FALL 2012 RAPTOR MIGRATION STUDIES AT BONNEY BUTTE, OREGON


Photo by Jade Ajani

HawkWatch International, Inc.

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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 population trends of raptors that migrate through the Cascade Mountain portion of the Pacific Coast Flyway (Hoffman et al. 2002, Smith et al. 2008a). 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 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 2012 season marked the 19th consecutive year of counting. After two years of completely volunteer trapping and banding efforts, this past season we were happy to be able to fund the efforts and allow for full standardization, and especially being able to give compensation to the dedicated volunteers that help. Nevertheless, this past season marks the 17th season of good season long efforts. This report summarizes the 2012 results of those activities.

The Bonney Butte project was 1 of 8 long-term, annual migration counts and 1 of 4 migration banding studies conducted or co-sponsored by HWI during 2012. The primary objective of these efforts is to track long-term population trends of diurnal raptors in western North America and around the Gulf Coast region in Texas (Hoffman and Smith 2003; Smith et al. 2001, 2008a, b). Raptors can serve as important biological indicators of ecosystem health (Bildstein 2001) and long-term migration counts are one of the most cost effective and efficient methods for monitoring the regional status and trends of multiple raptor species (Zalles and Bildstein 2000, Bildstein et al. 2008).

In coordination with the long-term counting and banding efforts, HWI has and will continue to explore related research activities to further help provide valuable information about migratory behavior of raptors, as well as identify species' ranges, migratory routes and connectivity, and track changes in raptor health and populations (e.g., Hoffman et al. 2002, Lott and Smith 2006, Goodrich and Smith 2008, McBride et al. 2004). In addition, these migration studies offer unique opportunities for the public to learn about raptors and the natural environment, and providing such opportunities is another important component of the raptor migration projects that HWI manages and co-sponsors.

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 shrub steppe 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 higher in elevation in relation to the observation site. The intervening space is largely forested.

METHODS

COUNT

Three official observers were hired as per diem volunteers to conduct daily counts, interact with the public for on-site outreach, as well as assist with the banding efforts when available and the opportunities arose (see Appendix A for a complete observer history). Weather permitting, two official or designated observers conducted standardized daily counts of migrating raptors from late August through late October. Observations typically began between 0800–0900 hrs and ended near 1700 hrs Pacific Standard Time (PST). Occasionally, visitors also assist 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 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 of precipitation, visibility, and an assessment of thermal-lift conditions were 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 including 2012 data follows Farmer et al. (2007). In comparing 2012 annual statistics against means and 95% confidence intervals for previous seasons, we equate significance with a 2012 value falling outside the bounds of the confidence interval for the associated mean.

TRAPPING AND BANDING

Similar to the counts, trapping and banding efforts began late August and continued through late October at a single traditional banding station, generally between 0900–1700 hrs PST (see Appendix F for daily trapping records). 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 then released within 45 minutes of capture.

RESULTS AND DISCUSSION

WEATHER SUMMARY

For the 2012 season, inclement weather forced operations to end six days early (see Appendix C for daily weather records, as well as Appendix E for comparisons of annual start and end dates). Seven additional days were also precluded from observation, and three days were shortened (reduced observation time to ≤ 4 hours; Appendix C). For comparison, on an average seasonal basis (i.e., from 1997-2011) inclement weather prevented 12.7 days and severely hamper 5.1 days of observation in a given season.

During active observation periods, sky conditions were recorded predominantly clear to partly cloudy, or fair 54% of the time, 27% as transitional (i.e., cloud cover changed from clear or partly cloudy to mostly cloudy or overcast during the day, or vice versa), and 19% as mostly cloudy or overcast. In comparison, the averages for the site are 50% fair, 23% transitional, and 28% as mostly cloudy to overcast, suggesting that although the predominant skies remained fair, there was a substantial increase in mostly cloudy to overcast skies with slightly less skies that were transitional. The season's visibility however, was above

average both towards the east (78 km in 2012 vs. 67.6 km for the average) and west (76 km vs. 63.4 km on average), even though the season witnessed an increase in the percentage of days affected by haze and fog (i.e., 63% of active observational days in 2012 vs. 58% on average). Visibility affected by rain and/or snow however, was quite negligible (3.8% for the season vs. 11.4 % on average). Temperatures for the season were above average (16.0˚ C vs. 13.8˚ C, respectively). Thus, the season's rankings of good to excellent thermal lift also corresponded to well above average (66% vs. 39.5% on average). With thermal lift being excellent for raptor migration in association with above average visibility and strong counters, this past season's total counts were ranked the second highest on record for the site and well above average (Appendix E). Thermal lift however, could have also caused some raptors to be so high as to escape detection.

As per normal, the 2012 wind conditions were primarily light (<12 kph), but were less so than on average (72% of active observation days vs. on average of 85.8%). In contrast, the number of days with moderate winds (12-29 kph) was significantly higher (25% vs. 13.4% on average). Strong winds (>29 kph) at this site are typically absent, occurring on average of 0.8%, or less than one day, but this past season, strong winds blew at approximately 4% of active observation days. Wind directions, on average, often blow from the SW-W (29%), SW-NW (14%), and NE-E (11%). During this past season, winds also blew at a higher proportion from the SW-NW (28%) and SW-W (15%) but also easterly as winds blew SE-SW part of the day then switched to W-NW for another significant portion of the day (11% vs. 0.6%), N-E (11% vs. 2.1%), NE-SE (9% vs. 2.6%), and NE-E (6% vs. 11%; see above). A good proportion of the season's winds also blew quite variably (8% vs. 4.4%), as well as calm and variable (6% vs. 2.0%). Thus, still comparable with previous wind speed and directional trends, winds seemed to blow slightly harder with more frequency, and there were higher proportions of winds coming from easterly or variable directions.

In summary, although there were quite a few days of inclement weather coupled with winds blowing more out of easterly directions, the season's favorable westerly winds blowing stronger coupled with good to excellent thermal lift rankings clearly demonstrates these are favorable conditions for raptors to migrate through the Bonney Butte location, as demonstrated by the large numbers of raptors counted this past season (Appendix E). Above average visibility and experienced, dedicated counters (Appendix A), we believe also played a role.

COUNT SUMMARY

Observers during the 2012 season were able to work 53 of 63 possible days between 27 August and 31 October, which was above the long term average (51 ± 95% CI of 2.7 days, Appendix E). In addition, the number of observation hours (451.42) was also well above the average (380.89 ± 29.25 hours, Appendix E). The 2012 average of 1.99 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) is a slight decrease from the long-term average of 2.4 ± 0.21 observers.

Observers counted 3,924 migrant raptors of 17 species, resulting with a significant 36% above average count (Table 1, and see Appendix D for daily count records). Two species set record highs; Turkey Vultures and Ospreys at 790 and 121 birds, respectively. From a rare species at this location, one Red-shouldered Hawk of unknown age was identified and counted on 07 October. Otherwise, only five (i.e., Northern Harriers, Northern Goshawks, Bald and Golden Eagles, and Prairie Falcons) out of the 17 species were counted below average (Table 1).

The overall flight consisted of 52% accipiters, 20% vultures, 17% buteos, 4% falcons, 3% eagles, 3% Ospreys, 1% harriers, and <1% unidentified raptors. The season featured significantly higher than average proportions of vultures and Ospreys, but significantly below average accipiters, buteos, and eagles, and below average falcons and harriers (Figure 2). Sharp-shinned Hawks were again the most common species encountered, with 36.9% of the total, followed by Turkey Vultures (20.1%), Red-tailed Hawks (15.4%), Cooper's Hawks (11.4%), Ospreys (3.1%), Merlins (2.5%), Golden Eagles (1.9%), and Bald Eagles (1.2%). The remaining species were comprised of <1% of the overall count (Appendix E).

Passage Rates and Long-term Trends

Regression analyses of the adjusted passage rates through 2012 revealed significant ($P \leq 0.10$) declines for Northern Harriers (Fig. 3), Red-tailed and Ferruginous Hawks (Fig. 6), adult Golden Eagles (Fig. 7), and American Kestrels (Fig. 8). For Northern Harriers, a marginal decline emerged ($p = 0.085$, Fig. 6), but with little variation explained by the model ($r^2 = 0.172$), inferring significance should be done with caution due to the likelihood of a Type I error. The marginally statistical decline for Ferruginous Hawks ($p = 0.052$, Fig. 6) was also suspect because of similar reasoning mentioned above ($r^2 = 0.205$) and the fact that this species is not commonly seen at this site (see Table 1 and Appendix E). Red-tailed Hawks, on the other hand, showed steady significant declines since 2008 (see previous reports). Thus, we will continue to monitor the species at this and other western North American sites for similar trends. Golden Eagles (Farmer et al. 2008) continued to demonstrate decline across much of its western range, but data from Bonney Butte (Fig. 7) and Chelan Ridge (another HWI site in Washington) are both indicating declines in the adult age class. Evidence of widespread American Kestrel population decline continued, and HWI scientists, along with many other North American researchers and Citizen Scientists are teaming up with the Peregrine Fund to help investigate various causal relationships to further understand the reasons for this trend (http://kestrel.peregrinefund.org/). On a more positive note, three species (i.e., Turkey Vultures, Bald Eagles and Peregrine Falcons) were showing continued rates of increase (Figs. 3, 7, & 8, respectively). Turkey Vultures have just begun this trend, but Bald Eagles and Peregrine Falcons continued to increase since being delisted, although the Bald Eagle increase was only marginally significant this year (slope = 0.323, $r^2 = 0.183$, $p = 0.068$; Fig. 7).

Age Ratios

Immature : adult ratios were below average in 2012 for Northern Harriers, Sharp-shinned Hawks, Cooper's Hawks, Broad-winged Hawks, Red-tailed Hawks, and Peregrine Falcons, but above average for Northern Goshawks, Golden Eagles, and Bald Eagles (Table 2). As mentioned above, it is important to try and differentiate age (and even gender) classes as best as possible to help determine if it is the adult, immature, or both age classes were involved in current population trends. However, in many raptor species it can be difficult to correctly identify immature vs. the adults using only observational data and the percentage of unknown aged birds are often high (Table 2). Thus, results should be treated with caution when assessing and comparing age ratios and year-to-year reproductive output.

Seasonal Timing

The combined-species median passage date of 29 September was one day early compared to the long-term average (Table 3). The volume of migration usually peaks around the last ten days of September, and then gradually declines through the first ten days in October (Fig. 9). During the next 5-day period in mid-October, there can usually be another small spike in numbers moving through the area. Afterwards, numbers begin to gradually decline, often dramatically towards the end of October. This past season, however, the pattern was even more irregular (Fig. 9). Migration began in earnest by mostly exceeding the average volume through mid-September, then numbers declined and began another slow gradual peak through the end of September. Numbers then dipped during the first 5-day period in October, but the highest count of the season occurred during the second October 5-day period. Afterwards, from mid-October on, lower than average numbers prevailed, and unfortunately towards the end of the season, inclement weather prevented observation for many days (Appendix C), which in turn reduced overall count numbers as well.

Most species-level median passage dates this past season were 1 to 7 days early (Table 3). Ospreys, Northern Harriers, Sharp-shinned Hawks, and Peregrine Falcons passed through the site 1 to 10 days later than usual (Table 3). The overall volume of Cooper's Hawks stayed near the expected passage date, with no change in median passage (Table 3). However, the age-specific median dates of Cooper's Hawks shows immature birds moving through the area four days early, while the adults moved through three days later than normal (Table 4). Age-specific median dates of both adult and immature Sharp-shinned Hawks arriving a few days early (Table 4) also demonstrated a different picture from the overall passage

for all members of the species moving through the area a day later than average (Table 3). Again, a number of Sharp-shinned Hawks were not able to be aged (Table 2); thus, helping to explain the discrepancy (but see also Appendix D for daily raptor counts). Otherwise, the age-specific median dates generally followed the same pattern of birds passing through the site early, or consistent with previous seasonal phenological timing, as for example in immature Bald Eagles (Table 4).

Resident Raptors

From 29 August through 02 October, one pair of adult light morph Red-tailed Hawks and one immature light Red-tailed Hawk were seen on most days during this time period. From 03 through 10 October, a single Red-tailed Hawk of unknown age and morph was seen every day, and on 14 October, adult light and dark morphs were seen hunting. On 18 October, the last resident Red-tailed Hawk of unknown age and morph was recorded.

A single resident Osprey was seen on most days from the beginning of the surveys, 27 August, through 23 September. On 30 August and 12 September, this Osprey was seen carrying a fish.

From 27 August through 19 September, resident Bald Eagles were observed on seven separate days. Adults were observed on 27 August and again on 01, 02 and 19 September. An S2 or S3 immature bird was also observed on 27 August. Similarly, a S1 or S2 immature bird was seen during two back-to-back days on 02 and 03 September, and a S4 bird was also seen on 02 September. Birds of unknown age were observed on two separate days; 28 August and 17 September. Resident Golden Eagles were also seen on five separate days beginning from 02 September to 10 October. A second-year bird was seen on 02 September, another sub-adult on 06 September, and two immature birds flew by on 10 October. An adult was seen on 04 September and an bird of unknown age passed the site on 23 September.

Resident Turkey Vultures were observed on eight separate days from 28 August through 15 September. Single birds were observed on 28 and 29 August, as well as on 01 and 12 September. On 04 September, six vultures were counted, ten to fifteen were observed on 05 September, eight on 14 September, and on 15 September, “numbers of Turkey Vultures” were passed the Bonney Butte site.

During the beginning of the season from 27 August through 01 September, a resident Sharp-shinned Hawk was documented every day except on 31 August. On 01 September, two resident Sharp-shinned Hawks were recorded. Similarly, resident Cooper’s Hawks were observed on six separate days through 19 September as well. Cooper’s Hawks of unknown age and gender were documented on 28 and 31 August, as well as on 01 September. An immature Cooper’s Hawk was recorded on 29 August, 04 September, and again on 19 September. Resident Northern Goshawks were seen on five separate days; immature birds on 04 and 22 September, as well as on 05 October, and birds of unknown age stopped by on 25 September and 07 October.

Lastly, the only resident falcon, a Peregrine Falcon of unknown age, was seen on two separate occasions; 29 August and 14 September. Often, resident birds displaying territorial behavior can be seen flying in non-migratory northerly directions, as well as hunting and/or kiting in the same area for multiple days throughout the season, thus distinguishing themselves from migrants.

TRAPPING AND BANDING SUMMARY

Trapping occurred on 51 days between 27August and 25 October, and totaled 376.25 hours (see Appendix G for comparing annual efforts against the overall mean, as well as Appendix F for daily trapping records). A total of 290 raptors were captured representing nine different species (Appendix G). As usual, the three most frequently captured species were Sharp-shinned Hawks (58% of captures), Cooper’s Hawks (25%), and Red-tailed Hawks (11%). In addition, six Northern Goshawks, five Merlins, two Golden Eagles, one Northern Harrier, one Broad-winged Hawk, and one Rough-legged Hawk were captured (Appendix G). In addition to identifying gender and age related differences on each bird, morpho/physiological indices (i.e., crop fullness, keel muscle, and wing-pit fat ratings, weight, and other

wing loading indices) continue to be collected and data archived to ensure ongoing comparisons across time and sites.

ENCOUNTERS WITH BANDED BIRDS

In 2012, two recoveries were reported to the Patuxent Bird Banding Lab from individuals originally banded by HWI personnel at Bonney Butte over the years; One Cooper's Hawk and one Sharp-shinned Hawk (Table 5). Both birds were originally banded as hatch-year females and survived past their third year, although the Sharp-shinned Hawk did not survive through the end of 2012 (Table 5). Presumably, the Cooper's Hawk is still roaming on its wintering grounds. This bird was recaptured at the Golden Gate Bird Observatory's long-term raptor migration monitoring and research station near San Francisco's Golden Gate Bridge in California. The Sharp-shinned Hawk was unfortunately found dead near the city of Fallbrook, California, and as in many cases the cause of the mortality was unknown (Table 5).

During the fall migration season, the crew recaptured only one previously banded bird with an interesting backstory! On 17 September the crew recaptured a color banded adult after-second year female Cooper's Hawk that was originally banded as a nestling on 23 June, 2008 in Victoria, British Columbia, Canada. Researchers often use alphanumeric colored leg bands to better understand adult nest fidelity and dispersal, as well as dispersal of the young. Thus, information from this individual confirm that birds are migrating off the island while shedding light on potential migration routes they may be using.

Most raptors that migrate over Bonney Butte primarily occupy the confines of the Pacific Coast Flyway on their migratory route south (along the Cascade-Sierra Nevada ranges and westward from southern British Columbia to Baja California; Hoffman et al. 2002), and this year's recaptures and encounter recoveries were no exception. Adding this past season recoveries, thus far a total of 82 raptors banded at Bonney Butte have subsequently been encountered elsewhere (Appendix G). Again, these recaptures and recoveries are important because they provide information on the birds' dispersal and migration routes, migratory connectivity, survivorship and longevity, as well as potential causes of mortality.

VISITATION

Including a Boy Scout group of 19 individuals that visited Bonney Butte on 14 October, a total of 276 individuals were recorded to have visited the site during the 2012 season. On 09 October, there were three groups of seven individuals that also visited, arriving from Lyle, Washington, as well as from the cities of Wasco and Greshem, Oregon. Most of the visitors, however, appeared alone or in smaller groups of two to five. Also, most visitors were from Oregon, but visitors also traveled from Washington, Michigan, and California.

Every hour, observers assess the disturbance level of visitors to quantify how visitation may affect raptor detectability. In 2012 after 459 hours of assessing visitor disturbance, results of those ratings were as follows: 75.6% of the time the crews indicated no disturbance, while 18.1% of the time disturbance appeared to be low, 4.8% moderate, and 1.5% it was rated high.

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Table 1. Fall raptor migration unadjusted counts and adjusted passage rates by species at Bonney Butte, OR: 1994–2011 versus 2012.

	COUNT			RAPTORS / 100 HOURS		
SPECIES	1994–2011[1]	2012	% CHANGE	1994–2011[1]	2012	% CHANGE
Turkey Vulture	324 ± 59.4	790	+144	135.1 ± 24.18	247.1	+83
Osprey	67 ± 9.6	121	+80	22.4 ± 3.39	29.2	+31
Northern Harrier	29 ± 5.9	24	-17	8.4 ± 1.75	5.9	-30
Sharp-shinned Hawk	1132 ± 146.7	1446	+28	392.9 ± 52.67	410.5	+4
Cooper's Hawk	346 ± 38.0	446	+29	118.6 ± 16.12	122.8	+4
Northern Goshawk	28 ± 5.1	26	-5	8.3 ± 1.64	6.9	-18
Unknown small accipiter[2]	38 ± 21.4	106	+180	–	–	–
Unknown large accipiter[2]	5 ± 3.0	9	+71	–	–	–
Unknown accipiter	54 ± 23.2	15	-72	–	–	–
TOTAL ACCIPITERS	1586 ± 177.5	2048	29	–	–	–
Red-shouldered Hawk	1 ± 0.8	1	-18	0.4 ± 0.30	0.2	-44
Broad-winged Hawk	7 ± 8.0	8	+21	3.8 ± 4.21	4.2	+12
Swainson's Hawk	1 ± 0.5	3	+286	0.2 ± 0.17	1.0	+297
Red-tailed Hawk	573 ± 73.1	605	+6	175.7 ± 26.92	149.9	-15
Ferruginous Hawk	0 ± 0.2	0	-100	0.1 ± 0.07	0.0	-100
Rough-legged Hawk	12 ± 3.8	20	+64	8.1 ± 2.64	14.3	+76
Unidentified buteo	26 ± 7.9	23	-12	–	–	–
TOTAL BUTEOS	620 ± 80.9	660	+6	–	–	–
Golden Eagle	86 ± 14.7	76	-12	28.2 ± 5.24	19.9	-29
Bald Eagle	51 ± 6.9	48	-6	15.3 ± 2.00	12.9	-15
Unidentified eagle	3 ± 1.3	1	-68	–	–	–
TOTAL EAGLES	141 ± 16.7	125	-11	–	–	–
American Kestrel	19 ± 3.7	22	+15	6.1 ± 1.38	5.3	-13
Merlin	72 ± 11.7	97	+35	26.4 ± 4.60	27.4	+4
Prairie Falcon	5 ± 1.3	4	-16	1.7 ± 0.42	1.3	-26
Peregrine Falcon	8 ± 2.5	10	+22	2.5 ± 0.84	2.7	+7
Unknown small falcon[2]	1 ± 0.9	5	+511	–	–	–
Unknown large falcon[2]	2 ± 1.8	3	+94	–	–	–
Unknown falcon	2 ± 1.2	0	-100	–	–	–
TOTAL FALCONS	108 ± 12.6	141	+31	–	–	–
Unidentified Raptor	21 ± 10.2	15	-28	–	–	–
ALL SPECIES	2895 ± 298.3	3924	+36	–	–	–

[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: 1994–2011 versus 2012.

	Total and Age-classified Counts								Immature : Adult Ratio	
	1994–2011 Average			2012			% Unknown Age			
	Total	Imm.	Adult	Total	Imm.	Adult	1994–2011[1]	2012	1994–2011[1]	2012
Northern Harrier	29	13	5	24	9	6	38 ± 8.1	42	3.8 ± 1.68	1.6
Sharp-shinned Hawk	1132	262	344	1446	374	516	47 ± 5.6	38	0.8 ± 0.15	0.7
Cooper's Hawk	346	109	75	446	152	105	46 ± 6.0	42	1.7 ± 0.59	1.4
Northern Goshawk	28	12	8	26	13	3	30 ± 7.5	38	2.1 ± 0.62	4.3
Broad-winged Hawk	7	1	2	8	1	6	36 ± 23.3	-	0.4 ± 0.33	0.2
Red-tailed Hawk	573	168	274	605	168	302	24 ± 3.5	22	0.7 ± 0.09	0.6
Golden Eagle	86	50	19	76	48	8	20 ± 3.1	26	3.4 ± 0.94	6.0
Bald Eagle	51	11	37	48	13	34	7 ± 3.1	2	0.3 ± 0.06	0.4
Peregrine Falcon	8	1	3	10	1	4	51 ± 4.0	50	0.7 ± 0.59	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 2012, with a comparison between 2012 and the 1994–2011 average median passage dates.

	2012				1994–2011
Species	First Observed	Last Observed	Bulk Passage Dates[1]	Median Passage Date[2]	Median Passage Date[2, 3]
Turkey Vulture	27-Aug	09-Oct	07-Sep – 01-Oct	20-Sep	22-Sep ± 1.3
Osprey	28-Aug	11-Oct	03-Sep – 01-Oct	20-Sep	18-Sep ± 1.5
Northern Harrier	05-Sep	18-Oct	11-Sep – 14-Oct	01-Oct	28-Sep ± 2.5
Sharp-shinned Hawk	27-Aug	25-Oct	11-Sep – 17-Oct	06-Oct	05-Oct ± 1.8
Cooper's Hawk	27-Aug	25-Oct	09-Sep – 09-Oct	26-Sep	26-Sep ± 2.4
Northern Goshawk	07-Sep	25-Oct	10-Sep – 17-Oct	30-Sep	02-Oct ± 3.0
Red-shouldered Hawk	–	–	–	–	26-Sep [4] 0.0
Broad-winged Hawk	07-Oct	07-Oct	18-Sep – 22-Sep	21-Sep	23-Sep ± 5.1
Swainson's Hawk	31-Aug	15-Sep	–	–	
Red-tailed Hawk	27-Aug	25-Oct	06-Sep – 16-Oct	27-Sep	28-Sep ± 2.3
Rough-legged Hawk	08-Oct	25-Oct	12-Oct – 18-Oct	18-Oct	19-Oct ± 2.4
Golden Eagle	01-Sep	25-Oct	12-Sep – 17-Oct	07-Oct	12-Oct ± 1.7
Bald Eagle	19-Sep	25-Oct	28-Sep – 25-Oct	04-Oct	07-Oct ± 2.5
American Kestrel	30-Aug	11-Oct	30-Aug – 07-Oct	12-Sep	19-Sep ± 3.8
Merlin	04-Sep	25-Oct	09-Sep – 17-Oct	08-Oct	09-Oct ± 2.2
Prairie Falcon	02-Sep	26-Sep	–		20-Sep ± 6.0
Peregrine Falcon	27-Aug	12-Oct	12-Sep – 12-Oct	08-Oct	28-Sep ± 5.4
Total	27-Aug	25-Oct	07-Sep – 12-Oct	29-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] Data for 2004 only. (See, again, superscript 3 above for criteria explanation, as well as Appendix E for a confirmation of annual counts.)

Table 4. Median passage dates by age for selected species of migrating raptors at Bonney Butte, OR: 1994–2011 versus 2012.

	ADULT		IMMATURE	
SPECIES	1994–2011[1]	2012	1994–2011[1]	2012
Sharp-shinned Hawk	10-Oct ± 1.8	08-Oct	23-Sep ± 1.5	18-Sep
Cooper's Hawk	03-Oct ± 2.5	06-Oct	20-Sep ± 2.2	16-Sep
Northern Goshawk	11-Oct ± 4.8	–	29-Sep ± 4.5	30-Sep
Red-tailed Hawk	02-Oct ± 2.9	30-Sep	21-Sep ± 2.0	14-Sep
Golden Eagle	12-Oct ± 3.0	03-Oct	10-Oct ± 2.2	09-Oct
Bald Eagle	07-Oct ± 2.9	03-Oct	10-Oct ± 3.1	10-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. Foreign encounters in 2012 of raptors banded during autumn migration at Bonney Butte, Oregon.

BAND #	SPECIES[1]-SEX	BANDING DATE	BANDING AGE[2]	ENCOUNTER DATE	ENCOUNTER AGE[2]	ENCOUNTER LOCATION	DISTANCE (km)	STATUS
1005-44937	CH-F	18-Sep-09	HY	19-Nov-12	ATY	Golden Gate Bird Observatory, CA	678	Recapture/Release @ Golden Gate Bird Observatory
1623-24201	SS-F	28-Aug-10	HY	24-Dec-12	ATY	Fallbrook, CA	1176	found dead – cause unknown

[1] Species: CH = Cooper's Hawk; SS = Sharp-shinned Hawk.

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

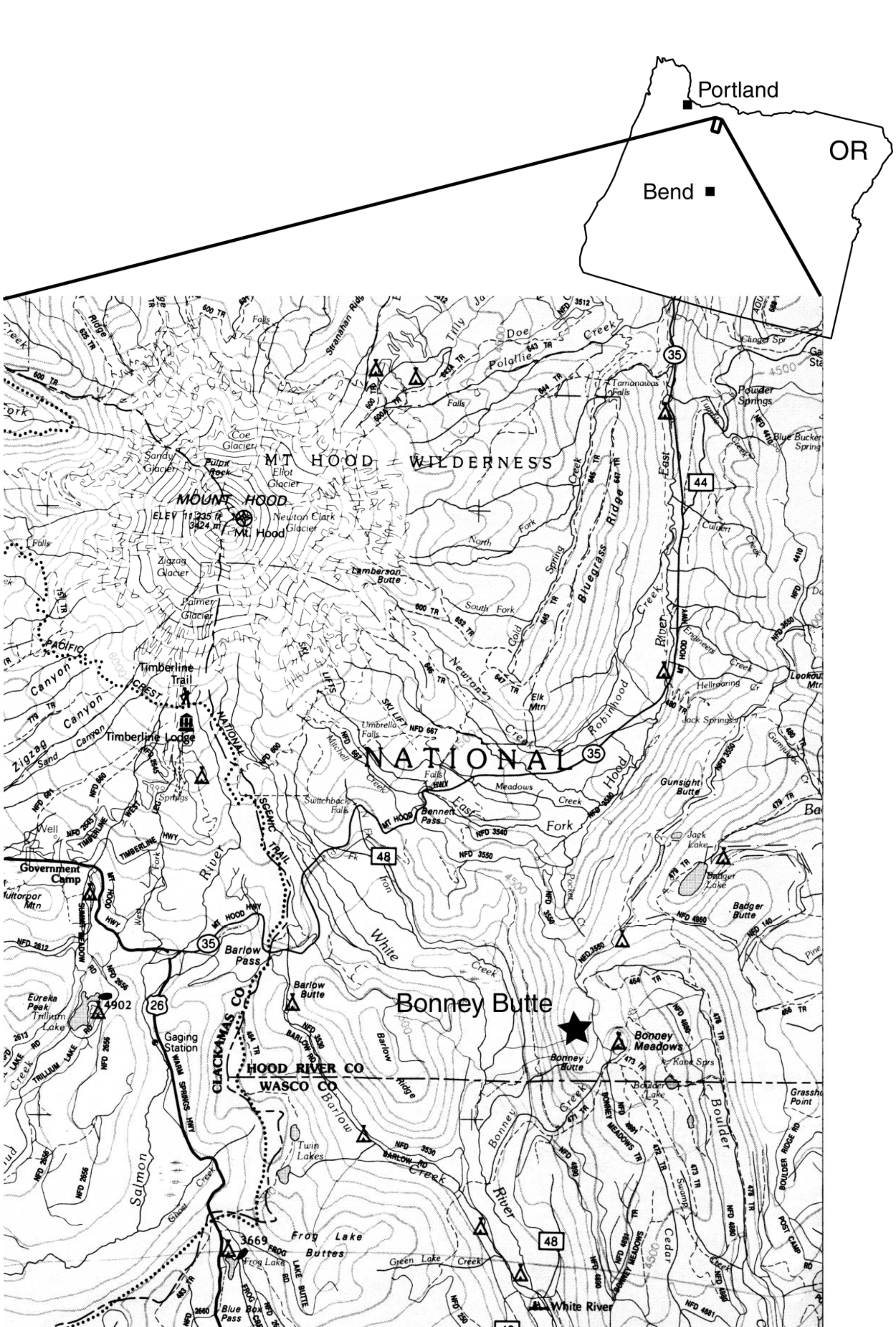

Figure 1. Location of the Bonney Butte Raptor Migration Project study site near Mt. Hood, Oregon.

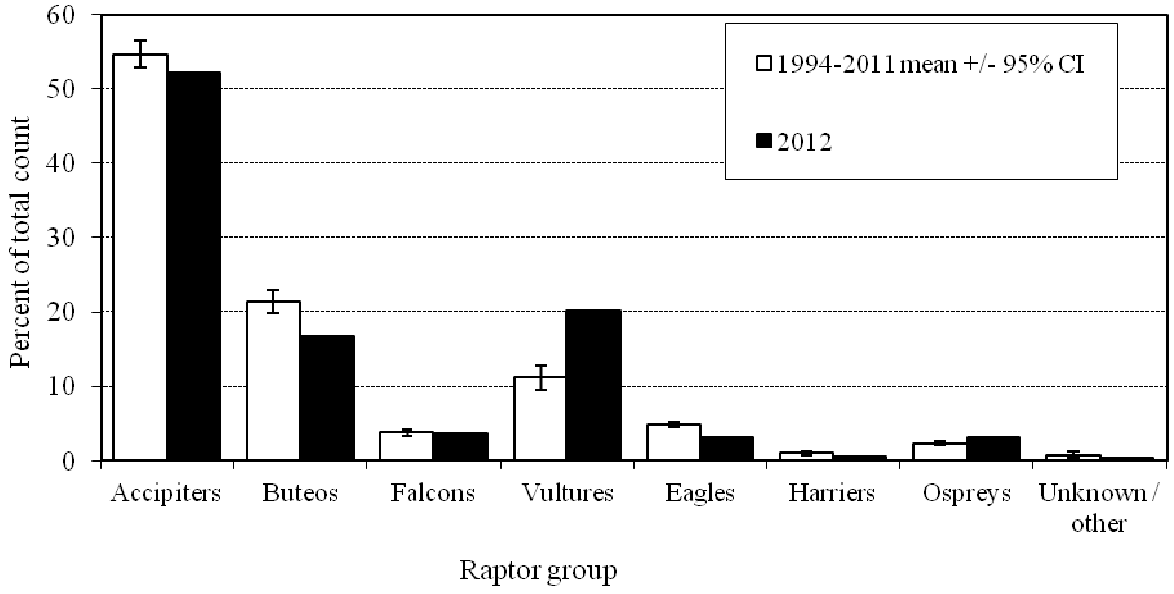

Figure 2. Fall raptor migration flight composition by major species groups at Bonney Butte, Oregon: 1994–2011 versus 2012.

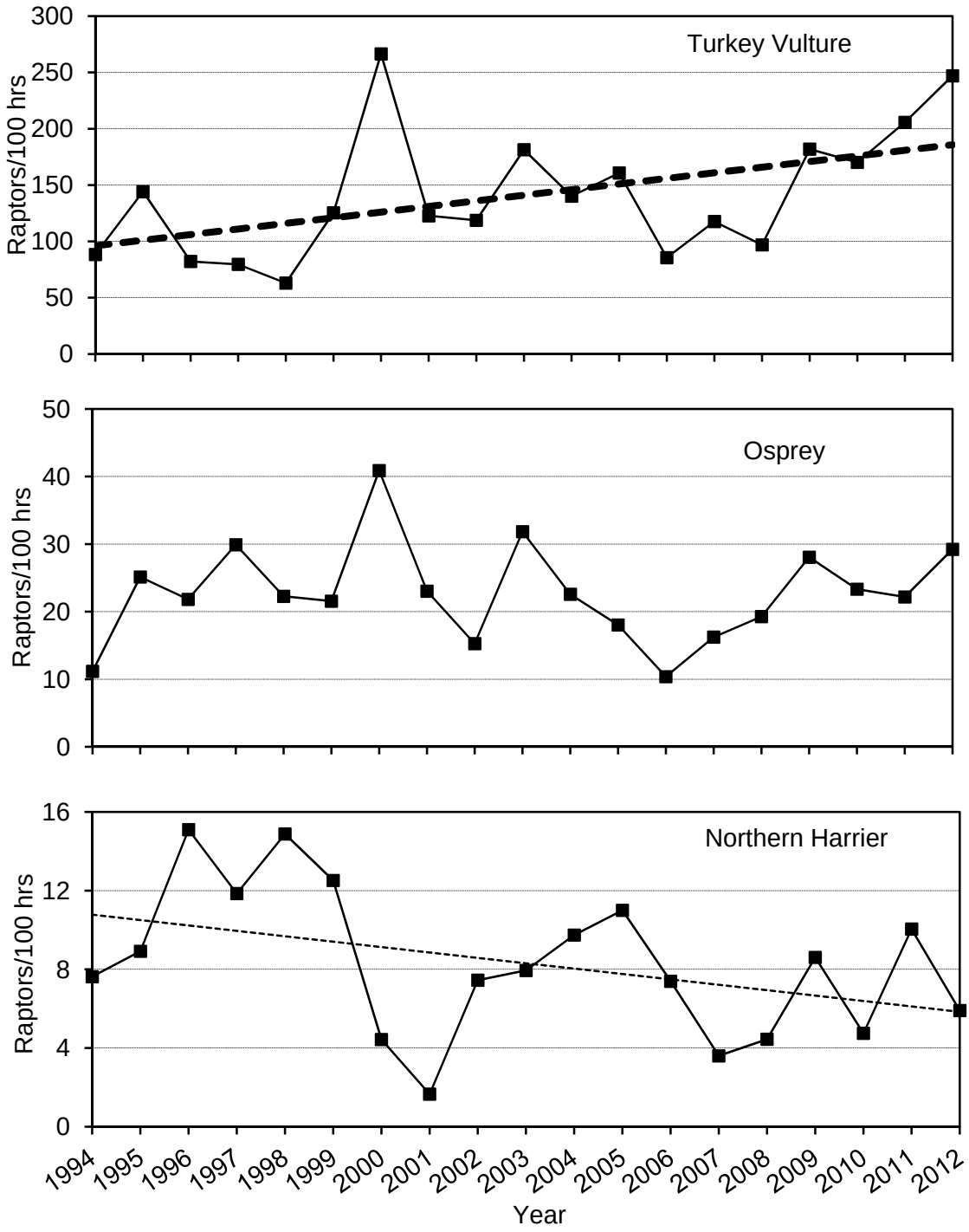

Figure 3. Adjusted, fall-migration passage rates for Turkey Vultures, Ospreys, and Northern Harriers at Bonney Butte, Oregon: 1994–2012. Dashed lines indicate significant ($P < 0.10$) regressions.

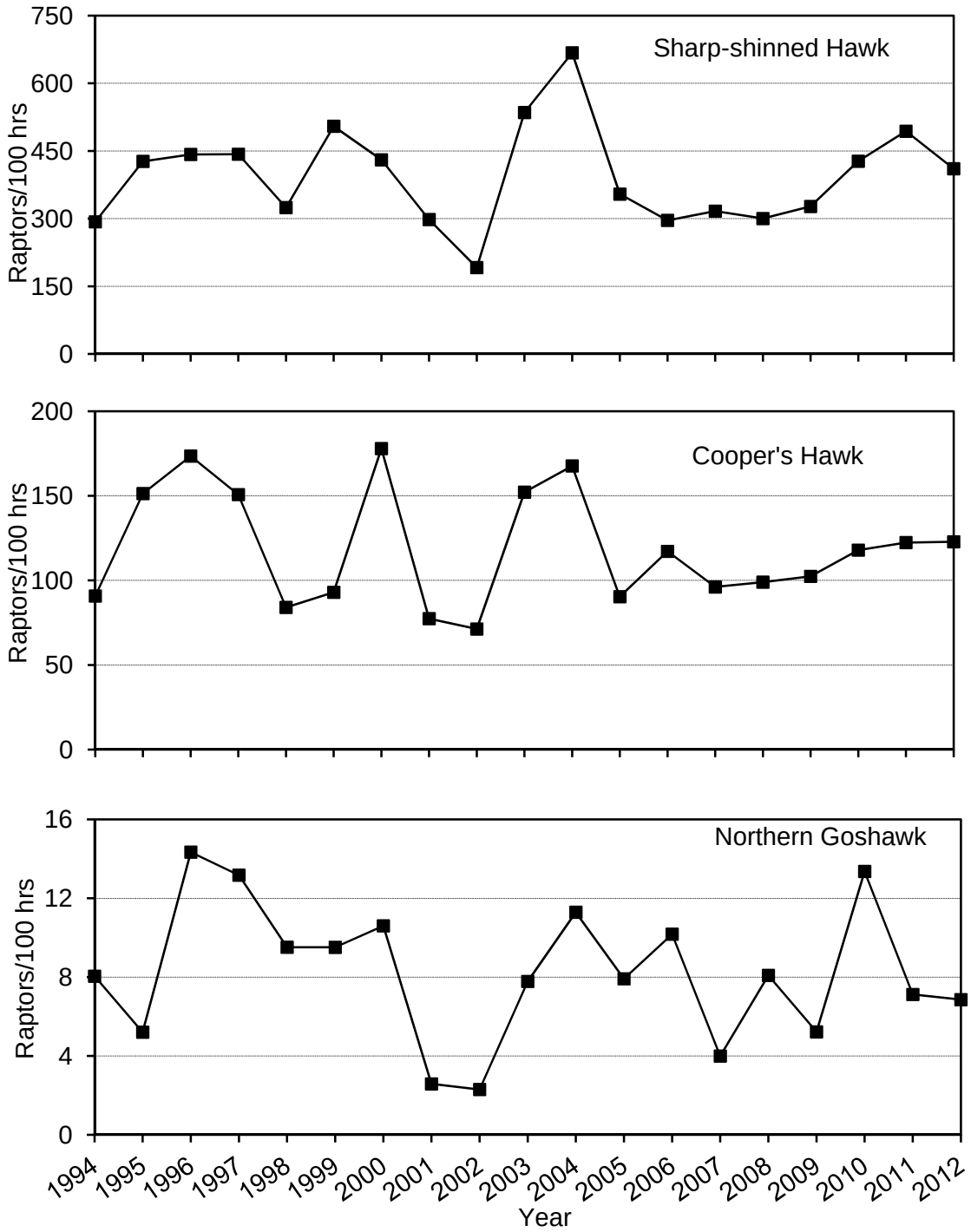

Figure 4. Adjusted, fall-migration passage rates for Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks at Bonney Butte, Oregon: 1994–2012. Dashed lines indicate significant (*P* < 0.10) regressions.

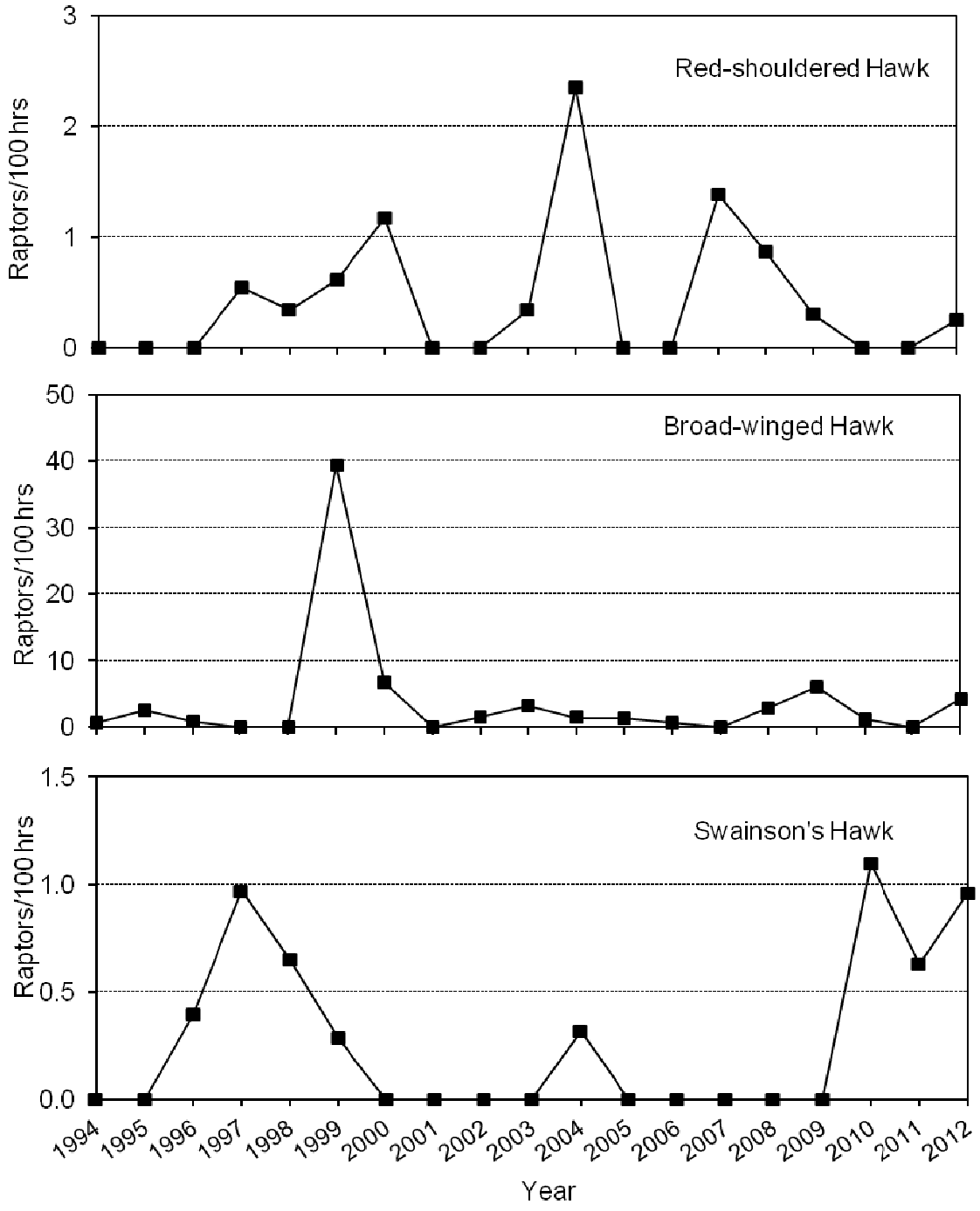

Figure 5. Adjusted, fall-migration passage rates for Red-shouldered, Broad-winged, and Swainson's Hawks at Bonney Butte, Oregon: 1994–2012. Dashed lines indicate significant ($P < 0.10$) regressions.

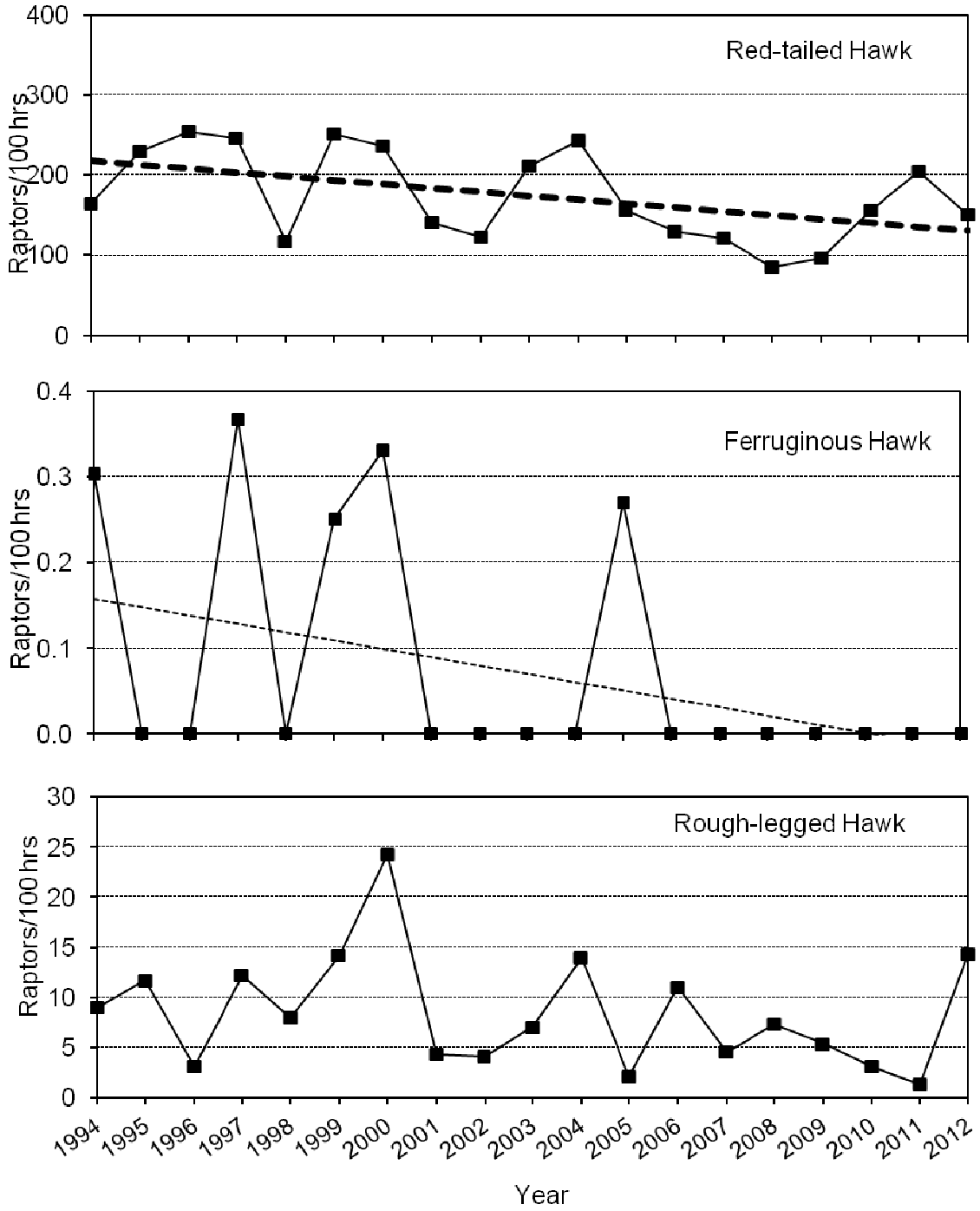

Figure 6. Adjusted, fall-migration passage rates for Red-tailed, Ferruginous, and Rough-legged Hawks at Bonney Butte, Oregon: 1994–2012. Dashed lines indicate significant ($P < 0.10$) regressions.

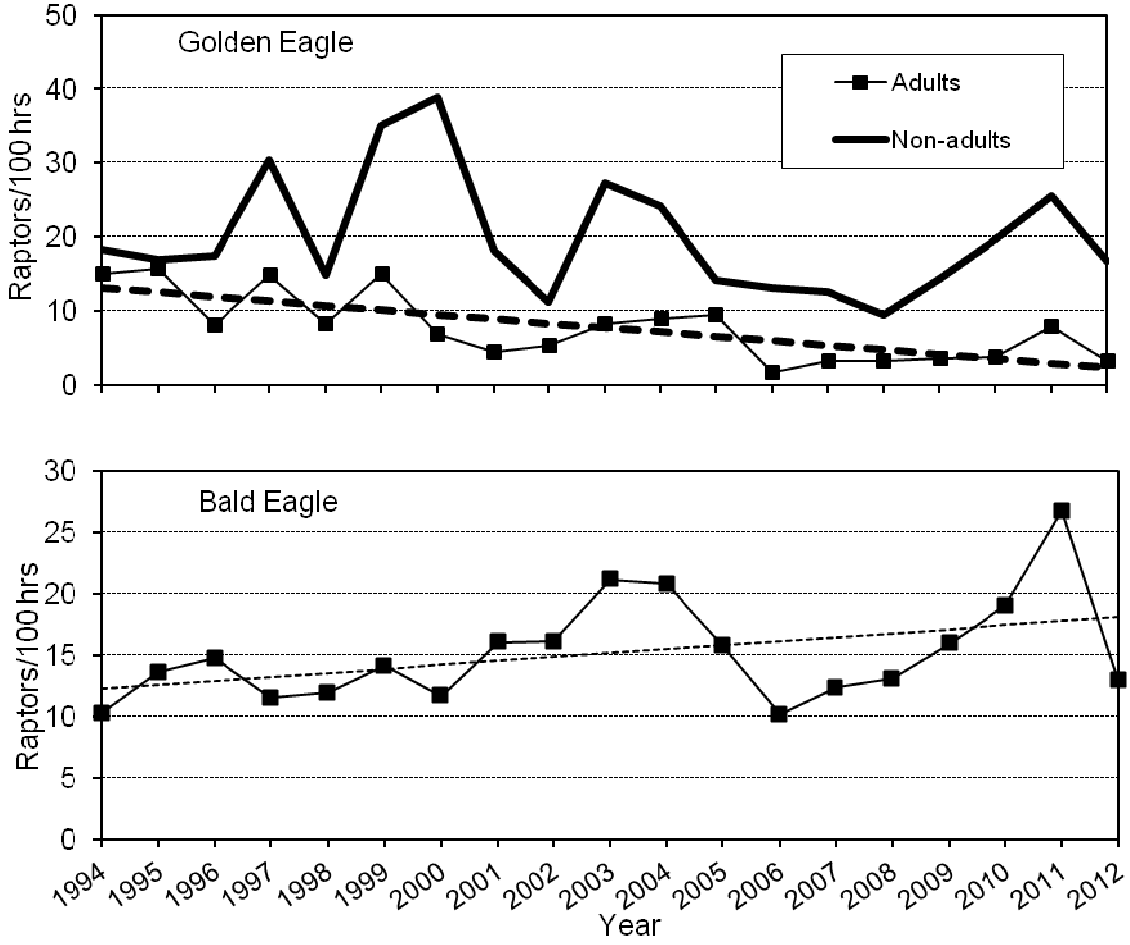

Figure 7. Adjusted, fall-migration passage rates for Golden and Bald Eagles at Bonney Butte, Oregon: 1994–2012. Dashed lines indicate significant ($P < 0.10$) regressions.

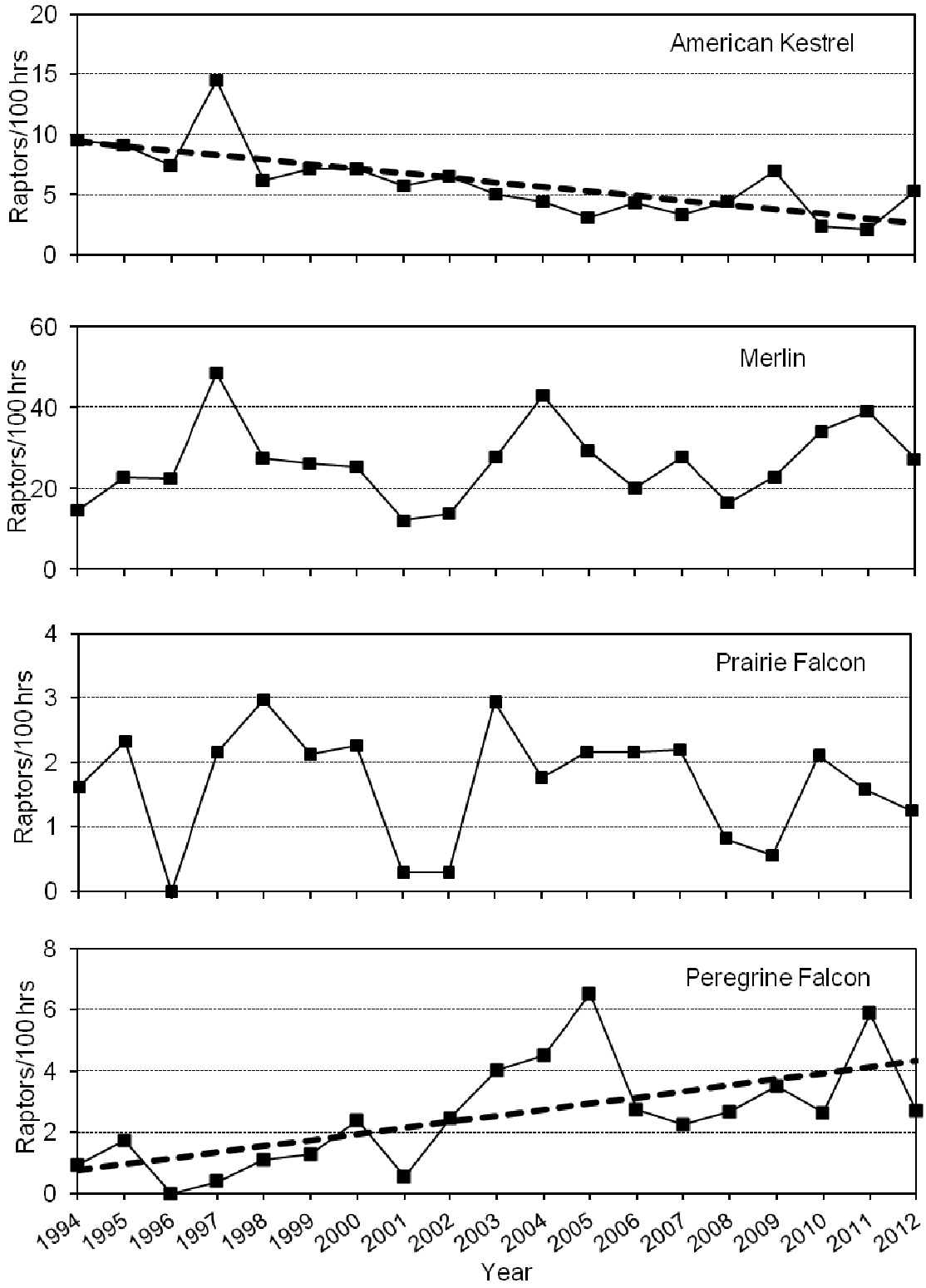

Figure 8. Adjusted, fall-migration passage rates for American Kestrels, Merlins, Prairie Falcons, Peregrine Falcons at Bonney Butte, Oregon: 1994–2012. Dashed lines indicate significant ($P < 0.10$) regressions.

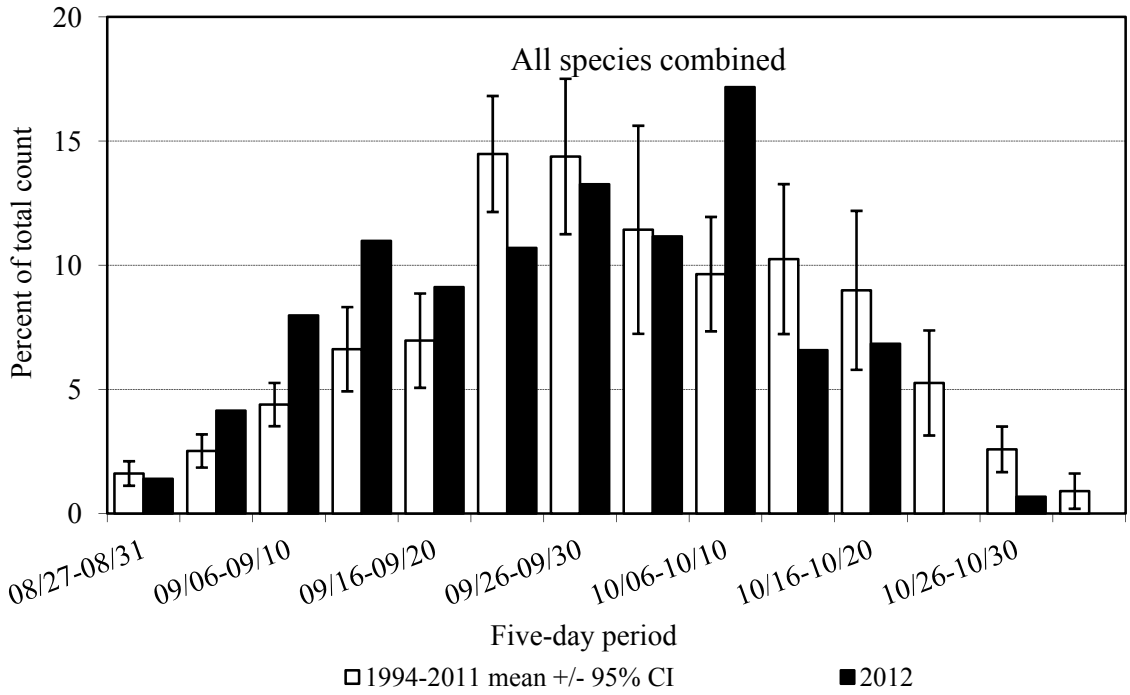

Figure 9. Combined-species passage volume by five-day periods for migrating raptors at Bonney Butte, Oregon: 1994–2011 versus 2012.

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 (+).

2005: Two observers throughout: Sean Wolfe (0) and Jim DeStaebler (0)

2006: Two observers throughout: Justin Feld (0) and Juliet Lamb (0).

2007: Two observers throughout: Mary Coolidge (1) and Sue Bruner (2)

2008: Two observers throughout: Aaron Viducich (1) and James Butch (0)

2009: Two observers throughout: James Butch (2) and Glen McHargue (0)

2010: Two observers throughout: Juliet Lamb (1), Yvan Satge (0), and Andrew Tillinghast (0)

2011: Two observers throughout: Robert Baez (2), Jade Ajani (0), and Adam Baz (0)

2012: Two observers throughout: Frank Mayer (4), Jade Ajani (1), Andrew Rosenberg (0), and Sanders Li Ho (0)

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[1] Numbers in parentheses indicate the number of seasons 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	*Cathartes aura*	TV	U	U	NA
Osprey	*Pandion haliaetus*	OS	U	U	NA
Northern Harrier	*Circus cyaneus*	NH	AM AF I Br U	AM AF U	NA
Sharp-shinned Hawk	*Accipiter striatus*	SS	A I U	U	NA
Cooper's Hawk	*Accipiter cooperii*	CH	A I U	U	NA
Northern Goshawk	*Accipiter gentilis*	NG	A I U	U	NA
Unknown small accipiter	*A. striatus* or *cooperii*	SA	U	U	NA
Unknown large accipiter	*A. cooperii* or *gentilis*	LA	U	U	NA
Unknown accipiter	*Accipiter* spp.	UA	U	U	NA
Red-shouldered Hawk	*Buteo lineatus*	RS	A, I, U	U	NA
Broad-winged Hawk	*Buteo platypterus*	BW	A I U	U	D L U
Swanson's Hawk	*Buteo swainsoni*	SW	U	U	D L U
Red-tailed Hawk	*Buteo jamaicensis*	RT	A I U	U	D L U
Ferruginous Hawk	*Buteo regalis*	FH	A I U	U	D L U
Rough-legged Hawk	*Buteo lagopus*	RL	U	U	D L U
Unknown buteo	*Buteo* spp.	UB	U	U	D L U
Golden Eagle	*Aquila chrysaetos*	GE	I, S, NA, A, U[4]	U	NA
Bald Eagle	*Haliaeetus leucocephalus*	BE	I, S1, S2, NA, A, U[5]	U	NA
Unknown eagle	*Aquila* or *Haliaeetus spp.*	UE	U	U	NA
American Kestrel	*Falco sparverius*	AK	U	M F U	NA
Merlin	*Falco columbarius*	ML	AM Br U	AM Br U	NA
Prairie Falcon	*Falco mexicanus*	PR	U	U	NA
Peregrine Falcon	*Falco peregrinus*	PG	A I U	U	NA
Unknown small falcon	*F. sparverius* or *columbarius*	SF	U	U	NA
Unknown large falcon	*F. mexicanus* or *peregrinus*	LF	U	U	NA
Unknown falcon	*Falco* 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: 2012.

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. east (km)[1]	Visib. west (km)[1]	Median Flight Distance[5]	Birds / Hour
27-Aug	8.92	2.2	0	pc-mc	3.4	sw-nw	21.9		2	68.0	68.0	1	1.3
28-Aug	9.00	2.1	0	ovc, mc PM	19.1	sw-n	16.5	30.24	4	88.6	86.4	0	0.4
29-Aug	9.00	2.0	0	clr-mc	9.3	sw-w	18.3	30.29	2	100.0	80.5	1	1.3
30-Aug	9.25	2.9	0	clr, haze	3.5	se-sw, w-nw	22.4	30.20	1	100.0	100.0	1	2.9
31-Aug	9.00	2.0	0	clr, haze	11.4	sw-w	19.9	30.10	2	79.5	72.7	1	1.4
1-Sep	9.00	3.6	0	clr, haze	8.7	sw-w	18.8	30.28	2	86.4	95.5	2	2.6
2-Sep	9.00	2.0	0	ovc, mc, pc PM	6.6	sw-nw	16.2	30.37	1	100.0	100.0	2	3.1
3-Sep	9.00	2.0	0	clr, haze	4.8	se-sw, w-nw	21.1	30.32	1	100.0	100.0	3	5.4
4-Sep	9.00	3.5	0	clr, haze	4.8	se-sw, w-nw	22.7	30.39	1	88.6	88.6	2	5.3
5-Sep	9.25	2.0	0	clr, haze	8.8	sw-w	20.6	30.28	1	100.0	100.0	3	8.1
6-Sep	9.00	3.0	0	clr, haze	13.5	n-e	17.3	30.30	2	54.5	63.2	2	4.8
7-Sep	9.00	3.0	0	clr, haze	11.6	ne-se	20.6	30.45	1	100.0	100.0	2	8.3
8-Sep	9.00	2.0	0	mc-ovc, haze	7.8	se-sw, w-nw	24.2	30.33	2	100.0	100.0	2	7.4
9-Sep	9.00	3.4	0	clr-ovc, haze	24.0	sw-nw	12.6	30.18	3	100.0	69.1	2	5.4
10-Sep	5.50	1.8	0	ovc, fog	26.9	sw-nw	7.9	30.27	4	100.0	61.4	2	4.2
11-Sep	9.00	2.0	0	clr, haze	6.7	var	12.8	30.37	2	100.0	100.0	2	9.9
12-Sep	9.00	3.5	0	clr-pc, haze	10.5	n-e	14.8	30.90	3	42.7	44.5	2	7.3
13-Sep	8.67	2.8	0	pc-mc, haze	10.4	ne-se	19.4	30.90	2	95.5	96.4	2	18.3
14-Sep	9.33	3.8	0	pc-ovc, haze	10.8	sw-w	23.2	30.74	1	60.9	60.0	2	9.5
15-Sep	9.33	3.9	0	pc-ovc, haze	11.6	sw-w	19.6	30.76	2	52.7	53.6	2	10.6
16-Sep	9.00	3.0	1	clr, haze	7.4	ne-e	18.3	30.78	1	86.4	96.4	2	8.4
17-Sep	9.00	1.9	0	clr, haze	7.7	ne-e	19.7	30.78	1	51.8	56.4	1	10.9
18-Sep	9.00	1.9	0	clr, haze	6.1	s-w	24.0	30.75	1	43.6	57.7	2	4.7
19-Sep	9.00	3.4	0	pc-mc, haze	4.8	e-s	25.5	30.79	2	27.3	40.9	2	4.8
20-Sep	9.00	2.0	0	clr-ovc, haze	7.7	ne-e	24.3	30.74	2	47.3	64.5	1	13.3
21-Sep	9.00	2.0	0	clr-mc, haze	8.6	var	21.6	30.67	2	16.8	29.1	2	10.2
22-Sep	9.00	3.9	1	clr	25.8	sw-nw	14.3	30.62	3	96.5	100.0	2	9.9
23-Sep	9.00	3.4	1	clr-mc, haze	4.9	se-sw, w-nw	13.0	30.64	2	96.4	95.5	2	5.4
24-Sep	9.00	2.0	0	clr, haze	8.8	sw-nw	16.9	30.66	2	26.0	25.9	2	7.4
25-Sep	9.00	1.9	0	clr-mc	10.1	sw-nw	12.9	30.62	2	100.0	83.2	2	12.4
26-Sep	8.25	2.6	0	clr, haze	4.6	var	20.4	30.64	2	56.5	81.0	2	6.9
27-Sep	8.83	2.0	1	pc-ovc, haze	5.7	ne-se	18.7	30.65	3	51.8	87.3	2	7.4
28-Sep	9.00	3.0	0	ovc	8.7	sw-nw	19.6	29.92	2	53.6	59.5	2	13.9
29-Sep	9.50	2.8	1	pc-ovc	14.7	sw-w	16.0	29.95	2	100.0	100.0	2	16.9
30-Sep	9.00	2.7	1	clr	6.2	sw-nw	19.0	30.11	2	100.0	100.0	2	17.7
1-Oct	9.00	2.0	0	clr	9.1	var	20.3	30.03	1	100.0	100.0	4	6.0
2-Oct	9.00	2.8	0	clr	14.9	w-nw	14.5	29.86	2	100.0	100.0	2	13.9
3-Oct	9.00	2.0	0	clr, haze	12.2	n-e	5.8	29.96	4	56.4	61.4	2	9.2
4-Oct	9.00	2.0	0	clr, haze	14.9	n-e	7.8	29.92	3	68.6	50.9	2	3.0
5-Oct	9.00	1.9	0	clr	13.0	n-e	7.2	29.94	4	100.0	100.0	2	6.7
6-Oct	9.00	3.7	1	clr	10.4	n-e	8.3	29.93	3	97.7	100.0	2	13.0
7-Oct	9.00	3.5	0	clr, haze	7.9	ne-se	13.3	29.83	3	63.0	85.0	1	33.2
8-Oct	9.00	2.0	0	clr-pc, haze	7.9	sw-nw	14.5	29.74	1	93.2	93.2	2	13.9
9-Oct	9.00	1.9	1	clr, haze	5.0	ne-se	14.9	29.83	1	75.5	70.0	2	8.0
10-Oct	9.00	2.5	0	clr, haze PM	9.4	sw-nw	15.4	29.75	1	97.7	90.9	3	11.8
11-Oct	9.00	2.5	0	clr, haze	6.3	calm/var	18.0	28.24	2	100.0	100.0	2	10.6
12-Oct	4.00	2.0	0	ovc, rain	12.5	sw-nw	10.7	29.65	4	72.5	54.2	2	3.0
13-Oct	0.00	0.0		weather day: fog/rain									
14-Oct	9.00	1.9	0	ovc	29.7	sw-nw	10.4	29.81	4	100.0	80.5	2	5.0

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. east (km)[1]	Visib. west (km)[1]	Median Flight Distance[5]	Birds / Hour
15-Oct	0.00	0.0		weather day: ovc, fog									
16-Oct	2.00	1.0	0	ovc, fog	30.8	sw-nw	3.3	29.69	4	25.0	2.5	2	4.0
17-Oct	8.75	2.0	0	pc-ovc	4.0	calm/var	7.3	29.93	3	100.0	100.0	2	19.7
18-Oct	8.83	2.5	0	mc-ovc	9.8	se-sw, w-nw	13.4	29.84	3	100.0	100.0	2	10.1
19-Oct	0.00	0.0		weather day: fog/snow									
20-Oct	0.00	0.0		weather day: fog/snow									
21-Oct	0.75	1.0	0	snow/dust	15.0	sw-nw	4.5	29.45	4	0.0	1.5	0	0.0
22-Oct	0.00	0.0		weather day: fog/snow									
23-Oct	0.00	0.0		weather day: fog/snow									
24-Oct	0.00	0.0		weather day: fog/snow									
25-Oct	7.25	1.9	0	ovc	2.9	calm/var	4.3	29.98	4	100.0	46.8	2	4.1
26-Oct	0.00	0.0		weather day: fog/snow									
27-Oct	0.00	0.0		weather day: fog/snow									
28-Oct	0.00	0.0		weather day: fog/snow									
29-Oct	0.00	0.0		weather day: fog/snow									
30-Oct	0.00	0.0		weather day: fog/snow									
31-Oct	0.00	0.0		weather day: fog/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: 2012.

	Obs	Species[1]																											Birds
Date	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-12	8.92	6	0	0	1	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	1	0	0	0	0	12	1.3
28-Aug-12	9.00	0	1	0	0	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0.4
29-Aug-12	9.00	1	4	0	1	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	1	0	1	12	1.3
30-Aug-12	9.25	4	0	0	6	2	0	4	0	0	0	0	0	5	0	0	2	0	0	0	4	0	0	0	0	0	0	0	27	2.9
31-Aug-12	9.00	5	3	0	2	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	13	1.4
01-Sep-12	9.00	6	0	0	6	2	0	0	1	0	0	0	0	3	0	0	2	2	0	0	1	0	0	0	0	0	0	0	23	2.6
02-Sep-12	9.00	7	3	0	2	1	0	3	0	0	0	0	1	7	0	0	0	0	0	0	2	0	1	0	0	0	0	1	28	3.1
03-Sep-12	9.00	6	2	0	15	6	0	5	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	5.4
04-Sep-12	9.00	22	3	0	11	5	0	1	0	0	0	0	0	4	0	0	0	0	0	0	1	1	0	0	0	0	0	0	48	5.3
05-Sep-12	9.25	19	2	1	17	7	0	4	0	2	0	0	0	18	0	0	1	2	0	0	0	2	0	0	0	0	0	0	75	8.1
06-Sep-12	9.00	3	4	0	12	4	0	1	1	1	0	0	0	13	0	0	0	1	0	0	1	1	0	0	0	0	0	1	43	4.8
07-Sep-12	9.00	34	8	0	7	6	1	5	0	2	0	0	0	6	0	0	1	1	0	0	1	2	0	0	1	0	0	0	75	8.3
08-Sep-12	9.00	26	2	1	15	9	1	0	0	0	0	0	0	10	0	0	0	0	0	0	0	3	0	0	0	0	0	0	67	7.4
09-Sep-12	9.00	4	8	0	19	4	0	1	0	0	0	0	0	11	0	0	0	0	0	0	0	2	0	0	0	0	0	0	49	5.4
10-Sep-12	5.50	3	0	0	1	2	1	1	0	0	0	0	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	4.2
11-Sep-12	9.00	18	2	1	40	8	2	5	0	0	0	0	0	8	0	0	0	1	0	0	2	0	0	0	0	0	0	2	89	9.9
12-Sep-12	9.00	25	2	2	14	6	0	3	1	0	0	0	0	7	0	0	2	2	0	0	0	1	0	1	0	0	0	0	66	7.3
13-Sep-12	8.67	51	2	0	50	27	0	3	0	2	0	0	0	23	0	0	0	0	0	0	0	1	0	0	0	0	0	0	159	18.3
14-Sep-12	9.33	34	4	0	20	13	0	5	0	1	0	0	0	10	0	0	0	0	0	0	1	0	0	0	1	0	0	0	89	9.5
15-Sep-12	9.33	35	1	1	18	8	0	8	0	0	0	0	1	20	0	0	3	0	0	0	0	1	0	0	1	0	0	2	99	10.6
16-Sep-12	9.00	25	3	0	18	9	0	6	0	2	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	1	76	8.4
17-Sep-12	9.00	35	4	0	25	13	0	4	0	1	0	0	0	12	0	0	0	2	0	0	0	1	1	0	0	0	0	0	98	10.9
18-Sep-12	9.00	19	1	1	9	4	0	1	0	0	0	2	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	1	42	4.7
19-Sep-12	9.00	11	2	0	13	3	1	3	0	0	0	0	0	8	0	0	0	0	1	0	0	0	0	0	0	0	0	1	43	4.8
20-Sep-12	9.00	16	3	1	45	33	1	2	0	0	0	4	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	1	120	13.3
21-Sep-12	9.00	30	13	0	23	18	0	2	0	0	0	1	0	1	0	0	2	0	0	0	0	2	0	0	0	0	0	0	92	10.2
22-Sep-12	9.00	19	9	1	28	10	0	2	1	1	0	1	0	7	0	0	2	4	0	0	1	1	1	0	0	0	0	1	89	9.9
23-Sep-12	9.00	29	2	0	6	7	0	1	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	5.4

Appendix D. continued

	Obs	Species[1]																											Birds
Date	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
24-Sep-12	9.00	37	4	2	10	4	1	1	0	0	0	0	0	5	0	0	0	0	2	0	0	1	0	0	0	0	0	0	67	7.4
25-Sep-12	9.00	9	3	0	23	17	1	6	0	0	0	0	0	46	0	0	0	1	1	0	1	4	0	0	0	0	0	0	112	12.4
26-Sep-12	8.25	19	0	1	16	5	1	1	0	0	0	0	0	7	0	0	1	2	0	0	1	2	1	0	0	0	0	0	57	6.9
27-Sep-12	8.83	5	2	0	28	7	1	2	0	0	0	0	0	18	0	0	0	0	0	0	0	2	0	0	0	0	0	0	65	7.4
28-Sep-12	9.00	34	4	0	35	15	0	6	0	0	0	0	0	23	0	0	1	1	1	0	0	3	0	1	0	1	0	0	125	13.9
29-Sep-12	9.50	33	3	0	44	26	3	3	0	1	0	0	0	31	0	0	0	2	6	1	0	7	0	0	0	1	0	0	161	16.9
30-Sep-12	9.00	74	2	2	39	15	0	0	0	0	0	0	0	17	0	0	1	2	2	0	1	4	0	0	0	0	0	0	159	17.7
01-Oct-12	9.00	9	5	0	19	9	1	0	0	0	0	0	0	6	0	0	0	2	2	0	0	1	0	0	0	0	0	0	54	6.0
02-Oct-12	9.00	21	2	0	47	16	1	2	1	0	0	0	0	20	0	0	0	2	9	0	0	1	0	2	0	0	0	1	125	13.9
03-Oct-12	9.00	47	0	0	10	2	0	2	1	0	0	0	0	16	0	0	1	3	1	0	0	0	0	0	0	0	0	0	83	9.2
04-Oct-12	9.00	0	0	1	14	3	1	1	0	0	0	0	0	5	0	0	0	0	2	0	0	0	0	0	0	0	0	0	27	3.0
05-Oct-12	9.00	1	0	1	28	9	0	1	1	0	0	0	0	17	0	0	0	0	0	0	0	2	0	0	0	0	0	0	60	6.7
06-Oct-12	9.00	1	1	1	73	13	0	1	0	0	0	0	0	12	0	0	1	9	1	0	1	2	0	0	0	0	0	1	117	13.0
07-Oct-12	9.00	3	3	1	215	34	3	4	1	0	1	0	0	19	0	0	0	0	2	0	2	10	0	1	0	0	0	0	299	33.2
08-Oct-12	9.00	2	2	0	70	21	1	3	0	2	0	0	0	13	0	1	1	3	1	0	0	5	0	0	0	0	0	0	125	13.9
09-Oct-12	9.00	2	0	0	39	5	0	1	0	0	0	0	0	10	0	1	0	3	5	0	0	5	0	1	0	0	0	0	72	8.0
10-Oct-12	9.00	0	1	1	63	5	0	1	0	0	0	0	0	17	0	0	0	5	2	0	1	7	0	1	2	0	0	0	106	11.8
11-Oct-12	9.00	0	1	2	61	5	0	0	0	0	0	0	0	11	0	0	1	6	0	0	1	6	0	1	0	0	0	0	95	10.6
12-Oct-12	4.00	0	0	0	6	1	0	0	0	0	0	0	0	3	0	1	0	0	0	0	0	0	0	1	0	0	0	0	12	3.0
13-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
14-Oct-12	9.00	0	0	1	16	4	2	0	1	0	0	0	0	6	0	0	0	12	2	0	0	1	0	0	0	0	0	0	45	5.0
15-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
16-Oct-12	2.00	0	0	0	4	1	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	8	4.0
17-Oct-12	8.75	0	0	1	101	8	2	1	0	0	0	0	0	39	0	7	0	3	1	0	0	9	0	0	0	0	0	0	172	19.7
18-Oct-12	8.83	0	0	1	57	7	0	0	0	0	0	0	0	6	0	9	0	1	3	0	0	5	0	0	0	0	0	0	89	10.1
19-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
20-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
21-Oct-12	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.00

Appendix D. continued

	Obs	Species[1]																											Birds
Date	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
22-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
23-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
24-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
25-Oct-12	7.25	0	0	0	4	5	1	0	0	0	0	0	0	9	0	1	0	4	4	0	0	2	0	0	0	0	0	0	30	4.1
26-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
27-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
28-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
29-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
30-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
31-Oct-12	0.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
Total	451.42	790	121	24	1446	446	26	106	9	15	1	8	3	605	0	20	23	76	48	1	22	97	4	10	5	3	0	15	3924	8.7

[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: 1994–2012.

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

Appendix E. continued

	2004	2005	2006	2007	2008	2009	2010	2011	2012	MEAN
Start date	27-Aug	27-Aug	28-Aug	27-Aug	28-Aug	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug
End date	29-Oct	27-Oct	31-Oct	31-Oct	31-Oct	25-Oct	22-Oct	29-Oct	25-Oct	28-Oct
Observation days	46	49	57	51	60	51	52	55	53	51
Observation hours	341.25	392.92	459.92	397.00	481.83	425.75	421.42	414.33	451.42	380.89
Raptors / 100 hours	1119.7	699.6	577.5	571.5	514.5	649.9	804.4	893.2	869.3	779.61
SPECIES	RAPTOR COUNTS									
Turkey Vulture	326	389	232	281	269	469	446	510	790	324
Osprey	70	60	38	47	70	101	81	72	121	67
Northern Harrier	29	38	33	13	19	33	18	39	24	29
Sharp-shinned Hawk	1790	1067	1015	921	1003	1110	1438	1448	1446	1132
Cooper's Hawk	485	269	418	249	316	339	420	380	446	346
Northern Goshawk	33	24	40	16	33	18	47	26	26	28
Unknown small accipiter[1]	27	14	7	52	111	71	10	81	106	38
Unknown large accipiter[1]	2	13	2	10	12	6	10	1	9	5
Unknown accipiter	0	46	60	12	37	0	27	0	15	54
TOTAL ACCIPITERS	2337	1433	1542	1260	1512	1544	1952	1936	2048	1586
Red-shouldered Hawk	7	0	0	3	3	1	0	0	1	1
Broad-winged Hawk	2	2	1	0	5	10	2	0	8	7
Swainson's Hawk	1	0	0	1	0	0	4	2	3	1
Red-tailed Hawk	725	562	531	388	359	361	588	775	605	573
Ferruginous Hawk	0	1	0	0	0	0	0	0	0	0
Rough-legged Hawk	17	3	27	6	16	8	5	2	20	12
Unidentified buteo	9	4	30	40	16	3	7	5	23	26
TOTAL BUTEOS	761	572	589	438	399	383	606	784	660	620
Golden Eagle	93	72	56	52	52	63	80	110	76	86
Bald Eagle	61	55	44	45	46	55	68	93	48	51
Unidentified eagle	2	1	1	2	8	5	1	3	1	3
TOTAL EAGLES	156	128	101	99	106	123	149	206	125	141
American Kestrel	14	9	17	7	16	27	9	8	22	19
Merlin	105	80	69	71	62	71	108	114	97	72
Prairie Falcon	5	3	7	6	3	2	8	4	4	5
Peregrine Falcon	14	14	10	5	11	11	10	21	10	8
Unknown small falcon[1]	1	2	0	5	0	0	0	0	5	1
Unknown large falcon[1]	0	10	1	3	0	2	0	1	3	2
Unknown falcon	0	6	1	1	2	0	0	0	0	2
TOTAL FALCONS	139	124	105	98	94	113	135	148	141	108
Unidentified raptor	3	5	16	33	10	1	3	6	15	21
GRAND TOTAL	3821	2749	2656	2269	2479	2767	3390	3701	3924	2895

[1] Designations used for the first time in 2001.

Appendix F. Daily capture totals of migrating raptors at Bonney Butte, Oregon: 2012.

DATE	STATION HOURS	SPECIES[1]														TOTAL	CAPTURES/HR
		NH	SS	CH	NG	RS	BW	RT	RL	GE	BE	AK	ML	PR	PG		
27-Aug-12	6.50	0	0	1	0	0	0	1	0	0	0	0	0	0	0	2	0.3
28-Aug-12	5.00	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	0.6
29-Aug-12	8.00	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.1
30-Aug-12	8.00	0	3	0	0	0	0	1	0	0	0	0	0	0	0	4	0.5
31-Aug-12	7.50	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
01-Sep-12	7.75	0	3	4	0	0	0	0	0	0	0	0	0	0	0	7	0.9
02-Sep-12	7.75	0	1	3	0	0	0	0	0	0	0	0	0	0	0	4	0.5
03-Sep-12	8.00	0	1	3	0	0	0	0	0	0	0	0	0	0	0	4	0.5
04-Sep-12	8.00	0	4	1	1	0	0	1	0	0	0	0	0	0	0	7	0.9
05-Sep-12	8.00	0	5	2	0	0	0	0	0	0	0	0	0	0	0	7	0.9
06-Sep-12	7.50	0	4	1	0	0	0	0	0	0	0	0	0	0	0	5	0.7
07-Sep-12	7.75	0	3	1	0	0	0	1	0	0	0	0	0	0	0	5	0.6
08-Sep-12	6.00	0	6	3	0	0	0	0	0	0	0	0	0	0	0	9	1.5
09-Sep-12	8.00	0	5	1	0	0	0	0	0	0	0	0	0	0	0	6	0.8
10-Sep-12	5.00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0.4
11-Sep-12	8.25	0	9	3	2	0	0	0	0	0	0	0	0	0	0	14	1.7
12-Sep-12	7.75	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
13-Sep-12	7.75	0	5	3	0	0	0	0	0	0	0	0	0	0	0	8	1.0
14-Sep-12	7.25	0	5	5	0	0	0	1	0	0	0	0	0	0	0	11	1.5
15-Sep-12	8.00	0	5	1	0	0	0	2	0	0	0	0	0	0	0	8	1.0
16-Sep-12	8.00	0	5	1	0	0	0	0	0	0	0	0	0	0	0	6	0.8
17-Sep-12	8.00	0	3	4	0	0	0	1	0	0	0	0	1	0	0	9	1.1
18-Sep-12	7.75	0	5	2	0	0	0	0	0	0	0	0	0	0	0	7	0.9
19-Sep-12	7.75	0	4	2	0	0	0	3	0	0	0	0	0	0	0	9	1.2
20-Sep-12	8.00	0	4	5	0	0	0	1	0	0	0	0	0	0	0	10	1.3
21-Sep-12	6.25	0	5	1	0	0	1	1	0	0	0	0	0	0	0	8	1.3
22-Sep-12	7.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
23-Sep-12	7.50	0	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0.5
24-Sep-12	7.50	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
25-Sep-12	8.00	0	3	2	0	0	0	2	0	0	0	0	0	0	0	7	0.9
26-Sep-12	8.00	0	1	1	0	0	0	0	0	1	0	0	0	0	0	3	0.4
27-Sep-12	7.75	0	2	0	0	0	0	0	0	0	0	0	1	0	0	3	0.4
28-Sep-12	8.00	0	7	3	0	0	0	0	0	0	0	0	0	0	0	10	1.3
29-Sep-12	8.00	0	12	2	1	0	0	1	0	0	0	0	0	0	0	16	2.0
30-Sep-12	8.00	0	1	1	0	0	0	1	0	0	0	0	0	0	0	3	0.4
01-Oct-12	8.00	0	3	0	0	0	0	3	0	0	0	0	0	0	0	6	0.8
02-Oct-12	8.00	0	4	3	0	0	0	5	0	0	0	0	0	0	0	12	1.5
03-Oct-12	7.50	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1
04-Oct-12	7.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
05-Oct-12	7.00	0	1	2	0	0	0	0	0	0	0	0	0	0	0	3	0.4
06-Oct-12	7.75	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0.3
07-Oct-12	7.75	0	4	2	1	0	0	1	0	0	0	0	0	0	0	8	1.0
08-Oct-12	8.00	0	5	0	0	0	0	1	1	0	0	0	0	0	0	7	0.9
09-Oct-12	7.00	0	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0.4
10-Oct-12	8.00	0	3	2	0	0	0	1	0	0	0	0	0	0	0	6	0.8
11-Oct-12	8.00	0	14	0	0	0	0	3	0	0	0	0	2	0	0	19	2.4

Appendix F. Daily capture totals of migrating raptors at Bonney Butte, Oregon: 2012.

	STATION	SPECIES[1]															
DATE	HOURS	NH	SS	CH	NG	RS	BW	RT	RL	GE	BE	AK	ML	PR	PG	TOTAL	CAPTURES/HR
12-Oct-12	3.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
13-Oct-12	0.00																
14-Oct-12	7.75	0	2	1	1	0	0	0	0	1	0	0	0	0	0	5	0.6
15-Oct-12	0.00																
16-Oct-12	0.00																
17-Oct-12	7.00	0	6	1	0	0	0	1	0	0	0	0	1	0	0	9	1.3
18-Oct-12	7.25	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3
19-Oct-12	0.00																
20-Oct-12	0.00																
21-Oct-12	0.00																
22-Oct-12	0.00																
23-Oct-12	0.00																
24-Oct-12	0.00																
25-Oct-12	3.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0

[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: 1995–2012.

	1995	1996	1997	1998	1999	2000	2001	2002	2003
First trapping day	7-Oct	18-Sep	31-Aug	6-Sep	5-Sep	28-Aug	25-Aug	27-Aug	26-Aug
Last trapping day	28-Oct	10-Oct	1-Nov	30-Oct	24-Oct	24-Oct	28-Oct	27-Oct	27-Oct
Number of stations	1	1	1	1	1	1	1	1	1
Station days	10	21	39	34	22	58	50	55	47
Station hours	44.50	127.20	202.80	199.95	142.75	239.75	320.50	357.75	345.35
Captures / 10 stn hrs	4.9	10.0	11.0	12.8	10.0	13.0	10.3	10.4	12.5
Species	Number of captures								
Northern Harrier	0	1	0	2	1	1	0	6	4
Sharp-shinned Hawk	18	80	139	163	82	161	171	172	268
Cooper's Hawk	0	20	29	43	14	67	74	71	64
Northern Goshawk	1	7	7	3	3	8	11	7	12
Red-shouldered Hawk	0	0	0	0	0	0	0	0	0
Broad-winged Hawk	0	0	0	0	0	1	0	0	0
Red-tailed Hawk	2	14	39	29	36	66	66	108	73
Rough-legged Hawk	0	0	1	0	1	0	1	0	0
Golden Eagle	0	3	2	1	2	3	2	0	2
Bald Eagle	0	0	0	0	0	0	0	0	0
American Kestrel	0	0	0	0	1	0	1	0	0
Merlin	1	2	5	11	3	1	4	5	4
Prairie Falcon	0	0	1	4	0	1	0	1	3
Peregrine Falcon	0	0	0	0	0	2	0	1	0
All species	22	127	223	256	143	311	330	371	430
Recaptures[1]	0	0	0	0	0	0	0	0	0
Foreign Recaptures[2]	0	0	1	1	0	0	1	0	2
Foreign Encounters[3]	1	0	1	2	6	3	2	6	8

Appendix G. continued

	2004	2005	2006	2007	2008	2009	2010	2011	2012	Mean*	Total
First trapping day	27-Aug	27-Aug	27-Aug	27-Aug	28-Aug	27-Aug	27-Aug	1-Sep	27-Aug	27-Aug	
Last trapping day	15-Oct	27-Oct	28-Oct	30-Oct	30-Oct	25-Oct	21-Oct	26-Oct	25-Oct	25-Oct	
Number of stations	1	1	1	1	1	1	1	1	1	1	
Station days	36	48	49	45	56	49	38	30	51	45	
Station hours	263.00	342.25	354.25	317.25	406.00	359.50	263.25	139.52	376.25	293.88	
Captures / 10 stn hrs	15.0	15.3	13.9	10.5	10.5	13.9	13.5	10.6	7.7	12.3	
Species											
Northern Harrier	2	7	2	1	3	3	0	0	1	2.3	34
Sharp-shinned Hawk	219	310	259	200	247	337	199	93	168	209.1	3193
Cooper's Hawk	90	101	88	74	100	98	68	30	73	70.1	1074
Northern Goshawk	14	12	11	3	15	3	21	2	6	9.3	144
Red-shouldered Hawk	0	0	0	1	1	0	0	0	0	0.1	2
Broad-winged Hawk	0	0	0	0	1	0	0	0	1	0.1	3
Red-tailed Hawk	61	67	106	42	45	39	57	19	33	59.6	883
Rough-legged Hawk	0	1	1	0	1	0	0	0	1	0.4	7
Golden Eagle	1	3	6	0	1	2	1	0	2	1.9	31
Bald Eagle	0	1	0	0	0	2	0	0	0	0.2	3
American Kestrel	0	0	2	1	1	1	1	2	0	0.6	8
Merlin	4	13	12	9	8	12	8	2	5	7.1	107
Prairie Falcon	4	3	4	2	1	1	0	0	0	1.8	25
Peregrine Falcon	0	4	1	0	1	0	0	0	0	0.6	9
All species	395	522	492	333	425	498	355	148	290	363.1	5523
Recaptures[1]	2	1	1	0	0	0	0	0	0	0.3	4
Foreign Recaptures[2]	2	3	1	1	1	2	1	0	1	1.1	17
Foreign Encounters[3]	5	9	6	7	3	8	9	4	2	5.1	82

[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.
* Mean calculations do not include 2011 because banding efforts were limited, not standardized, and conducted under a collaborators permitted bands.