–
Trapping days	10	21	39	34	22	58	50	55	47	36	48	38	–
Trapping hours	44.50	127.20	202.80	199.95	142.75	239.75	320.50	357.75	345.35	263.00	342.25	235.07	–
Captures / hour	4.9	10.0	11.0	12.8	10.0	13.0	10.3	10.4	12.5	14.9	15.2	11.4	–
Northern Harrier	0	1	0	2	1	1	0	6	4	2	7	2.2	24
Sharp-shinned Hawk	18	80	139	163	82	161	171	172	268	218	309	162	1781
Cooper's Hawk	0	20	29	43	14	67	74	71	64	90	101	52	573
Northern Goshawk	1	7	7	3	3	8	11	7	12	13	12	8	84
Broad-winged Hawk	0	0	0	0	0	1	0	0	0	0	0	0	1
Red-tailed Hawk	2	14	39	29	36	66	66	108	73	61	67	51	561
Rough-legged Hawk	0	0	1	0	1	0	1	0	0	0	1	0.4	4
Golden Eagle	0	3	2	1	2	3	2	0	2	1	3	2	19
Bald Eagle	0	0	0	0	0	0	0	0	0	0	1	0	1
American Kestrel	0	0	0	0	1	0	1	0	0	0	0	0	2
Merlin	1	2	5	11	3	1	4	5	4	4	13	5	53
Prairie Falcon	0	0	1	4	0	1	0	1	3	4	3	2	17
Peregrine Falcon	0	0	0	0	0	2	0	1	0	0	4	1	7
All species	22	127	223	256	143	311	330	371	430	393	521	284	3127
Recaptures ¹	0	0	0	0	0	0	0	0	0	2	1	0	3
Foreign Recaptures ²	0	0	1	2	0	0	1	0	2	2	3	1.0	11
Foreign Encounters ³	1	0	1	2	6	3	2	5	8	2	9	3.5	39

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.