

**FALL 2002 RAPTOR MIGRATION STUDIES IN THE
GOSHUTE MOUNTAINS OF NORTHEASTERN NEVADA**

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February 2003

The Goshute Mountains Raptor Migration Project in northeastern Nevada is an ongoing effort to monitor long-term trends in populations of raptors using the Intermountain Flyway (*sensu* Hoffman et al. 2002). HWI and its organizational precursors have been studying the fall raptor migration in the Goshute Mountains since 1980 when HWI founder Steve Hoffman and colleagues first began banding at the site. Standardized counts were begun in 1983 and have continued each year since. This is one of the longest running standardized, raptor-migration monitoring efforts in western North America, with the 2002 season marking the 23rd consecutive season of banding and 20th consecutive count at the site. Annual counts typically range between 17,000-25,000 migrants of up to 18 species, making this one of the largest concentrations in the western U.S. and Canada. This report provides a brief summary of the 2002 count and banding results. HWI will present a more in-depth review of the season's results in a comprehensive, multi-site report in summer 2003.

STUDY SITE

The Goshute Mountains form a 100-km ridge that runs north–south along the Utah–Nevada border. The study site is located in the Goshute Wilderness Study Area approximately 40 km southwest of Wendover, Nevada, on land administered by the Bureau of Land Management (BLM), Elko Field Office (40° 25.417' N, 114° 16.276' W). The project site is located near the south end of the Goshute range and is reached via a primitive road that begins near Ferguson Springs and then a primitive trail that ascends Christmas Tree Canyon from the east.

Before 2001, the main count site was located atop the highest point of the ridge in the project area at an elevation of 2,743 m. This location provided an expansive 360° view of the surrounding landscape, but poor visibility at or below eye level on the east side. Hence, to address the fact that the view to the east from the main count site was obstructed, in most years after 1983 when easterly winds prevailed, the observers commonly moved about 250 m north to a second observation post that provided an unobstructed view along the lower eastern flanks of the ridge. After considerable deliberation and for reasons describe in detail in Vekasy and Smith (2002), HWI's Science Committee (which includes HWI staff and Board members, experienced HWI field observers, and outside experts) decided to adopt a new standard of using only the latter observation post throughout the season beginning in 2001.

In 2002, four banding stations were located 100–700 m to the north, south, and southeast of the observation post. **North** station, established mid-season in 1989 and modified slightly in 1998, was located about 300 m north-northwest of the count site on top of the ridge at 2,700 m elevation, and was the first station southbound migrants encountered. **West** station, established in 1980 and modified slightly in 1995 and 2000, was located about 100 m south and slightly west of the count site on the west flank of the ridge at 2,720 m elevation. **Meadow** station, established in 1987 and modified in 1996, 1998, and 2000, was located about 500 m southeast of the count site on the east flank of the ridge in a natural sagebrush meadow at 2,620 m elevation. **South** station, established in 1982 and modified in 1998, was located 700 m south and slightly east of the count site in a topographic saddle at 2,660 m elevation.

COUNT METHODS

Two official or designated observers, relieved or supplemented by other trained volunteers, conducted standardized daily counts of migrating raptors from a single observation site (OP2). Primary observers Nathan McNett and Greg Levandoski had six and two full-seasons, respectively, of previous experience counting migratory raptors, both having worked for HWI before. Visitors and other crewmembers also frequently assisted with spotting migrants. Weather permitting, observations usually began between 0800 and 0900 hrs Mountain Standard Time (MST) and ended near sunset, usually between 1800 and 1900 hrs.

Data gathering and recording followed standardized protocols used at all HWI migration sites and as outlined in prior reports for this project (e.g., Vekasy and Smith 2002).

TRAPPING AND BANDING METHODS

Rotating crews of 1–5 trappers and processors operated each trapping station, with crew size depending on volunteer availability, trapper experience, characteristics of the station, and flight volume. The crews generally trapped between 0900 and 1700 hrs MST. Capture devices included mist nets, remotely triggered standard bow nets, remotely triggered surge bow nets, and dho-gaza nets. Each banding station operated from 3–6 standard bow nets, 1 surge bow net, 1–3 dho-gazas, and 3–4 mist 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. Processors identified species, subspecies, sexes, and ages of all birds using morphological characteristics, and recorded a series of standard morphometric, health, and molt data for each bird. Unless selected for attachment of a satellite transmitter, all birds were released within 45 minutes from the time of capture. All birds with transmitters were released within one hour of capture.

OBSERVATION EFFORT

Counts occurred on 81 of 83 possible observation days between 15 August and 5 November. The number of observation days was significantly higher (5%) than the 1983–2001 average of $77 \pm 95\%$ CI of 2.7 days. The total hours of observation (725.67) also was significantly higher (8%) than the 1983–2001 average of $664.1 \pm 95\%$ CI of 34.60 hours. The 2002 average of 2.1 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) was significantly lower (19%) than the 1990–2001 (period during which a minimum of two full-time observers has been the standard) mean of $2.7 \pm 95\%$ CI of 0.30 observers/hr.

MIGRATION SUMMARY

The observers counted 11,349 migrant raptors of 17 species during the 2002 season (see Appendix B for unadjusted daily count records). Except for 1993, this is the lowest overall count recorded since 1987 (see Appendix E for annual summaries). In particular, the count of only 11 Northern Goshawks was by far the lowest count ever recorded for this species at the site. No other record-low, species-specific counts occurred, however, which is apt testimony to the fact that most species showed pronounced increasing trends in the Goshutes between the late 1980s and mid-1990s, likely due to the positive influence of high moisture levels on raptor productivity in the otherwise xeric northern Great Basin during this period. In contrast, the low 2002 counts continue a pattern of general decline since 1997/1998 when prolonged drought began to plague much of the interior West.

The 2002 flight was composed of 50% accipiters, 28% buteos, 14% falcons, 3% eagles, 2% vultures, and 1% or less each of harriers, Ospreys, and unidentified raptors. The 2002 season featured a significantly below-average proportion of accipiters and significantly above-average proportions of buteos, eagles, harriers, and Ospreys (Figure 1). The most commonly observed species were the Sharp-shinned Hawk and Red-tailed Hawk (27% each of the total count), followed by Cooper's Hawk (21%), American Kestrel (13%), Golden Eagle (3%), and Turkey Vulture (2%). No other species comprised more than 1.5% of the total count.

The combined-species median passage date of 27 September 2002 was a significant 4 days later than average. Twelve species showed later than average median passage dates in 2002, with the differences significant for nine species. Only Swainson's Hawks showed significantly earlier than average timing. The overall, combined-species seasonal activity pattern showed atypically low activity during the middle

of September and the first five days of October due to stormy weather, followed by relatively high activity levels through most of the rest of October (Figure 2). Thus, at least slightly late passage timing seemed to be the rule for most species using the Goshute flyway in 2002; however, this pattern did not extend to other HWI sites in the West. This suggests that a localized shift in flight dynamics or weather effects caused the Goshute pattern rather than a larger-scale regional shift in migration timing.

Adjusted (to standardize for annual sampling period and adjust for incompletely identified birds) passage rates were significantly higher than average for Broad-winged Hawks, Golden Eagles, and Peregrine Falcons, but below average for all other species, significantly so for Turkey Vultures, Northern Harriers, Sharp-shinned Hawks, Cooper's Hawks, Northern Goshawks, Swainson's Hawks, Rough-legged Hawks, American Kestrels, and Prairie Falcons (Table 1). Broad-winged Hawks, Golden Eagles, and Peregrine Falcons are all showing significant long-term increases in the Goshutes; however, for both broad-wings and peregrines, the rate of increase has slacked off in the past few years (Figure 3). In contrast, the Golden Eagle is one of only three species (the others being Bald Eagle and Rough-legged Hawk) for which a distinct, recent downturn has not occurred. In fact, significant quadratic regressions confirm for seven species (Turkey Vulture, Sharp-shinned Hawk, Cooper's Hawk, Ferruginous Hawk, American Kestrel, Merlin, and Prairie Falcon) a flip-flop from primarily increasing patterns from the mid-1980s through mid-1990s to primarily decreasing patterns beginning in 1997/1998 when prolonged drought conditions set in throughout much of the interior West (e.g., see Figure 4).

Thus, for most species, well below-average 2002 counts in the Goshutes appeared to extend patterns of decline since the drought set in. Moreover, as was also true in 2001, 7 of 10 species for which comparisons were possible showed below average immature : adult ratios in 2002, with the differences significant for five species. These statistics suggest that the drought contributed to low nesting success and juvenile recruitment in 2002, and hence to the low counts. HWI also documented record low total counts in the Bridger Mountains, MT and at Bonney Butte, OR in 2002. However, the fall 2002 season featured stark contrasts within each of the three major western flyways, which confound interpretation of the season's results.

In the Pacific Coast Flyway, HWI documented a slightly above-average overall count at Chelan Ridge, WA in the northeastern Cascades but a record-low total count at Bonney Butte in the Oregon Cascades. Farther south, Golden Gate Raptor Observatory (GGRO 2003) reported the highest ever (since 1984) activity levels at its monitoring site in the Marin Headlands of California. In the Intermountain Flyway, HWI's low Goshute count matched the long-term pattern at Lipan Point in the Grand Canyon (since 1991), but when counts were combined for HWI's two Grand Canyon sites, the combined total in the Grand Canyon was about average compared to the last five years, whereas the Goshute count was 60% lower than the relevant 1997–2001 average. Moreover, Idaho Bird Observatory reported the third highest overall count for their site near Boise (G. Kaltenecker personal communication). In the Rocky Mountain Flyway, a record-low overall count contrasted with an average overall count in the Manzano Mountains, NM.

Other evidence such as higher than usual band-return rates during the past two years, high mortality among many of our satellite telemetry birds, evidence of very low nesting activity and success among Northern Goshawks in the region, and corroborating data from passerine studies suggest that the drought is in fact reducing productivity and survival for many species. However, the stark contrasts in pattern seen across the western migration-monitoring network in 2002 suggest that the drought and other pronounced changes in regional weather patterns may also be contributing to substantial changes in the dynamics of raptor migration through western North America. For example, perhaps the occurrence of record-high activity levels in coastal California but very low activity in northeastern Nevada reflects an intentional diversion of many birds away from Intermountain routes that pass through the drought-stricken Great Basin and into Pacific Coast routes where the drought has been less severe.

TRAPPING EFFORT

The crews operated 1–4 banding stations on 68 of 74 days between 24 August and 5 November (see Appendix D for daily capture records and Appendix E for annual summaries). The number of trapping days and station hours (1,449.8) were 15% and 14% higher, respectively, than the 1980–2001 averages (average of 3.6 stations per season), but were very similar to the 1987–2001 averages (average of 4.4 stations/season) of 65 days and 1,677 hours.

TRAPPING SUMMARY

The 2002 capture total of 2,357 raptors included 10 species, 2,346 newly banded birds, 7 recaptures of birds previously banded in the Goshutes, and 4 foreign recaptures (i.e., recaptures of birds originally banded elsewhere; Table 2, Appendix E). The 2002 effort raises the total number of birds captured since project inception to 49,309, including 82 Goshute recaptures and 33 foreign recaptures. Sharp-shinned Hawks accounted for 55% of the total 2002 captures, followed by Cooper's Hawks (34%), Red-tailed Hawks (5%), and American Kestrels (5%). Each of the remaining species accounted for less than 1% of the total. Highlights included the second highest capture total for Red-tailed Hawks (also only the second 100+ capture total for this species), including two uncommon Harlan's subspecies, and the third highest capture total for Golden Eagles, including an unprecedented three after-hatch year birds. In contrast, the total of only 7 Northern Goshawks was the lowest capture total for this species since 1986.

The 2002 combined-species capture total was 16% below average, primarily due to significantly below-average totals for two of the four most commonly captured species: Sharp-shinned Hawks (down 22%) and American Kestrels (down 38%; Table 2). Capture totals were also at least slightly below average for Cooper's Hawks (1%), Prairie Falcons (35%), and the three rarely captured buteos (Broad-winged, Swainson's, and Rough-legged Hawks), whereas totals were above average for Northern Harriers, Red-tailed Hawks, Golden Eagles, Merlins, and Peregrine Falcons. Capture rates generally mirrored these results, except that the capture rate for Cooper's Hawks was 13% above average (Table 2). In contrast, aside from the three uncommonly captured buteos, capture success was above average for all other species except American Kestrels, significantly so for all but Northern Harriers (Table 2).

Decent capture rates and high capture success despite often well-below average flight volume applied to each of HWI's four western migration banding sites in 2002 (including Bonney Butte, OR, Chelan Ridge, WA, and the Manzano Mountains, NM). These statistics suggest that migrants of most species were hungrier than usual and therefore more likely to be attracted to our trapping operations, which appears consistent with the notion that the drought reduced foraging opportunities and success.

ENCOUNTERS WITH PREVIOUSLY BANDED BIRDS

The 2002 captures included five recaptures of Cooper's Hawks and two recaptures of Sharp-shinned Hawks originally banded in the Goshutes between 1996–2000 (Table 3). This brings the total number of Goshute recaptures since 1980 to 82 birds, all accipiters (Appendix E).

The 2002 captures included four foreign recaptures of birds originally banded elsewhere: 2 Cooper's Hawks and 2 Sharp-shinned Hawks (Table 4). At the time of this writing, we were still awaiting a full report from the Bird Banding Lab to identify the origins of these birds.

As of February 2003, we had received word of 29 foreign encounters with Goshute-banded birds in 2002, including 8 birds banded during the 2002 season! The previous high annual total for the site was 21 birds in 1993 (Appendix C) and never before had so many returns been reported so quickly following a particular season. The 2002 encounters bring the total foreign encounters since 1980 to 304 birds. The 2002 encounters involved 13 Cooper's Hawks banded between 1993 and 2002, 11 Sharp-shinned Hawks

banded between 1997 and 2002, 3 Red-tailed Hawks banded in 2001 and 2002, a Merlin banded in 2001, and a Prairie Falcon banded in 2000.

The Prairie Falcon was found dead in June in the Imperial Valley of southern California. The Merlin was found in August after it had been injured in British Columbia, but was later released apparently in decent shape. One Red-tailed Hawk was found injured in November and taken to a rehabilitation facility in southern Arizona. One Cooper's Hawk was found injured in March and later died near Delta, Utah; another was captured and released after it raided a pigeon coop in Montana; another was shot during winter in Sinaloa, Mexico; and another was found dead in some type of nest in October near Sedona, Arizona. The reporter for the last bird thought that it had been killed by a nest predator, but the timing and location suggest otherwise. Three Sharp-shinned Hawks were recovered dead in British Columbia, Washington, and Arizona after having collided with or becoming entangled in manmade structures or materials, and another died in southern California in April after having been trapped inside a building. Otherwise, the remaining pre-2002 accipiters were simply found dead with no known cause of death in Arizona, Idaho, Oregon, British Columbia, and the Yukon Territory (first HWI band-return in 20+ years from this province!), and we are still awaiting full reports from the Bird Banding Lab concerning recoveries of the eight 2002 birds.

SATELLITE TELEMETRY

We succeeded in deploying satellite transmitters on 3 Northern Goshawks, 4 Red-tailed Hawks, and 6 Golden Eagles in the Goshutes during the 2002 season. This fulfilled our objectives except for falling well short of our target of seven goshawks. The abysmally low count of only 11 goshawks obviously contributed to the poor showing for this species. Moreover, 4 of the 7 captured goshawks were either too small or in too poor condition to be suitable for outfitting.

As has been the rule thus far, all three of the 2002 goshawks died rather quickly. One second-year bird wandered both north and south of the project site after its release and ended up perishing within 2–3 weeks at a location ~20 km SSW of the project site near the Kinsley Mountains of Nevada. We recovered this transmitter and the circumstances suggested that the bird either succumbed to a fatal accident or was killed by a predator while foraging. The location was within an occupied Golden Eagle territory, a known potential predator. Another Goshute bird perished within about three weeks after traveling ~120 km SSW of the project site to an area along the eastern foothills of the Egan Range near Ely, Nevada. We were again unable to determine the cause of death due to heavy scavenging; however, the short survival time, abundance of suitable prey in the area, and the existence of a known nearby Great Horned Owl territory suggested that predation might have been the culprit. The third Goshute bird survived for 1–2 months after its release and traveled ~135 km north of the project site to near the Delano Mountains of northeastern Nevada. This otherwise healthy bird had sustained a compound fracture of one wing (most likely a foraging accident) and probably died quickly from the injury.

Consistently short survival times limit our ability to be sure that these birds' movements represent typical behavior. Nevertheless, all of the goshawks we have outfitted in the Goshutes thus far have remained within 200 km of the project site and have shown multi-directional movements, suggesting that, outside of cyclical boreal-invasion events, most of the birds we see in the Goshutes are probably regional residents. This bodes well for our interest in using counts of young birds as an index to local productivity.

One of the 2002 Red-tailed Hawks, outfitted in late September 2002, traveled to near Bakersfield, California, but died shortly thereafter. We subsequently recovered the transmitter from this bird, with only scattered feathers remaining at the time of recovery. The other three birds are currently wintering in the San Gabriel Mountains just north of San Bernardino, California, in the Gila River Valley about 85

km southeast of Phoenix, Arizona, and just across the California border in Baja California about 45 km east of Tijuana.

As of February 2003, all six of the Golden Eagles outfitted in 2002 were still alive. Their current wintering areas include the Toiyabe Range of central Nevada, the Dixie National Forest of southwest Utah, the Hurricane Cliffs area in southwest Utah, the Mimbres River valley in southwestern New Mexico (after first wandering into northern Chihuahua, Mexico), west-central Texas between Lubbock and Abilene, and the northernmost foothills of the Sierra Madre Occidental along the Sonora–Chihuahua border in northern Mexico. The wintering distributions of these six new Goshute eagles extend much farther southeast than those of our first four Goshute birds.

Complete tracking summaries and maps for all of HWI's telemetry birds can be found on our web site at www.hawkwatch.org. A comprehensive 2003 telemetry progress report also can be accessed in the publications section of the web site.

IDENTIFYING MIGRANT ORIGINS THROUGH STABLE ISOTOPE ANALYSES

For the first time in 2002, HWI contributed feather samples from Red-tailed Hawks and Northern Goshawks captured in the Goshutes to two Boise State University graduate student studies designed to use analyses of stable-isotope ratios to identify migrant origins. This cutting-edge technique uses known geographic patterns of variation in the distribution of heavy and light isotopes of primarily hydrogen to determine the approximate latitudinal origins of migrants (Meehan et al. 2001, Smith et al. in press). Variation in precipitation patterns contributes to distinct patterns of variation in the ratios of heavy and light hydrogen isotopes across the landscape, and these isotope signatures are incorporated in the growing feathers of young birds. Thus, feathers can be collected from juvenile migrants, the isotope ratios in the feathers determined, and then each bird's signature can be compared against the known distribution of isotope-ratios across the landscape to identify the approximate latitudinal origins of each migrant.

The resolution of the analyses is rather coarse scale, but for broad-ranging species allows researchers to determine whether migrants derive primarily from, for example, northern, central or southern segments of the species' range. This technique has already yielded valuable insight concerning the origins and migration ecology (relative passage timing of different subpopulations) of migrants sampled at HWI migration project sites in Florida (Meehan et al. 2001, Lott et al. 2003) and in the Manzanos (Smith et al. in press, DeLong 2003). Moreover, compared to complimentary satellite-telemetry studies, the stable-isotope technique can be applied to any size bird. In 2002, HWI collected feathers for the red-tail and goshawk studies at all of its banding project sites in the West, and we anxiously await the results of the pending analyses.

If appropriate funding can be secured, HWI hopes to significantly expand its involvement in stable-isotope research beginning in fall 2003.

SITE VISITATION

In 2002, 255 individuals signed the HWI visitor logs, which is slightly below average for the site but still a good showing. Frequently poor weekend weather and unusually cool temperatures in September may have contributed to the slight reduction in visitation. The visitors included 105 members of organized groups, including 65 middle school students from nearby Wendover, UT/NV, a student group from Utah State University, a Sierra Club group, and members of several scout troops.

ACKNOWLEDGMENTS

For financial and in-kind support in 2002, we enthusiastically thank the National Fish and Wildlife Foundation, Bureau of Land Management–Elko Field Office, Bureau of Reclamation–Upper Colorado Region, Mr. George Perkins, Jr., JEPS Foundation, Dr. Ezekiel R. and Edna Wattis Dumke Foundation, Katherine W. Dumke and Ezekiel R. Dumke, Jr. Foundation, Barrick Goldstrike Mines, Kennecott Utah Copper Corporation, Dr. Kay Millar, Jennifer and Randy Speers, and HWI members. In particular, besides direct financial support, the BLM Elko District provided helicopter airlift and other essential logistical support; special thanks to the Elko Dispatch staff for communications support and to Steve Dondero, Ray Lister, and Tamara Hawthorne for project oversight. We are also very grateful for the support of Michael Devine and the Stateline–Silversmith Casino Resorts of Wendover, Nevada, who donated hotel accommodations for the field crews on their days off. Thanks also to Eddie Pouch and the Ruby Valley YCC Crew for their help in setting up camp. For food, supplies, and services discounts and donations, we thank Smith’s of Wendover, Einstein’s Bagels in Salt Lake City, Salt Lake Roasting Company, The Leather Factory, West Wendover Waste Water Treatment Plant, and West Wendover Public Water Works. Lastly, special thanks to Don Baccus, Brian Meiering, Jerry Liguori, Aaron Barna, Steve Wilson, and Patricia Johnson for volunteering their time to assist our field crews.

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Table 1. Unadjusted counts and adjusted passage rates by species: 1983–2001 versus 2002.

SPECIES	COUNTS			RAPTORS/100 HOURS ¹		
	1983–2001 ²	2002	% CHANGE	1983–2001 ²	2002	% CHANGE
Turkey Vulture	315 ± 72.0	243	-23	90.8 ± 18.28	72.4	-20
Osprey	92 ± 21.9	83	-10	21.2 ± 4.41	18.1	-15
Northern Harrier	181 ± 35.2	154	-15	28.3 ± 4.77	23.0	-18
Sharp-shinned Hawk	4945 ± 937.4	3009	-39	1066.0 ± 160.54	629.1	-41
Cooper's Hawk	3379 ± 698.2	2369	-30	820.9 ± 140.80	589.1	-28
Northern Goshawk	120 ± 23.8	11	-91	19.7 ± 3.70	1.7	-91
Unknown small accipiter ³	–	246	–	–	–	–
Unknown large accipiter ³	–	4	–	–	–	–
Unknown accipiter	359 ± 89.2	7	-98	–	–	–
TOTAL ACCIPITERS	8803 ± 1581.9	5646	-36	–	–	–
Red-shouldered Hawk	0.3 ± 0.3	0	-100	–	–	–
Broad-winged Hawk	41 ± 16.2	58	+40	15.3 ± 5.45	21.3	+39
Swainson's Hawk	205 ± 64.5	91	-56	49.7 ± 15.24	23.4	-53
Red-tailed Hawk	2995 ± 453.7	3008	0	493.1 ± 58.62	458.3	-7
Ferruginous Hawk	16 ± 3.1	20	+22	2.7 ± 0.51	2.6	-6
Rough-legged Hawk	15 ± 4.9	6	-61	7.7 ± 2.12	2.5	-67
Unidentified buteo	72 ± 22.9	42	-42	–	–	–
TOTAL BUTEOS	3346 ± 499.1	3225	-4	–	–	–
Golden Eagle	270 ± 26.1	330	+22	42.8 ± 3.60	46.8	+9
Bald Eagle	13 ± 3.3	12	-10	2.7 ± 0.62	2.2	-19
Unidentified eagle	1 ± 0.6	0	-100	–	–	–
TOTAL EAGLES	284 ± 28.0	342	+20	–	–	–
American Kestrel	2058 ± 434.5	1503	-27	427.0 ± 82.71	315.9	-26
Merlin	41 ± 13.0	39	-4	7.8 ± 2.46	7.2	-8
Prairie Falcon	30 ± 6.4	12	-61	5.0 ± 0.95	2.2	-55
Peregrine Falcon	11 ± 4.4	15	+38	2.0 ± 0.72	3.1	55
Unknown small falcon ³	–	0	–	–	–	–
Unknown large falcon ³	–	4	–	–	–	–
Unknown falcon	7 ± 2.2	2	-73	–	–	–
TOTAL FALCONS	2147 ± 453.0	1575	-27	–	–	–
Unidentified raptor	129 ± 44.6	81	-37	–	–	–
GRAND TOTAL	15298 ± 2522.0	11349	-26	–	–	–

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

² Mean ± 95% confidence interval.

³ These categories represent new distinctions initiated as standard practice in 2002 (see Appendix A).

Table 2. Capture totals, rates, and successes: 1987–2001 versus 2002.

SPECIES	CAPTURE TOTAL		CAPTURE RATE ¹		CAPTURE SUCCESS (%) ²	
	1987–2001 ³	2002	1987–2001 ³	2002	1987–2001 ³	2002
Northern Harrier	7 ± 2.7	8	0.5 ± 0.19	0.6	4.4 ± 1.64	5.2
Sharp-shinned Hawk	1648 ± 245.8	1284	100.1 ± 7.99	88.6	29.3 ± 5.08	40.7
Cooper's Hawk	800 ± 148.5	791	48.2 ± 5.08	54.6	20.1 ± 3.04	31.9
Northern Goshawk	35 ± 11.7	7	2.1 ± 0.51	0.5	28.0 ± 4.11	63.6
Broad-winged Hawk	1 ± 0.5	0	0.1 ± 0.03	0.0	2.7 ± 1.26	0.0
Swainson's Hawk	0.3 ± 0.3	0	0.0 ± 0.02	0.0	0.1 ± 0.16	0.0
Red-tailed Hawk	76 ± 15.3	109	4.6 ± 0.60	7.5	2.3 ± 0.32	3.6
Rough-legged Hawk	0.1 ± 0.3	0	0.0 ± 0.02	0.0	0.6 ± 1.14	0.0
Golden Eagle	5 ± 1.5	9	0.3 ± 0.12	0.6	1.9 ± 0.60	2.7
American Kestrel	203 ± 52.8	127	11.6 ± 2.36	8.8	8.6 ± 2.38	8.4
Merlin	12 ± 3.4	15	0.7 ± 0.21	1.0	21.7 ± 4.68	38.5
Prairie Falcon	6 ± 1.9	4	0.4 ± 0.10	0.3	18.6 ± 4.54	33.3
Peregrine Falcon	1 ± 0.6	3	0.1 ± 0.04	0.2	9.7 ± 5.81	20.0
All Species	2796 ± 438.2	2357	168.8 ± 11.98	162.6	17.4 ± 2.63	21.8

¹ Captures / 100 station hours.

² Number of birds captured / number of birds observed * 100, with birds identified only to the generic group level (i.e., unknown accipiter, buteo, falcon, or eagle) allocated to relevant species in proportion to their occurrence. For calculating the “all species” values, non-trappable species and distant birds not identified at least to the generic group level were excluded.

³ Mean of annual values ± 95% confidence interval. Limited to years when at least three trapping blinds were operated.

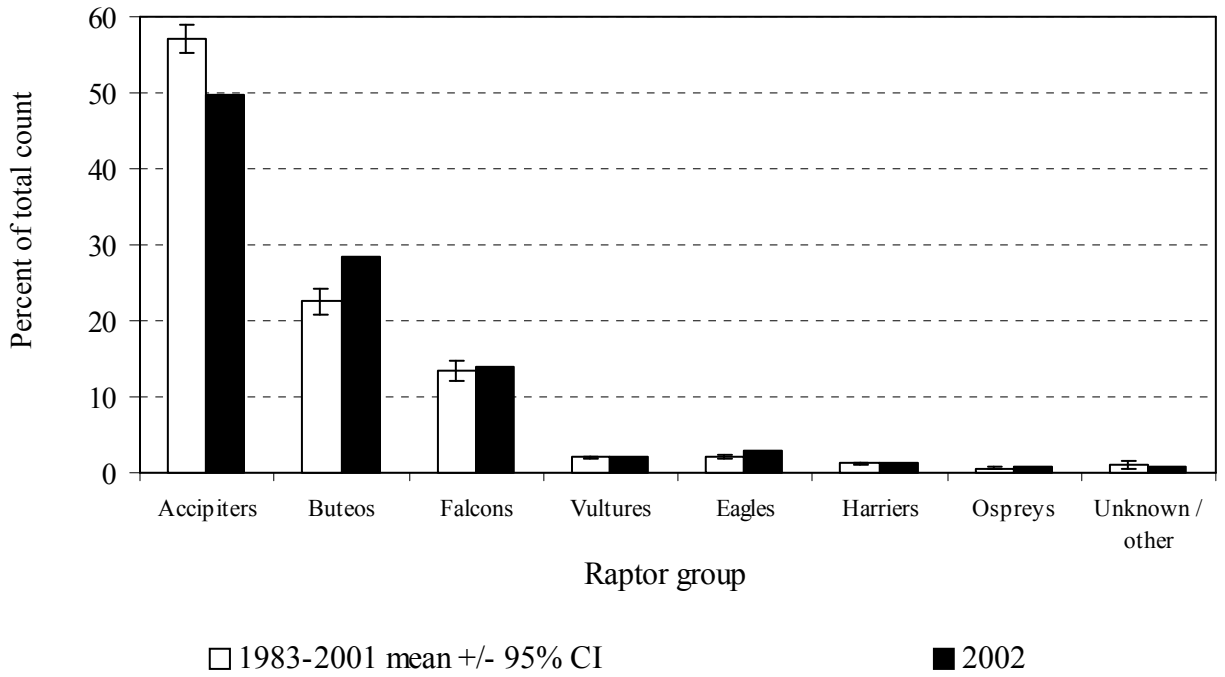


Figure 1. Flight composition by major species groups: 1983–2001 versus 2002.

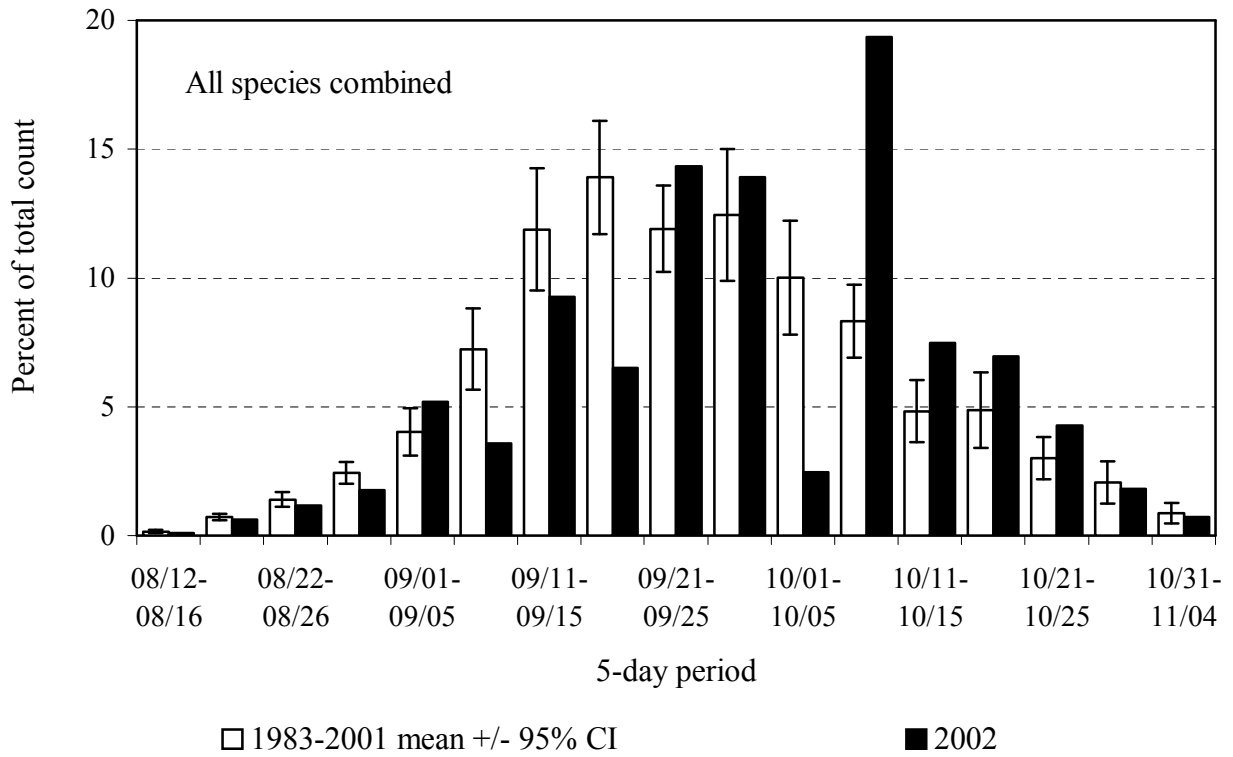


Figure 2. Combined-species passage volume by five-day periods: 1983–1999 versus 2001.

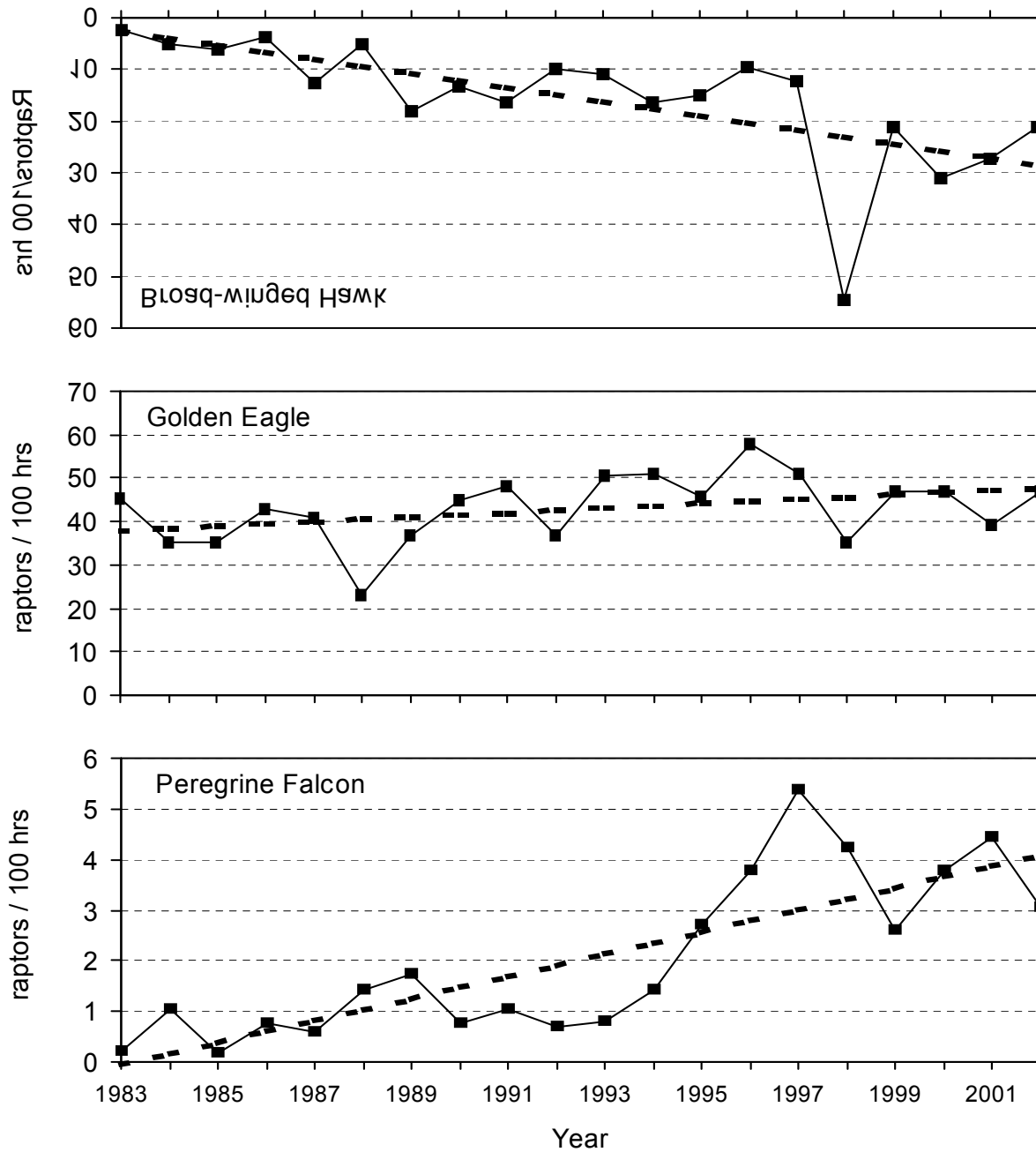


Figure 3. Adjusted annual passage rates for Broad-winged Hawks, Golden Eagles, and Peregrine Falcons: 1983–2002. Dashed lines indicate significant regressions ($P \leq 0.10$).

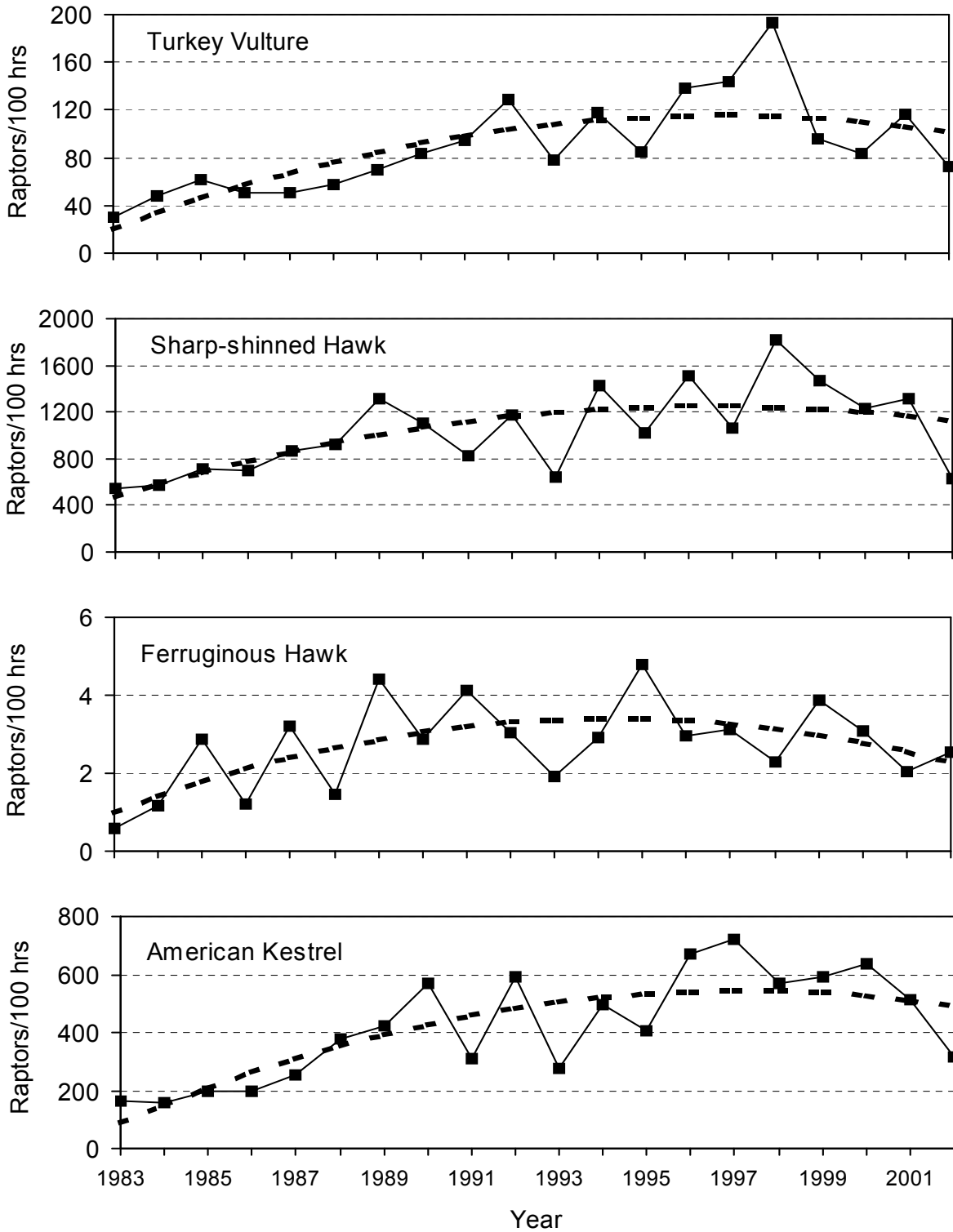


Figure 4. Adjusted annual passage rates for Turkey Vultures, Sharp-shinned Hawks, Ferruginous Hawks, and American Kestrels: 1983–2002. Dashed lines indicate significant regressions ($P \leq 0.10$).

Appendix A. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications.

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	A I Br U	M F U	NA
Sharp-shinned Hawk	<i>Accipiter striatus</i>	SS	A I U	U	NA
Cooper's Hawk	<i>Accipiter cooperii</i>	CH	A I U	U	NA
Northern Goshawk	<i>Accipiter gentilis</i>	NG	A I U	U	NA
Unknown small accipiter	<i>A. striatus</i> or <i>cooperii</i>	SA	U	U	NA
Unknown large accipiter	<i>A. cooperii</i> or <i>gentilis</i>	LA	U	U	NA
Unknown accipiter	<i>Accipiter</i> spp.	UA	U	U	NA
Red-shouldered Hawk	<i>Buteo lineatus</i>	RS	A I U	U	NA
Broad-winged Hawk	<i>Buteo platypterus</i>	BW	A I U	U	D L U
Swanson's Hawk	<i>Buteo swainsoni</i>	SW	U	U	D L U
Red-tailed Hawk	<i>Buteo jamaicensis</i>	RT	A I U	U	D L U
Ferruginous Hawk	<i>Buteo regalis</i>	FH	A I U	U	D L U
Rough-legged Hawk	<i>Buteo lagopus</i>	RL	U	U	D L U
Unknown buteo	<i>Buteo</i> spp.	UB	U	U	D L U
Golden Eagle	<i>Aquila chrysaetos</i>	GE	I, S, NA, A, U 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	AM U	NA
Prairie Falcon	<i>Falco mexicanus</i>	PR	U	U	NA
Peregrine Falcon	<i>Falco peregrinus</i>	PG	A I U	U	NA
Unknown small falcon	<i>F. sparverius</i> or <i>columbarius</i>	SF	U	U	NA
Unknown large falcon	<i>F. mexicanus</i> or <i>peregrinus</i>	LF	U	U	NA
Unknown falcon	<i>Falco</i> spp.	UF	U	U	NA
Unknown raptor	Falconiformes	UU	U	U	NA

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 B. Daily unadjusted raptor counts by species: 2002.

DATE	HOURS	SPECIES ¹																									TOTAL	/ HOUR	
		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
15-Aug	6.00	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	4	0.7
16-Aug	7.00	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	8	1.1
17-Aug	7.00	0	0	0	1	0	0	1	0	0	0	0	4	0	0	0	0	0	0	5	0	0	0	0	0	0	0	11	1.6
18-Aug	7.50	0	0	1	2	0	0	1	0	0	0	0	5	0	0	0	2	0	0	7	0	0	0	0	0	0	0	18	2.4
19-Aug	8.00	0	0	1	1	0	0	0	0	0	0	0	3	0	0	0	1	0	0	7	0	0	0	0	0	0	1	14	1.8
20-Aug	8.00	0	1	0	2	0	0	0	0	0	0	1	4	0	0	0	3	0	0	1	0	0	0	0	0	0	0	12	1.5
21-Aug	8.17	0	1	0	3	0	0	0	0	0	0	0	6	0	0	0	1	0	0	3	0	0	0	0	0	0	1	15	1.8
22-Aug	8.00	0	0	2	1	1	1	0	0	0	0	2	5	0	0	0	2	0	0	2	0	0	0	0	0	0	1	17	2.1
23-Aug	8.50	0	1	2	1	0	0	0	0	0	0	0	6	0	0	0	3	0	0	4	0	0	0	0	0	0	0	17	2.0
24-Aug	9.00	0	1	0	4	3	0	0	0	0	0	2	6	0	0	0	0	0	1	0	0	0	0	1	0	0	18	2.0	
25-Aug	8.50	1	1	1	4	1	0	0	0	1	0	5	7	0	0	0	4	0	0	10	0	0	0	0	0	0	1	36	4.2
26-Aug	9.00	0	0	0	4	1	0	1	0	0	0	1	5	0	0	3	0	0	0	29	0	0	0	0	0	0	1	45	5.0
27-Aug	9.00	1	2	2	4	3	0	0	0	0	0	0	10	1	0	2	0	0	0	11	0	0	0	0	0	0	0	36	4.0
28-Aug	9.00	0	3	1	5	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	0	0	15	1.7	
29-Aug	9.50	1	0	2	4	1	0	1	0	0	0	1	8	0	0	1	3	0	0	8	0	0	0	0	0	0	2	32	3.4
30-Aug	9.00	1	2	1	7	4	0	0	0	0	0	1	6	0	0	0	3	0	0	15	0	0	0	0	0	0	0	40	4.4
31-Aug	9.00	0	0	4	14	7	0	1	0	0	0	1	5	0	0	2	2	0	0	41	0	0	0	0	0	0	0	77	8.6
01-Sep	9.00	0	0	0	21	7	0	0	0	0	0	0	6	0	0	1	2	0	0	75	0	1	0	0	0	0	1	114	12.7
02-Sep	9.00	1	1	1	21	10	0	2	0	1	0	2	7	1	0	1	1	0	0	57	0	0	0	0	0	0	0	106	11.8
03-Sep	9.00	0	5	0	39	11	0	1	0	0	0	3	17	0	0	0	3	0	0	41	0	0	0	0	0	0	1	121	13.4
04-Sep	9.00	5	2	0	16	11	0	0	0	3	0	1	8	0	0	0	4	0	0	42	0	0	0	0	0	0	1	93	10.3
05-Sep	9.00	0	2	3	42	23	0	10	0	0	0	8	16	0	0	2	4	0	0	46	0	0	0	0	0	0	0	156	17.3
06-Sep	6.25	0	2	0	16	4	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	25	4.0
07-Sep	4.25	0	0	0	10	1	0	0	0	0	0	1	1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	15	3.5
08-Sep	7.25	0	2	0	15	5	0	1	0	0	0	3	4	0	0	0	1	0	0	3	0	0	0	0	0	0	0	34	4.7
09-Sep	9.00	10	6	4	32	41	0	4	0	0	1	5	43	0	0	2	4	1	0	23	0	0	0	0	1	0	1	178	19.8
10-Sep	10.00	2	0	1	24	53	1	4	0	0	1	7	24	1	0	1	2	1	0	31	0	0	0	0	0	0	1	154	15.4
11-Sep	9.00	5	1	1	33	23	0	0	0	1	0	2	19	0	0	0	5	0	0	32	0	0	0	0	0	0	0	122	13.6
12-Sep	8.50	1	3	0	29	28	0	2	0	0	0	3	16	1	0	0	0	0	11	0	1	0	0	0	0	1	96	11.3	
13-Sep	9.50	1	0	3	34	46	0	13	0	0	0	0	33	0	0	1	2	0	0	81	0	1	0	0	1	0	11	227	23.9
14-Sep	10.00	4	2	4	99	111	0	3	0	0	1	4	27	0	0	0	3	0	0	60	1	0	0	0	0	0	1	320	32.0
15-Sep	10.00	0	8	1	133	95	0	0	0	0	1	1	11	0	0	0	2	0	0	32	2	1	1	0	0	0	0	288	28.8
16-Sep	5.50	1	0	0	14	14	0	2	0	0	0	1	1	9	0	0	0	0	6	1	0	0	0	0	0	0	0	49	8.9
17-Sep	9.50	3	2	2	30	39	0	1	0	0	0	0	9	0	0	1	2	0	0	7	1	0	0	0	0	0	0	97	10.2
18-Sep	9.00	10	2	1	8	5	0	0	0	0	1	0	13	0	0	0	1	0	0	4	1	0	0	0	0	0	0	46	5.1
19-Sep	10.17	23	6	4	65	83	0	25	0	0	0	8	50	1	0	4	2	0	0	36	0	0	1	0	1	0	8	317	31.2
20-Sep	10.00	7	0	1	69	73	0	5	0	0	1	1	13	0	0	0	3	0	0	51	2	0	3	0	0	1	230	23.0	
21-Sep	10.00	24	3	3	64	94	0	8	0	0	2	13	71	1	0	4	3	0	0	63	0	1	0	0	0	1	4	359	35.9
22-Sep	10.00	28	1	2	82	97	0	11	0	0	9	2	53	0	0	1	1	0	0	27	2	1	0	0	0	0	2	319	31.9
23-Sep	10.00	1	2	2	72	63	0	6	0	0	12	1	12	0	0	1	2	0	0	23	0	0	0	0	0	0	2	199	19.9
24-Sep	10.50	18	0	0	120	129	0	5	0	0	4	0	36	0	0	2	7	0	0	149	0	0	1	0	0	0	3	474	45.1
25-Sep	10.00	3	1	2	77	112	0	2	0	0	6	1	21	0	0	2	2	0	0	44	1	1	0	0	0	0	2	277	27.7
26-Sep	10.00	8	5	4	140	101	0	4	0	0	3	1	54	0	0	3	1	0	0	53	0	0	0	0	0	0	0	377	37.7

Appendix B. continued

DATE	HOURS	SPECIES ¹																								TOTAL	/ HOUR			
		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
27-Sep	10.00	38	0	1	127	85	0	12	0	0	0	5	7	60	0	0	0	4	0	0	42	1	1	4	0	0	0	2	389	38.9
28-Sep	8.50	2	2	0	71	63	0	1	0	0	0	0	0	51	0	0	0	1	0	0	3	1	0	1	0	0	0	196	23.1	
29-Sep	10.00	4	3	4	99	92	0	6	0	0	0	1	2	27	0	0	0	2	0	0	67	0	1	0	0	0	0	308	30.8	
30-Sep	10.00	3	1	4	108	89	0	9	0	0	0	1	0	28	1	0	0	1	0	0	59	1	0	1	0	0	0	309	30.9	
01-Oct	0.00																													
02-Oct	0.00																													
03-Oct	9.00	3	0	1	5	1	0	0	0	0	0	0	0	8	0	0	0	2	0	0	2	0	0	1	0	0	0	23	2.6	
04-Oct	9.50	2	0	4	11	13	0	0	0	0	0	1	0	35	0	0	0	1	0	0	0	0	1	0	0	0	2	70	7.4	
05-Oct	10.50	15	1	2	43	60	0	4	0	0	0	1	0	43	0	0	0	6	0	0	11	0	0	0	0	0	0	186	17.7	
06-Oct	10.00	3	0	5	86	80	1	8	1	0	0	1	0	108	0	0	0	9	0	0	20	1	0	0	0	0	0	323	32.3	
07-Oct	10.25	4	1	2	52	43	0	8	1	0	0	1	0	92	1	0	0	8	0	0	48	2	0	0	0	0	1	4	268	26.1
08-Oct	9.83	5	1	7	68	46	1	9	0	1	0	1	0	191	1	0	1	6	1	0	29	0	0	0	0	0	9	377	38.4	
09-Oct	10.00	1	0	11	89	92	1	2	0	0	0	2	0	189	3	0	0	13	0	0	20	4	0	0	0	0	0	427	42.7	
10-Oct	10.50	1	2	7	247	226	0	10	0	0	0	1	0	270	0	0	1	7	0	0	22	1	1	1	0	0	4	801	76.3	
11-Oct	10.25	1	0	1	41	35	1	6	1	0	0	0	0	94	0	0	2	5	0	0	5	1	0	0	0	0	0	193	18.8	
12-Oct	10.00	0	0	0	17	9	0	2	0	0	0	0	0	53	0	0	0	3	0	0	1	1	0	0	0	0	1	87	8.7	
13-Oct	9.50	0	0	4	51	36	0	2	0	0	0	0	0	50	1	0	0	9	0	0	2	0	0	0	0	0	0	155	16.3	
14-Oct	9.50	1	1	5	63	30	1	16	0	0	0	0	0	66	0	0	1	15	0	0	7	1	0	0	0	0	1	208	21.9	
15-Oct	9.00	0	0	1	59	12	0	10	0	0	0	0	0	108	0	0	0	9	0	0	1	3	0	0	0	0	2	205	22.8	
16-Oct	10.00	0	0	2	16	9	0	2	0	0	0	0	0	33	0	0	0	8	0	0	1	0	0	0	0	0	0	71	7.1	
17-Oct	9.50	0	0	6	49	7	0	7	0	0	0	0	0	104	0	0	0	21	0	0	5	3	0	1	0	0	1	204	21.5	
18-Oct	10.00	0	0	5	56	14	1	9	0	0	0	0	0	135	1	0	0	16	0	0	2	1	0	0	0	0	2	242	24.2	
19-Oct	9.50	0	1	4	38	12	1	6	0	0	0	0	0	137	1	2	0	14	0	0	0	0	0	0	0	0	0	216	22.7	
20-Oct	9.50	0	0	2	22	0	0	2	0	0	0	0	0	24	0	0	0	4	0	0	0	2	0	0	0	0	1	57	6.0	
21-Oct	9.25	0	0	2	87	7	0	0	0	0	0	0	0	104	0	0	0	8	0	0	4	1	0	0	0	0	0	213	23.0	
22-Oct	9.00	0	0	5	40	3	1	0	0	0	0	0	0	41	0	1	0	6	0	0	0	2	1	0	0	0	0	100	11.1	
23-Oct	8.75	0	0	2	9	0	0	0	0	0	0	0	0	23	0	0	0	2	0	0	0	0	0	0	0	0	0	36	4.1	
24-Oct	9.00	0	1	2	7	0	0	0	0	0	0	0	0	36	0	1	0	9	0	0	0	0	0	0	0	0	0	56	6.2	
25-Oct	9.50	0	0	2	31	0	0	0	1	0	0	0	0	40	0	0	0	6	0	0	0	0	0	0	0	0	0	80	8.4	
26-Oct	9.25	0	0	1	25	3	0	0	0	0	0	0	0	52	0	0	0	6	1	0	0	0	0	0	0	0	0	88	9.5	
27-Oct	9.00	0	0	0	9	1	0	1	0	0	0	0	0	21	0	0	0	9	2	0	0	2	0	0	0	0	0	45	5.0	
28-Oct	9.00	0	0	0	7	0	0	0	0	0	0	0	0	22	1	1	0	9	2	0	0	0	0	0	0	0	0	42	4.7	
29-Oct	9.00	0	0	1	1	0	0	0	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	0	0	0	0	16	1.8	
30-Oct	8.50	0	0	2	2	0	0	0	0	0	0	0	0	6	0	0	1	3	0	0	0	0	0	0	0	0	0	14	1.6	
31-Oct	7.00	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	0	0	0	0	7	1.0	
01-Nov	8.00	0	0	1	0	0	0	0	0	0	0	0	0	7	0	0	0	1	0	0	0	0	0	0	0	0	0	9	1.1	
02-Nov	8.25	0	0	1	0	0	0	0	0	0	0	0	0	17	0	1	0	5	3	0	0	0	0	0	0	0	0	27	3.3	
03-Nov	8.00	0	0	0	2	0	0	0	0	0	0	0	0	19	1	0	0	4	0	0	0	0	0	0	0	0	0	26	3.3	
04-Nov	7.75	0	0	0	1	0	0	0	0	0	0	0	0	6	0	0	0	5	1	0	0	0	0	0	0	0	0	13	1.7	
05-Nov	8.00	0	0	0	5	1	0	0	0	0	0	0	0	37	3	0	0	6	0	0	0	0	0	0	0	0	2	54	6.8	
Total	725.67	243	83	154	3009	2369	11	246	4	7	0	58	91	3008	20	6	42	330	12	0	1503	39	12	15	0	4	2	81	11349	15.6

¹ See Appendix A for explanation of species codes.

Appendix C. Annual summaries of observation effort and unadjusted raptor counts by species: 1983–2002.

	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	MEAN
Start Date	15-Aug	16-Aug	20-Aug	16-Aug	17-Aug	17-Aug	18-Aug	15-Aug	16-Aug	16-Aug	16-Aug	16-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug
End Date	23-Oct	17-Nov	5-Nov	31-Oct	27-Oct	9-Nov	4-Nov	31-Oct	5-Nov	10-Nov	5-Nov	5-Nov	5-Nov	4-Nov	5-Nov	31-Oct	5-Nov	5-Nov	5-Nov	5-Nov	3-Nov
Observation days	68	83	76	67	66	85	76	78	79	85	80	78	83	74	79	71	82	78	83	81	78
Observation hours	561.08	638.66	654.50	485.00	564.25	734.66	567.50	667.00	707.67	743.42	659.50	709.58	694.92	620.17	673.58	719.50	748.08	681.50	787.30	725.67	667.18
Raptors / 100 hours	1517	1130	1427	1435	1921	1704	2397	2527	1879	2703	1510	3122	2276	3514	2541	3515	3003	2542	2662	1564	2235
SPECIES	RAPTOR COUNTS																				
Turkey Vulture	92	141	211	131	165	198	200	285	327	473	270	418	289	486	482	732	349	297	441	243	312
Osprey	41	39	40	43	51	54	65	86	62	119	54	130	92	99	187	176	110	152	152	83	92
Northern Harrier	109	105	139	89	120	125	77	161	152	184	116	292	252	255	255	247	356	233	178	154	180
Sharp-shinned Hawk	2021	2067	3177	2233	3537	4405	5404	5275	3702	5931	2838	6835	4752	6773	4677	9598	8094	6071	7429	3009	4849
Cooper's Hawk	1698	1378	1741	1149	2042	3012	3074	3647	2779	5071	2298	5576	3252	5075	3848	6736	4109	3022	5110	2369	3328
Northern Goshawk	105	146	119	65	65	74	80	123	146	259	120	105	150	241	97	99	103	123	80	11	115
Unkown small accipiter ¹	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	246	123
Unkown large accipiter ¹	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2
Unknown accipiter	562	362	311	251	710	295	204	374	648	639	348	522	416	464	368	75	132	87	56	7	342
TOTAL ACCIPITERS	4386	3953	5348	3698	6354	7786	8762	9419	7275	11900	5604	13038	8570	12553	8990	16508	12438	9303	12675	5646	8646
Red-shouldered Hawk	0	0	0	1	1	0	0	1	0	0	0	0	0	2	0	0	0	1	0	0	0.3
Broad-winged Hawk	6	13	15	7	30	16	37	35	44	26	27	41	40	27	37	160	59	87	79	58	42
Swainson's Hawk	116	34	78	276	69	43	60	351	108	208	159	244	287	498	143	507	334	132	251	91	199
Red-tailed Hawk	2105	1765	2132	1663	2317	2048	2263	3336	2976	3489	1827	4663	3572	3990	2922	3329	5183	3446	3926	3008	2996
Ferruginous Hawk	3	6	17	5	15	9	23	17	26	19	15	20	29	16	18	16	25	19	14	20	17
Rough-legged Hawk	0	17	17	10	9	23	21	14	3	13	7	17	11	17	10	6	50	24	23	6	15
Unidentified buteo	185	74	65	42	156	44	47	36	147	70	128	110	69	62	77	5	24	21	13	42	71
TOTAL BUTEOS	2415	1909	2324	2004	2597	2183	2451	3790	3304	3825	2163	5095	4008	4612	3207	4023	5675	3730	4306	3225	3340
Golden Eagle	239	206	230	196	221	154	203	290	324	263	317	338	299	344	329	235	348	305	295	330	273
Bald Eagle	8	10	9	13	7	8	9	19	16	21	26	19	17	6	6	6	31	14	8	12	13
Unidentified eagle	2	0	0	1	0	0	0	2	6	1	1	1	1	1	0	0	0	0	0	0	1
TOTAL EAGLES	249	216	239	210	228	162	212	311	346	285	344	358	317	351	335	241	379	319	303	342	287
American Kestrel	731	697	934	708	1099	1844	1669	2634	1564	2982	1234	2461	1964	3199	3394	3169	2974	3149	2774	1503	2030
Merlin	4	14	3	3	17	20	33	25	37	43	19	72	86	71	78	91	74	49	51	39	41
Prairie Falcon	31	16	5	11	15	27	24	26	23	40	26	45	58	44	48	50	33	37	23	12	30
Peregrine Falcon	0	5	1	3	2	8	9	3	5	4	4	7	15	21	29	26	15	21	29	15	11
Unknown small falcon ¹	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0	0
Unknown large falcon ¹	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2
Unidentified falcon	6	7	2	8	6	7	5	10	11	4	6	9	18	21	7	2	7	3	2	2	7
TOTAL FALCONS	772	739	945	733	1139	1906	1740	2698	1640	3073	1289	2594	2141	3356	3556	3338	3103	3259	2879	1575	2118
Unidentified raptor	446	113	94	53	186	107	96	106	193	234	117	229	149	83	102	25	57	34	26	81	127
GRAND TOTAL	8510	7215	9340	6961	10840	12521	13603	16856	13299	20093	9957	22154	15818	21795	17114	25290	22467	17327	20960	11349	15101

¹ Designations used consistently for the first time in 2002.

Appendix D. Daily trapping effort and captures by species: 2002.

DATE	STATION	SPECIES ¹													CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	RL	GE	AK	ML	PR	PG	TOTAL	/STN HR
24-Aug	13.00	0	1	0	0	0	0	1	0	0	0	0	0	0	2	0.2
25-Aug	13.50	0	5	1	0	0	0	0	0	0	1	0	0	0	7	0.5
26-Aug	17.42	0	2	0	0	0	0	1	0	0	0	0	0	0	3	0.2
27-Aug	14.25	0	3	1	0	0	0	0	0	0	0	0	0	0	4	0.3
28-Aug	0.00															
29-Aug	18.75	0	2	1	0	0	0	3	0	0	1	0	0	0	7	0.4
30-Aug	18.00	1	2	0	0	0	0	1	0	0	5	0	0	0	9	0.5
31-Aug	9.00	0	7	1	0	0	0	0	0	0	2	0	0	0	10	1.1
01-Sep	18.00	0	12	2	0	0	0	1	0	0	4	0	0	0	19	1.1
02-Sep	18.00	0	18	2	0	0	0	1	0	0	6	0	0	0	27	1.5
03-Sep	17.75	0	23	3	0	0	0	2	0	0	4	0	0	0	32	1.8
04-Sep	18.00	0	15	2	0	0	0	0	0	0	3	0	0	0	20	1.1
05-Sep	18.50	0	13	2	0	0	0	3	0	0	2	0	0	0	20	1.1
06-Sep	11.08	0	4	1	0	0	0	0	0	1	0	0	0	0	6	0.5
07-Sep	25.83	0	14	0	0	0	0	1	0	0	1	0	0	0	16	0.6
08-Sep	18.00	0	11	1	0	0	0	1	0	0	1	0	0	0	14	0.8
09-Sep	26.50	1	26	10	0	0	0	4	0	0	1	0	0	0	42	1.6
10-Sep	27.26	0	17	21	1	0	0	4	0	0	6	0	0	0	49	1.8
11-Sep	26.25	0	28	10	0	0	0	1	0	0	3	0	0	0	42	1.6
12-Sep	25.00	0	20	15	0	0	0	2	0	0	1	0	1	0	39	1.6
13-Sep	26.92	0	29	28	0	0	0	6	0	0	15	0	1	0	79	2.9
14-Sep	27.25	0	62	48	0	0	0	4	0	0	1	1	0	0	116	4.3
15-Sep	26.75	0	80	41	0	0	0	2	0	0	7	2	0	1	133	5.0
16-Sep	7.00	0	8	2	0	0	0	1	0	0	0	0	0	0	11	1.6
17-Sep	24.75	0	8	5	0	0	0	3	0	0	1	0	0	0	17	0.7
18-Sep	25.75	1	5	2	0	0	0	4	0	0	1	1	0	0	14	0.5
19-Sep	25.75	2	34	32	0	0	0	5	0	0	7	0	0	0	80	3.1
20-Sep	27.00	0	38	35	0	0	0	2	0	0	12	0	0	1	88	3.3
21-Sep	26.75	0	25	29	0	0	0	1	0	0	7	0	0	0	62	2.3
22-Sep	32.00	0	33	35	1	0	0	2	0	0	5	1	0	0	77	2.4
23-Sep	34.75	0	53	34	0	0	0	2	0	0	3	0	0	0	92	2.6
24-Sep	25.25	0	42	26	0	0	0	0	0	0	3	0	0	0	71	2.8
25-Sep	30.75	0	17	25	0	0	0	2	0	0	3	1	0	0	48	1.6
26-Sep	26.75	0	53	47	0	0	0	2	0	0	3	0	0	0	105	3.9
27-Sep	22.75	0	25	32	0	0	0	0	0	0	0	0	0	0	57	2.5
28-Sep	12.55	0	14	23	0	0	0	0	0	0	1	0	0	1	39	3.1
29-Sep	26.75	0	41	26	0	0	0	0	0	0	3	0	1	0	71	2.7
30-Sep	24.75	0	39	14	0	0	0	3	0	0	4	0	0	0	60	2.4
01-Oct	0.00															
02-Oct	0.00															
03-Oct	16.50	1	1	0	0	0	0	0	0	0	0	0	0	0	2	0.1
04-Oct	23.83	0	9	4	0	0	0	2	0	0	0	0	1	0	16	0.7

Appendix D. continued

DATE	STATION	SPECIES ¹													CAPTURES	
	HOURS	NH	SS	CH	NG	BW	SW	RT	RL	GE	AK	ML	PR	PG	TOTAL	/STN HR
05-Oct	25.92	0	23	25	0	0	0	2	0	0	0	0	0	0	50	1.9
06-Oct	25.42	0	29	39	0	0	0	7	0	0	1	1	0	0	77	3.0
07-Oct	24.75	0	15	17	0	0	0	2	0	0	4	0	0	0	38	1.5
08-Oct	24.25	0	18	20	0	0	0	1	0	0	2	1	0	0	42	1.7
09-Oct	28.33	0	27	37	1	0	0	4	0	0	1	1	0	0	71	2.5
10-Oct	17.50	0	57	24	0	0	0	0	0	0	0	1	0	0	82	4.7
11-Oct	26.00	0	21	14	0	0	0	1	0	0	1	0	0	0	37	1.4
12-Oct	30.00	0	10	1	0	0	0	1	0	0	0	1	0	0	13	0.4
13-Oct	25.50	0	34	12	0	0	0	2	0	2	0	0	0	0	50	2.0
14-Oct	24.00	0	25	6	0	0	0	2	0	0	1	0	0	0	34	1.4
15-Oct	22.25	0	27	9	1	0	0	6	0	1	0	0	0	0	44	2.0
16-Oct	30.50	0	18	3	0	0	0	0	0	1	0	0	0	0	22	0.7
17-Oct	25.00	0	23	6	0	0	0	0	0	0	0	1	0	0	30	1.2
18-Oct	34.00	0	24	4	2	0	0	2	0	0	0	1	0	0	33	1.0
19-Oct	24.75	0	15	3	0	0	0	1	0	0	0	0	0	0	19	0.8
20-Oct	16.50	0	7	0	0	0	0	0	0	0	0	0	0	0	7	0.4
21-Oct	23.75	0	39	7	0	0	0	3	0	0	0	1	0	0	50	2.1
22-Oct	22.75	0	8	1	1	0	0	1	0	0	0	1	0	0	12	0.5
23-Oct	17.00	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
24-Oct	21.50	0	4	0	0	0	0	2	0	0	0	0	0	0	6	0.3
25-Oct	16.00	1	8	0	0	0	0	0	0	1	0	0	0	0	10	0.6
26-Oct	16.25	0	12	2	0	0	0	3	0	0	0	0	0	0	17	1.0
27-Oct	24.50	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.0
28-Oct	24.50	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.0
29-Oct	7.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
30-Oct	0.00															
1-Nov	0.00															
2-Nov	4.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
3-Nov	6.00	0	0	0	0	0	0	1	0	1	0	0	0	0	2	0.3
4-Nov	0.00															
5-Nov	6.00	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0.2
Total	6.25	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.2

¹ See Appendix A for explanation of species codes.

Appendix E. Annual summaries of banding effort and capture totals by species: 1980–2002.

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	MEAN
Start date	23 Sep	2 Sep	8 Sep	25 Aug	28 Aug	2 Sep	27 Aug	30 Aug	28 Aug	30 Aug	24 Aug	21 Aug	19 Aug	22 Aug	19 Aug	22 Aug	19 Aug	18 Aug	18 Aug	21 Aug	21 Aug	22 Aug	24 Aug	
End date	19 Oct	10 Oct	16 Oct	22 Oct	17 Nov	8 Nov	10 Oct	27 Oct	23 Oct	24 Oct	31 Oct	26 Oct	7 Nov	22 Oct	29 Oct	25 Oct	23 Oct	22 Oct	22 Oct	3 Nov	28 Oct	4 Nov	5 Nov	
Blinds in operation	1	1	2	2	2	3	3	3	4	4	4	4	5	5	5	6	5	5	5	3	4	4	4	4
Trapping days	21	37	27	55	69	?	?	?	?	?	66	64	74	59	65	63	61	62	63	72	62	72	68	58
Station days	21	37	?	66	104	?	?	?	?	159	205	240	296	254	278	312	270	264	236	131	174	210	185	192
Station hours	149	227	159	443	622	654	483.8	833	1085	1203	1454	1899	2316	1971	2290	2382	2061	2087	1690	939	1286	1666	1450	1276
Capture/100 stn hrs	84.5	341.0	215.1	228.9	149.1	185.2	127.5	168.2	175.4	196.9	190.3	159.8	166.8	136.0	205.1	120.1	160.7	147.0	202.3	163.6	167.0	173.0	162.6	175.1
SPECIES	RAPTOR CAPTURES																							
Northern Harrier	0	2	0	8	3	6	2	4	10	9	4	9	10	4	7	2	1	18	4	0	17	11	8	6
Sharp-shinned Hawk	62	376	186	571	548	705	410	886	1177	1527	1583	1694	2036	1526	2686	1823	2091	1783	2131	897	1235	1608	1284	1255
Cooper's Hawk	36	300	129	306	261	366	164	395	553	652	821	909	1220	822	1473	695	737	767	1006	438	504	975	791	624
Northern Goshawk	6	11	3	32	40	42	5	27	22	29	44	33	104	27	35	27	68	20	20	20	24	23	7	29
Broad-winged Hawk	0	0	0	0	2	0	1	1	1	1	1	2	0	2	1	3	0	0	1	0	3	1	0	1
Swainson's Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	1	0	0
Red-tailed Hawk	14	26	13	43	31	51	15	43	37	66	99	93	97	53	158	93	84	67	69	49	58	76	109	63
Rough-legged Hawk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0
Golden Eagle	1	1	1	1	5	6	2	4	7	6	10	3	3	2	11	4	7	5	4	8	2	1	9	4
Bald Eagle	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Kestrel	7	58	8	51	28	34	17	37	85	61	190	266	367	223	285	193	290	351	149	97	285	168	127	147
Merlin	0	1	1	0	2	0	0	1	5	8	2	9	10	8	21	13	18	26	13	16	11	12	15	8
Prairie Falcon	0	0	0	6	5	2	1	3	7	5	7	7	8	1	7	3	7	17	7	3	8	3	4	5
Peregrine Falcon	0	0	0	0	1	0	0	0	0	2	1	1	0	1	0	1	1	4	0	1	1	1	3	1
All Species	126	775	341	1019	926	1212	617	1401	1904	2366	2762	3026	3855	2671	4685	2857	3304	3058	3404	1529	2148	2882	2357	2144
Recaptures ¹	0	0	0	0	0	0	0	0	0	0	4	4	7	9	10	3	3	7	9	4	6	9	7	4
Foreign Recaptures ²	0	0	1	0	0	0	0	0	0	2	0	0	1	1	2	1	4	3	5	2	3	4	4	1
Foreign Encounters ³	0	1	5	3	9	12	5	7	11	12	15	18	14	21	19	16	9	18	14	10	19	9	29	12

¹ Recaptures in the Goshutes of birds originally banded in the Goshutes.

² Recaptures in the Goshutes of birds originally banded elsewhere.

³ Birds originally banded in the Goshutes and subsequently encountered elsewhere.