

**FALL 2003 RAPTOR MIGRATION STUDY
IN THE BRIDGER MOUNTAINS, MONTANA**

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INTRODUCTION

The Bridger Mountains Raptor Migration Project in southwestern Montana is an ongoing effort to monitor long-term population trends of raptors using this northern portion of the Rocky Mountain Flyway (Hoffman et al. 2002, Smith and Hoffman 2003). HawkWatch International (HWI) initiated full-season counts at the site in 1991, with standardized annual monitoring commencing in 1992. This flyway is noted for large concentrations of Golden Eagles (see Appendix A for scientific names of all raptor species observed at the site). To date, 18 species of raptors have been observed migrating along the Bridger Mountains, with annual counts typically ranging between 2,000 and 3,500 migrants. This report summarizes results of the 2003 count, which marked the 11th consecutive full-season autumn count of migratory raptors at the site.

STUDY SITE

The Bridger Mountains are a relatively small range that runs primarily along a north–south axis. From Sacagawea Peak (2,950 m elevation), the range extends southward for 40 km before meeting the Gallatin Valley 5 km northeast of Bozeman, Montana. Consistent westerly winds collide with the Bridger range and create the lift that attracts southbound migrating raptors each fall. The observation site was a helicopter-landing platform atop the Bridger Bowl Ski Area at an elevation of 2,610 m (45° 49.022' N, 110° 55.778' W; Figure 1). The site lies within the Gallatin National Forest on the east slope of the mountain range, about 25 km north of Bozeman and 3 km north of Saddle Peak. The helicopter pad is a 5 m x 5 m wooden platform located approximately 50 m north of an avalanche cache/ski patrol hut. The site is accessed by following a primitive dirt road for 2.5 km (780 m rise in elevation) to the top of the Bridger chairlift, then continuing a short way along a footpath to the observation site at the top of the ridge.

METHODS

Weather permitting, two official or designated observers conducted standardized daily counts of migrating raptors from a single, traditional observation site from late August through late October. Observations typically began between 0830–1000 hrs and ended between 1600–1700 hrs Mountain Standard Time (MST). This was the first full season of migration counting for both official observers; both attended pre-season training (see Appendix B for a complete observer history). Local volunteers also occasionally assisted with spotting migrants. Data gathering and recording followed standardized protocols used at all HWI migration sites (Hoffman and Smith 2003).

The observers routinely recorded the following data:

1. Species, age, sex, and color morph of each migrant raptor, whenever possible and applicable (Appendix A lists common and scientific names for all species, information about the applicability of age, sex, and color morph distinctions, and two-letter codes used to identify species in some tables and figures).
2. Hour of passage for each migrant; e.g., the 1000–1059 hrs MST.
3. Wind speed and direction, air temperature, percent cloud cover, predominant cloud type(s), presence or of precipitation, visibility, and an assessment of thermal-lift conditions, recorded for each hour of observation on the half hour.
4. Predominant direction, altitude, and distance from the lookout of the flight during each hour.

5. Total minutes observed and the mean number of observers present during each hour (included designated observers plus volunteers/visitors who actively contributed to the count [active scanning, pointing out birds, recording data, etc.] for more than 10 minutes in a given hour), recorded on the hour.
6. A subjective visitor-disturbance rating (high, moderate, low, none) for each hour, recorded on the hour.
7. Daily start and end times for each official observer.

Calculation of “adjusted” (to standardize sampling periods and adjust for incompletely identified birds) passage rates (migrants counted per 100 hours of observation) and analysis of trends follows Hoffman and Smith (2003). In comparing 2003 annual statistics against means and 95% confidence intervals for previous seasons, I equate significance with a 2003 value falling outside the bounds of the confidence interval for the associated mean.

RESULTS AND DISCUSSION

WEATHER SUMMARY

Compared to the past six years (the period of record for which detailed weather records have been compiled and analyzed), inclement weather hampered observations to a relatively low degree in 2003 (see Appendix C for daily weather records), entirely precluding only 2 days of observation (1997–2002 average of 10 days) and reducing another 6 days to less than 4 hours of observation (average 6 days). Three of the 8 days significantly hampered by weather occurred during the last week of observations in late October, with the other five affected days scattered across the season. The season also featured a slightly higher than average proportion of active observation days where fair skies (<50% cloud cover) prevailed (42% vs. 1997–2002 average of 35%) and a high daily-average (average of hourly records) barometric pressure (30.64 vs. 2000–2002 average [the period of record for this data type] of 30.01 in Hg). However, although the overall average daily temperature was slightly warmer than usual (11.3°C vs. 1997–2002 average of 10.9°C), the range of daily-average (average of hourly records) temperatures was the broadest recorded since 1997 (-4.8°C – 29.3°C; a lower minimum only in 1997 [-6.6°C] and a higher maximum only in 2001 [29.6°C]), and the proportion of active observation days that included some rain or snow was slightly higher than average (21% vs. 1997–2002 average of 18%). In addition, a much higher than average proportion of active observation days featured visibility reducing fog and especially haze (77% vs. 1997–2002 average of 25%), which translated to reduced visibility estimates (maximums of ~70 km to the east and west in 2003 vs. averages of ~80 km).

In terms of wind speeds, the 2003 season averaged slightly calmer than usual, with no days of predominantly strong winds (>29 kph) (75% light [<12 kph], 25% moderate, and 0% strong vs. averages of 76%, 21%, and 3%). In terms of wind directions, the main variation from the average pattern was that purely west winds were less common than usual (11% of active observations days vs. 1997–2002 average of 21%), whereas variable southwest to westerly winds were more common than usual (47% of days vs. average of 30%).

In summary, the weather during the 2003 season was overall slightly milder and calmer than usual, but the major difference compared to the previous six years was that visibility reducing fog and especially haze were three times more prevalent than usual.

OBSERVATION EFFORT

The observers worked on 64 of 66 possible observation days between 27 August and 31 October. The number of observation days and hours were the highest ever recorded for the project (long-term averages: $50 \pm 95\%$ CI of 5.0 days, $327 \pm 95\%$ CI of 34.4 hours). This is consistent with evidence of milder than average weather, but may also reflect in part higher vigilance among this year's observers. The 2003 average of 1.9 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) matched the long-term average of $1.9 \pm 95\%$ CI of 0.13 observers per hour.

FLIGHT SUMMARY

The observers tallied 2,294 migrant raptors of 16 species during the 2003 season (Table 1, and see Appendix D for daily count records). This is the highest count in four years but still a significant 13% below average (see Appendix E for annual summaries). The count of Golden Eagles fell to a record low (Appendix E). The flight was composed of 58% eagles, 26% accipiters, 7% buteos, 6% falcons, 2% harriers, <1% Ospreys, and 1% unidentified raptors. These values represent significantly higher than average proportions of accipiters and falcons, and a below average proportion of eagles (Figure 2). The most numerous species were the Golden Eagle (53% of the total count), Sharp-shinned Hawk (18%), Cooper's Hawk (6%), Red-tailed Hawk (5%), Bald Eagle (4%), and Northern Harrier (2%). All other species each comprised 1% or less of the total.

Adjusted 2003 passage rates were below average for 14 of 16 commonly observed species, significantly so for Ospreys, Cooper's Hawks, Northern Goshawks, Ferruginous Hawks, Golden Eagles, and Merlins (Table 1, Figures 3–7). For most species, however, passage rates were at least higher than in 2002. Moreover, the high prevalence of visibility reducing fog and haze may have artificially reduced the 2003 counts slightly, and the higher than average observation effort may have artificially deflated the 2003 passage rate estimates slightly.

Regression analyses of data through 2003 revealed a marginally significant ($P \leq 0.10$), currently declining, quadratic trend for Ospreys (Figure 3); a marginally significant linear decline for Cooper's Hawks (Figure 4); a highly significant ($P \leq 0.01$) linear decrease for Golden Eagles (Figure 6); a significant, currently declining, quadratic trend for Merlins (Figure 7); and no significant trends for other species.

Increasing patterns through the mid-1990s followed by declines is a common pattern seen at most of HWI's western migration sites, which likely reflects the positive impact of high moisture levels during the late 1980s and early 1990s followed by the equally negative impact of the prolonged drought that has plagued much of the interior West since 1998 (Hoffman and Smith 2003). Improved passage rates in 2003 compared to 2002 for most species may reflect some level of recovery, but count volume still remained below average for most species, with counts of immature birds well below average for all three accipiters and Golden Eagles (Table 2).

Although changes in effort before 1997 may confound interpretation of the overall trends, there is little doubt that the Golden Eagle passage rate, especially that of young eagles, has dropped substantially since the mid-1990s, having fallen to new record lows in each of the past two years (Figure 4). Declining abundance of younger birds may reflect declining productivity during the past several years among eagles nesting at northern latitudes where a cyclical low in the abundance of snowshoe hares recently occurred (Sherrington 2003, C. McIntyre personal communication). However, the decline in adult numbers, especially the proportionately very large drop in 2003 (Table 2), may reflect the effects of mild winters allowing only partially migratory birds to remain farther north for the winter and contributing to late passage outside of our standard monitoring period. At the species level, Golden Eagles showed an

average median passage date in 2003 (Table 3); however, the adults were a significant 5 days later than average (Table 4).

In fact, adults of 5 of 7 species for which a comparison was possible showed significantly late timing in 2003 (Table 4). Otherwise, little commonality of timing patterns was evident across species in 2003 (Tables 3 and 4).

RESIDENT RAPTORS

The 2003 resident community included at least two family groups (at least nine individuals) of American Kestrels that resided in the immediate vicinity of the count site through late September. There was one family group of Golden Eagles, with one juvenile bird present in the area through early October and the adults present throughout the season. There appeared to be one family group of light-morph Red-tailed Hawks, with two juvenile birds present off and on through at least mid-October. At least two Sharp-shinned Hawks, two Cooper's Hawks, and one juvenile Northern Goshawk appeared to be resident in the area until at least early October. There were also two sightings of Ospreys in Swainson's Hawks in mid-October and one sighting of a Rough-legged Hawk on the last day of the season that also suggested resident behavior. This is a fairly typical assemblage for the site.

VISITATION

The fall migration site along the Bridger Range is a popular destination for Bozeman locals, as well as for raptor enthusiasts from the surrounding area. In 2003, 281 individuals signed the HWI visitor log. Roughly two thirds of these visited during the eighth annual Bridger Raptor Festival, which for a change featured both good weather and a strong flight. Visitors originated in seven other states besides Montana.

In 2003 at the Bridger site, 479 hourly assessments of visitor disturbance resulted in the following ratings: 86% none, 9% low, 3% moderate, and 2% high.

ACKNOWLEDGMENTS

Funding for the 2003 project was provided by Gallatin National Forest, the Fanwood Foundation, New Belgium Brewing Company, Sacagawea Audubon Society, and HWI members. Gallatin National Forest and Bridger Bowl Ski Area provided essential logistical support. Special thanks to Jeff Pentel, John Parker, Carla Sartor, Richard Hendrick, Matt Keefer, Bob Peterson, Luke DeVoe, David Willey, Bev Dixon, and Randy Elliot for their observational, logistical, and/or housing assistance.

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Table 1. Observation effort, annual fall-migration counts, and adjusted passage rates (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) by species in the Bridger Mountains, MT: 1992–2002 versus 2003.

SPECIES	COUNTS			RAPTORS/100HRS		
	1992–2002 ¹	2003	%CHANGE	1992–2002 ¹	2003	%CHANGE
Turkey Vulture	1 ± 1.1	0	-100	0.4 ± 0.55	0.0	-100
Osprey	7 ± 2.7	5	-27	3.7 ± 1.42	2.1	-43
Northern Harrier	53 ± 36.5	54	+2	17.2 ± 11.68	12.8	-25
Sharp-shinned Hawk	356 ± 73.3	416	+17	136.1 ± 27.03	118.2	-13
Cooper's Hawk	176 ± 52.3	132	-25	140.3 ± 38.70	69.8	-50
Northern Goshawk	37 ± 15.3	23	-38	12.9 ± 6.11	6.4	-50
Unknown small accipiter ²	6 ± 10.8	29	+427	–	–	–
Unknown large accipiter ²	2 ± 3.9	4	+100	–	–	–
Unknown accipiter	34 ± 8.4	0	-100	–	–	–
TOTAL ACCIPITERS	605 ± 129.7	604	0	–	–	–
Broad-winged Hawk	10 ± 6.4	9	-8	6.1 ± 3.75	3.5	-43
Swainson's Hawk	3 ± 1.9	2	-29	2.3 ± 2.06	1.0	-57
Red-tailed Hawk	109 ± 36.7	113	+4	41.0 ± 12.52	32.0	-22
Ferruginous Hawk	2 ± 1.4	1	-59	0.9 ± 0.43	0.3	-71
Rough-legged Hawk	38 ± 13.8	22	-42	28.9 ± 9.52	13.9	-52
Unidentified buteo	12 ± 3.3	6	-50	–	–	–
TOTAL BUTEOS	174 ± 49.9	153	-12	–	–	–
Golden Eagle	1574 ± 127.2	1226	-22	617.5 ± 40.82	392.4	-36
Bald Eagle	83 ± 16.7	93	+12	32.4 ± 6.80	30.4	-6
Unidentified eagle	9 ± 5.0	4	-55	–	–	–
TOTAL EAGLES	1667 ± 133.7	1323	-21	–	–	–
American Kestrel	80 ± 25.9	102	+28	72.7 ± 22.54	67.0	-8
Merlin	10 ± 3.9	4	-60	6.9 ± 2.37	2.2	-68
Prairie Falcon	12 ± 2.3	15	+22	8.2 ± 1.76	7.5	-9
Peregrine Falcon	8 ± 3.4	10	+22	6.3 ± 2.63	6.7	+6
Gyr Falcon	0.1 ± 0.18	0	-100	–	–	–
Unknown small falcon ²	0 ± 0.0	0	–	–	–	–
Unknown large falcon ²	1 ± 1.0	3	+500	–	–	–
Unknown falcon	5 ± 2.5	1	-81	–	–	–
TOTAL FALCONS	115 ± 34.5	135	+17	–	–	–
Unidentified raptor	28 ± 6.9	20	-29	–	–	–
GRAND TOTAL	2649 ± 313.7	2294	-13	–	–	–

¹ Mean ± 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 in the Bridger Mountains, MT: 1992–2002 versus 2003.

	TOTAL AND AGE-CLASSIFIED COUNTS						IMMATURE : ADULT			
	1992–2002 AVERAGE			2003			% UNKNOWN AGE		RATIO	
	TOTAL	IMM.	ADULT	TOTAL	IMM.	ADULT	1992–2002 ¹	2003	1992–2002 ¹	2003
Northern Harrier	53	26	11	54	26	13	33 ± 7.4	28	4.5 ± 5.26	2.0
Sharp-shinned Hawk	356	71	132	416	53	149	43 ± 8.9	51	0.6 ± 0.14	0.4
Cooper’s Hawk	176	53	54	132	39	25	39 ± 7.7	52	1.0 ± 0.31	1.6
Northern Goshawk	37	13	17	23	9	5	18 ± 8.8	39	1.5 ± 0.73	1.8
Broad-winged Hawk	10	2	3	9	4	4	39 ± 23.5	11	1.2 ± 1.24	1.0
Red-tailed Hawk	109	37	46	113	38	58	24 ± 5.0	15	0.8 ± 0.50	0.7
Golden Eagle	1574	605	575	1226	519	299	26 ± 5.0	33	1.1 ± 0.20	1.7
Bald Eagle	83	30	52	93	33	54	2 ± 19.6	6	0.6 ± 0.13	0.6
Peregrine Falcon	8	0	5	10	1	4	43 ± 19.6	50	0.05 ± 0.08	0.3

¹ Mean ± 95% confidence interval. For age ratios, note that the long-term mean immature : adult ratio is an average of annual ratios and may differ from the value obtained by dividing long-term 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 observation, bulk passage, and median passage dates by species for migrating raptors in the Bridger Mountains, MT in 2003, with a comparison of 2003 and 1992–2002 average median passage dates.

SPECIES	2003				1992–2002
	FIRST OBSERVED	LAST OBSERVED	BULK PASSAGE DATES ¹	MEDIAN PASSAGE DATE ²	MEDIAN PASSAGE DATE ³
Osprey	6-Sep	29-Sep	6-Sep – 29-Sep	21-Sep	14-Sep ± 3.5
Northern Harrier	28-Aug	25-Oct	2-Sep – 18-Oct	23-Sep	21-Sep ± 6.2
Sharp-shinned Hawk	28-Aug	27-Oct	16-Sep – 20-Oct	4-Oct	1-Oct ± 2.1
Cooper’s Hawk	29-Aug	25-Oct	9-Sep – 20-Oct	24-Sep	21-Sep ± 3.1
Northern Goshawk	19-Sep	29-Oct	22-Sep – 29-Oct	8-Oct	9-Oct ± 7.0
Broad-winged Hawk	3-Sep	3-Oct	3-Sep – 3-Oct	21-Sep	18-Sep ± 2.6
Swainson’s Hawk	16-Sep	21-Sep	–	–	13-Sep ± 7.8
Red-tailed Hawk	28-Aug	21-Oct	7-Sep – 9-Oct	28-Sep	19-Sep ± 2.8
Ferruginous Hawk	1-Oct	1-Oct	–	–	28-Sep ± 15.7
Rough-legged Hawk	9-Oct	29-Oct	14-Oct – 26-Oct	18-Oct	20-Oct ± 1.7
Golden Eagle	28-Aug	29-Oct	25-Sep – 24-Oct	11-Oct	11-Oct ± 2.8
Bald Eagle	14-Sep	26-Oct	28-Sep – 25-Oct	6-Oct	15-Oct ± 2.5
American Kestrel	28-Aug	15-Oct	7-Sep – 4-Oct	21-Sep	20-Sep ± 2.7
Merlin	17-Sep	24-Oct	–	–	1-Oct ± 2.4
Prairie Falcon	30-Aug	5-Oct	1-Sep – 4-Oct	22-Sep	23-Sep ± 6.2
Peregrine Falcon	21-Sep	24-Oct	22-Sep – 24-Oct	22-Sep	24-Sep ± 3.4
All species	27-Aug	29-Oct	19-Sep – 23-Oct	6-Oct	7-Oct ± 1.6

¹ Dates between which the central 80% of the flight passed; values are given only for species with annual counts ≥5 birds.

² Date by which 50% of the flight had passed; values are given only for species with annual counts ≥5 birds.

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

Table 4. Median passage dates by age for selected species of migrating raptors in the Bridger Mountains, MT: 1992–2002 versus 2003.

SPECIES	ADULT		IMMATURE	
	1992–2002 ¹	2003	1992–2002 ¹	2003
Northern Harrier	28-Sep ± 6.3	28-Sep	19-Sep ± 6.5	6-Sep
Sharp-shinned Hawk	3-Oct ± 2.9	7-Oct	21-Sep ± 3.2	23-Sep
Cooper’s Hawk	27-Sep ± 4.8	10-Oct	16-Sep ± 3.5	21-Sep
Northern Goshawk	11-Oct ± 9.1	24-Oct	26-Sep ± 5.4	7-Oct
Red-tailed Hawk	23-Sep ± 3.0	30-Sep	16-Sep ± 4.3	21-Sep
Golden Eagle	12-Oct ± 2.2	17-Oct	8-Oct ± 2.9	5-Oct
Bald Eagle	15-Oct ± 2.7	3-Oct	15-Oct ± 2.5	7-Oct

Note: Median passage dates are the dates by which 50% of the flight passed; values are given only for species with annual counts ≥5 birds.

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

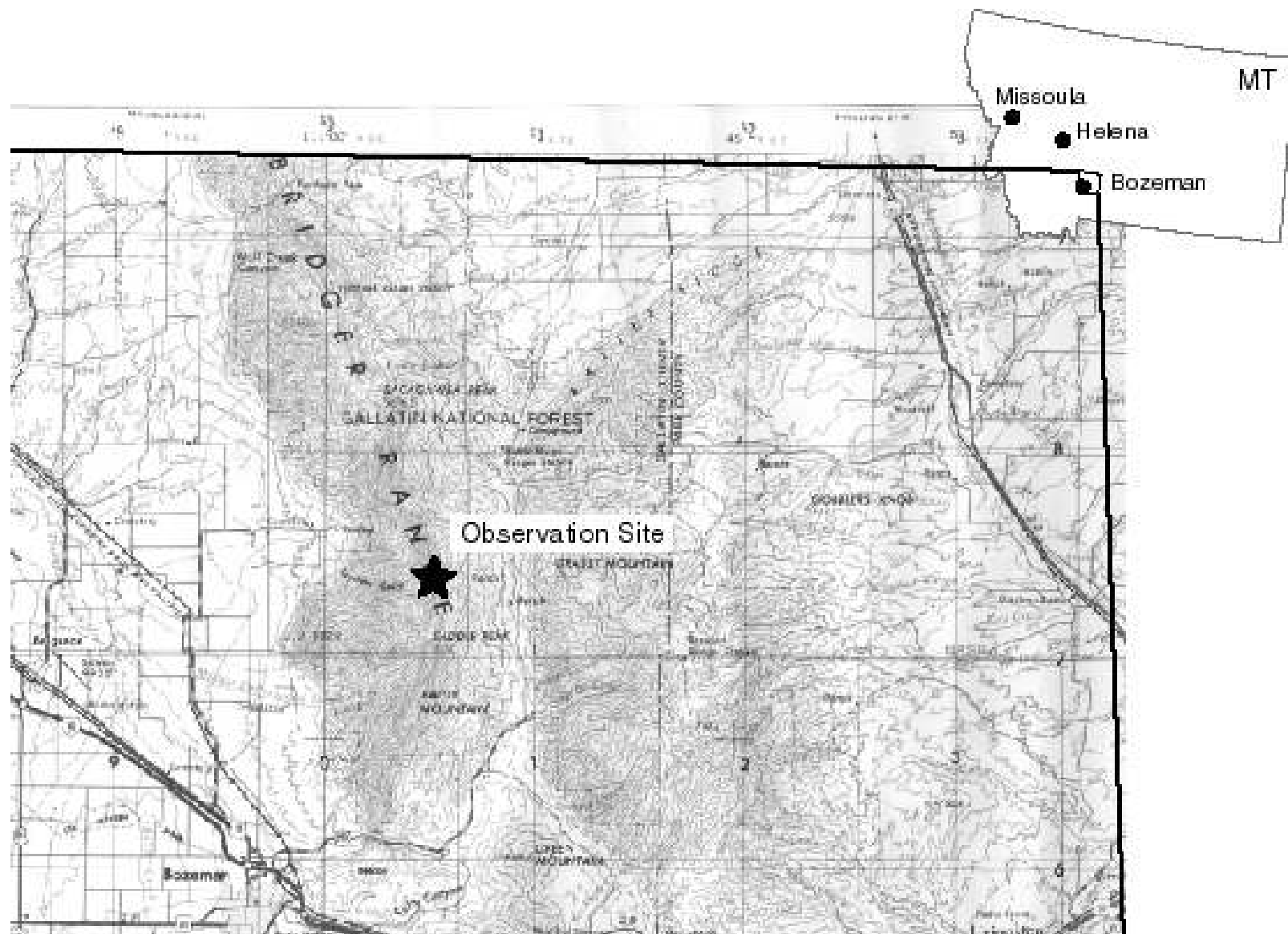


Figure 1. Location of the Bridger Mountains Raptor Migration Project study site.

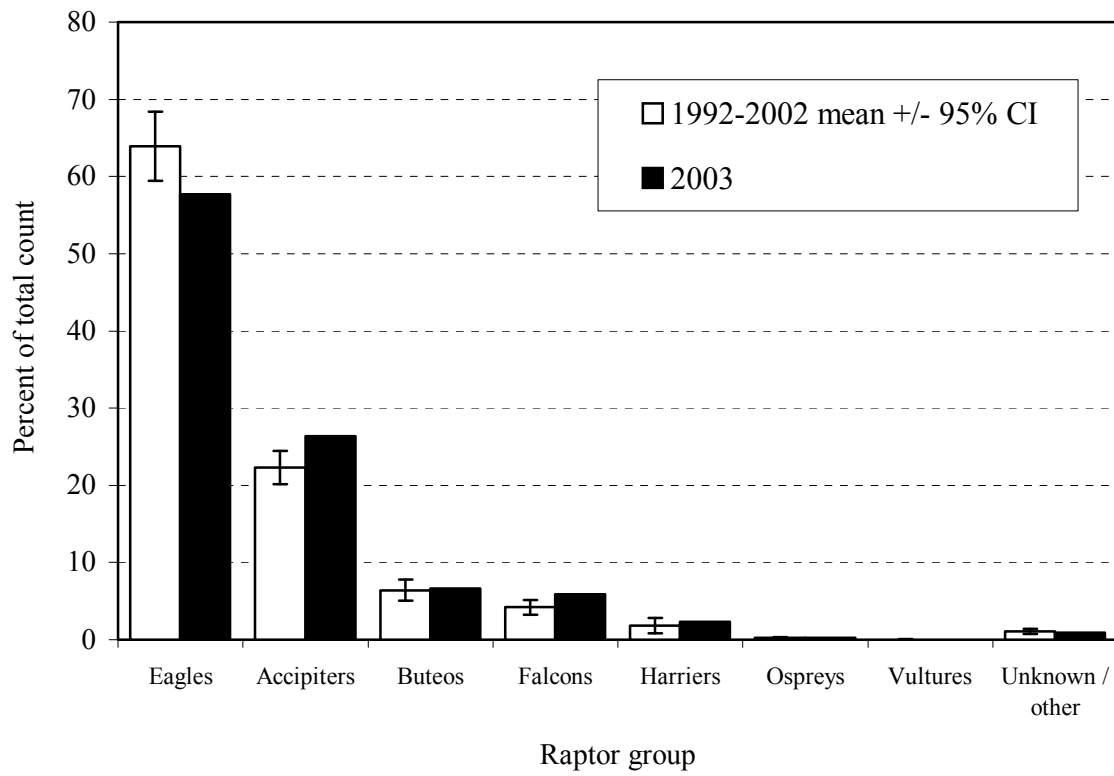


Figure 2. Composition of the fall raptor migration in the Bridger Mountains by major species groups: 1992–2002 versus 2003.

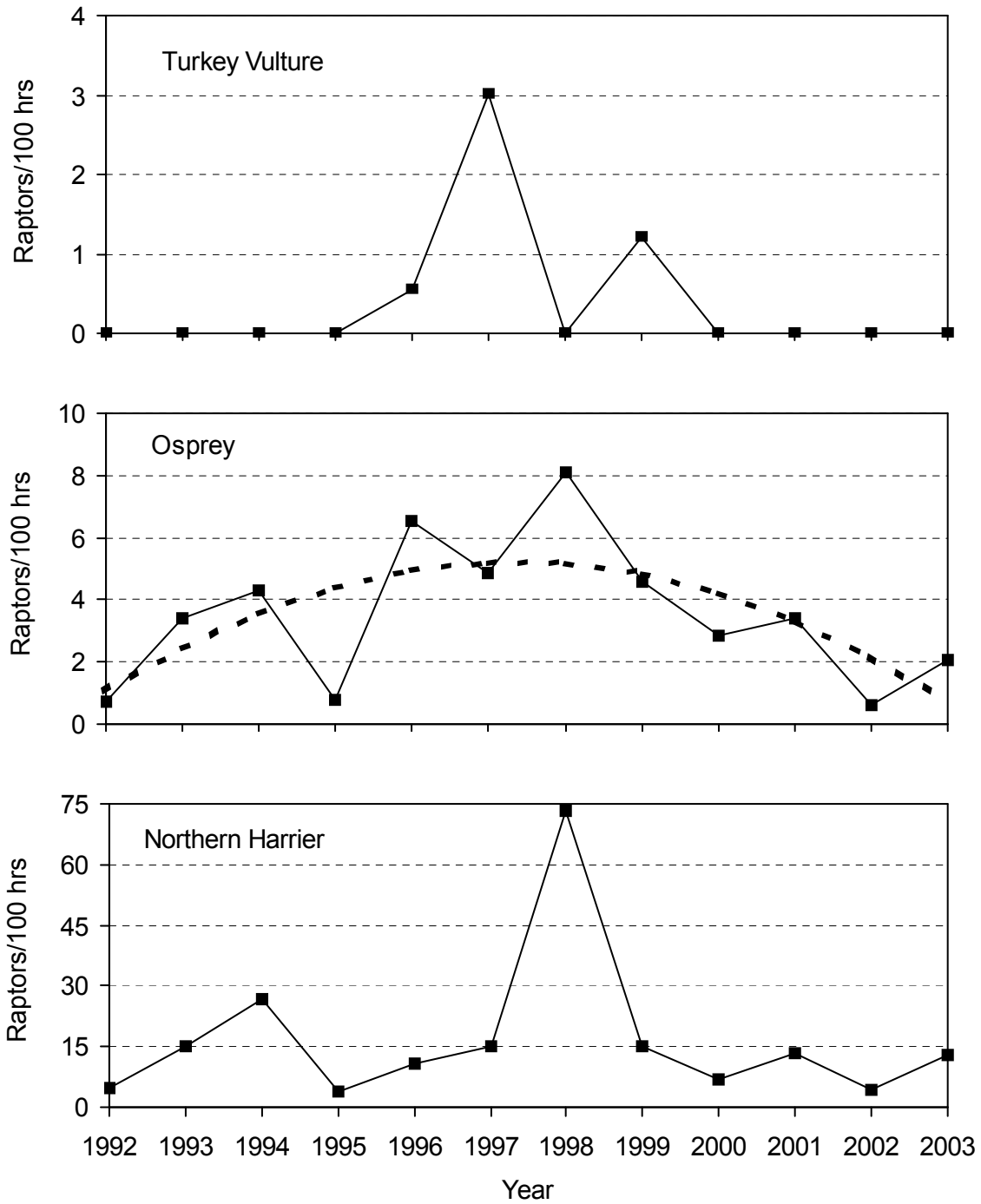


Figure 3. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Turkey Vultures, Ospreys, and Northern Harriers in the Bridger Mountains, MT: 1992–2003. Dashed lines indicate significant ($P \leq 0.10$) regressions.

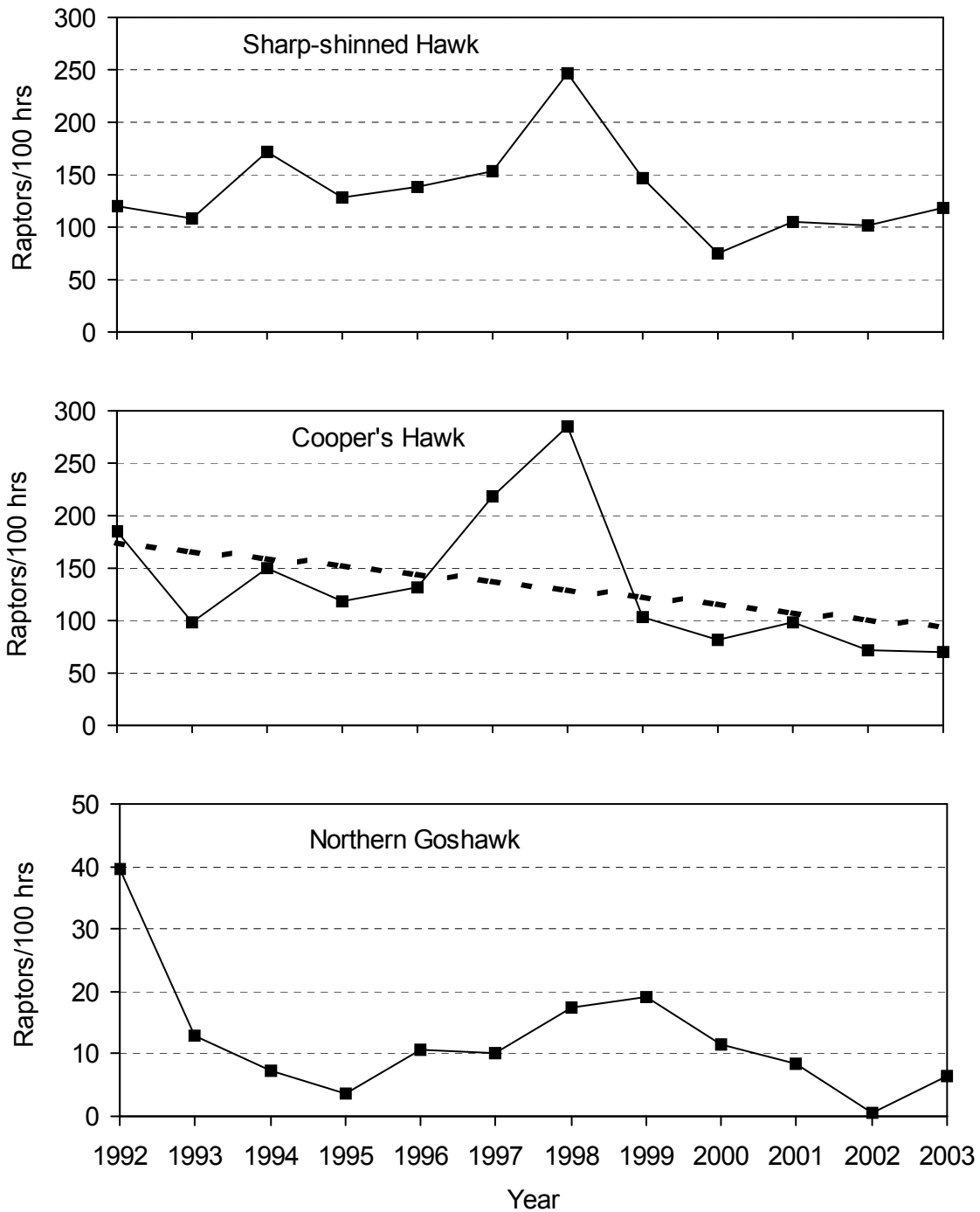


Figure 4. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Sharp-shinned Hawks, Cooper’s Hawks, and Northern Goshawks in the Bridger Mountains, MT: 1992–2003. Dashed lines indicate significant ($P \leq 0.10$) regressions.

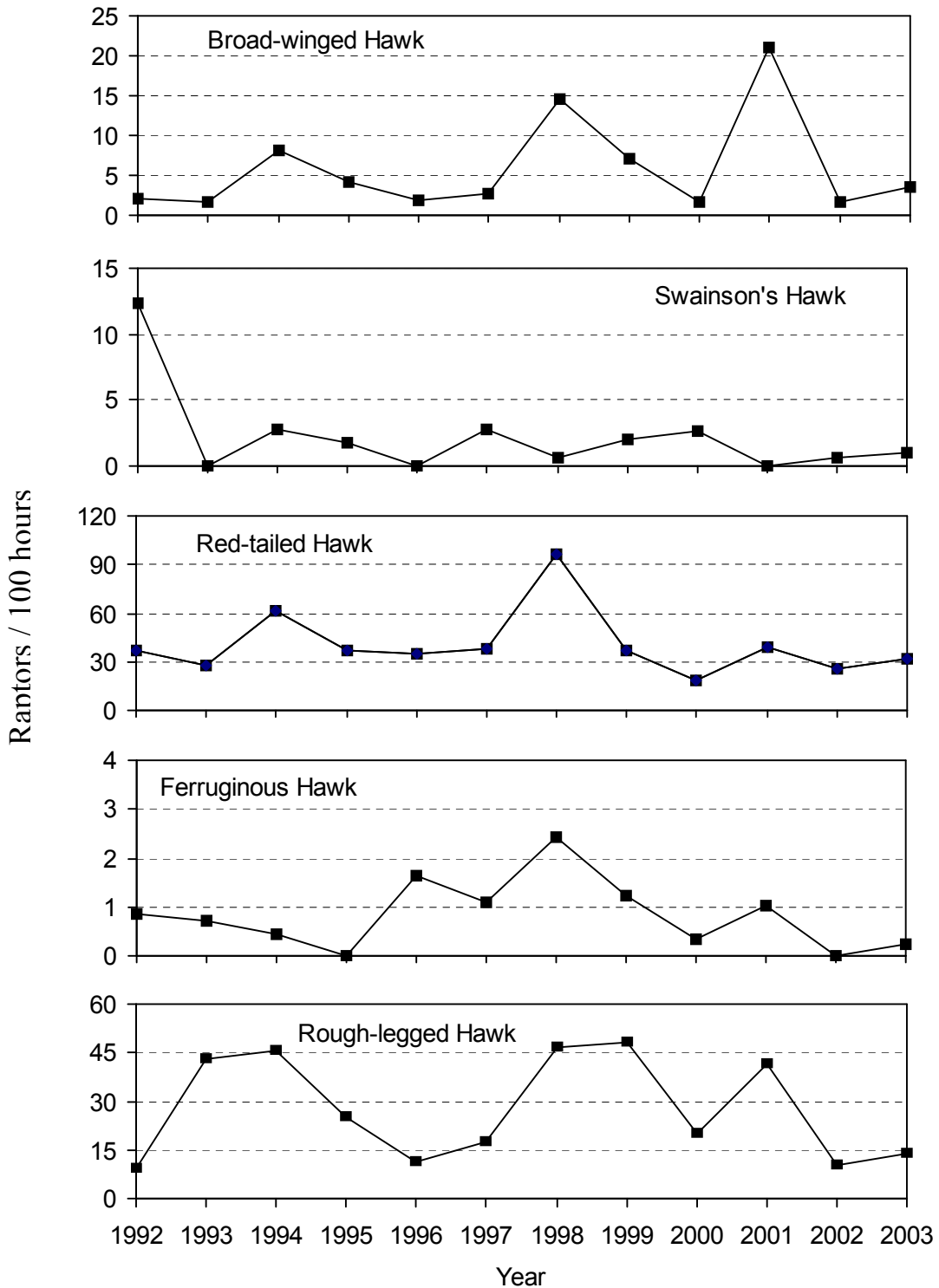


Figure 5. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Broad-winged, Swainson's, Red-tailed, Ferruginous, and Rough-legged Hawks in the Bridger Mountains, MT: 1992–2003. Dashed lines indicate significant ($P \leq 0.10$) regressions.

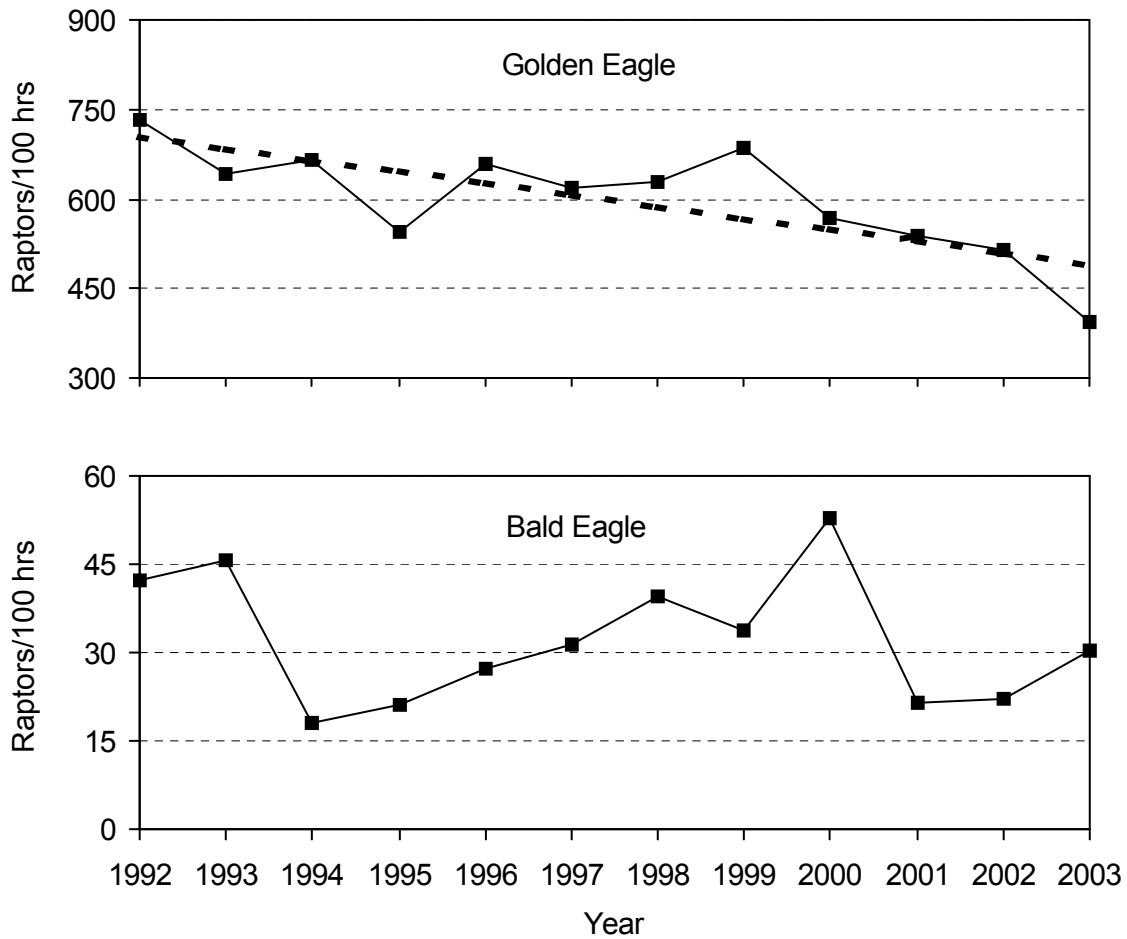


Figure 6. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Golden and Bald Eagles in the Bridger Mountains, MT: 1992–2003. Dashed lines indicate significant ($P \leq 0.10$) regressions.

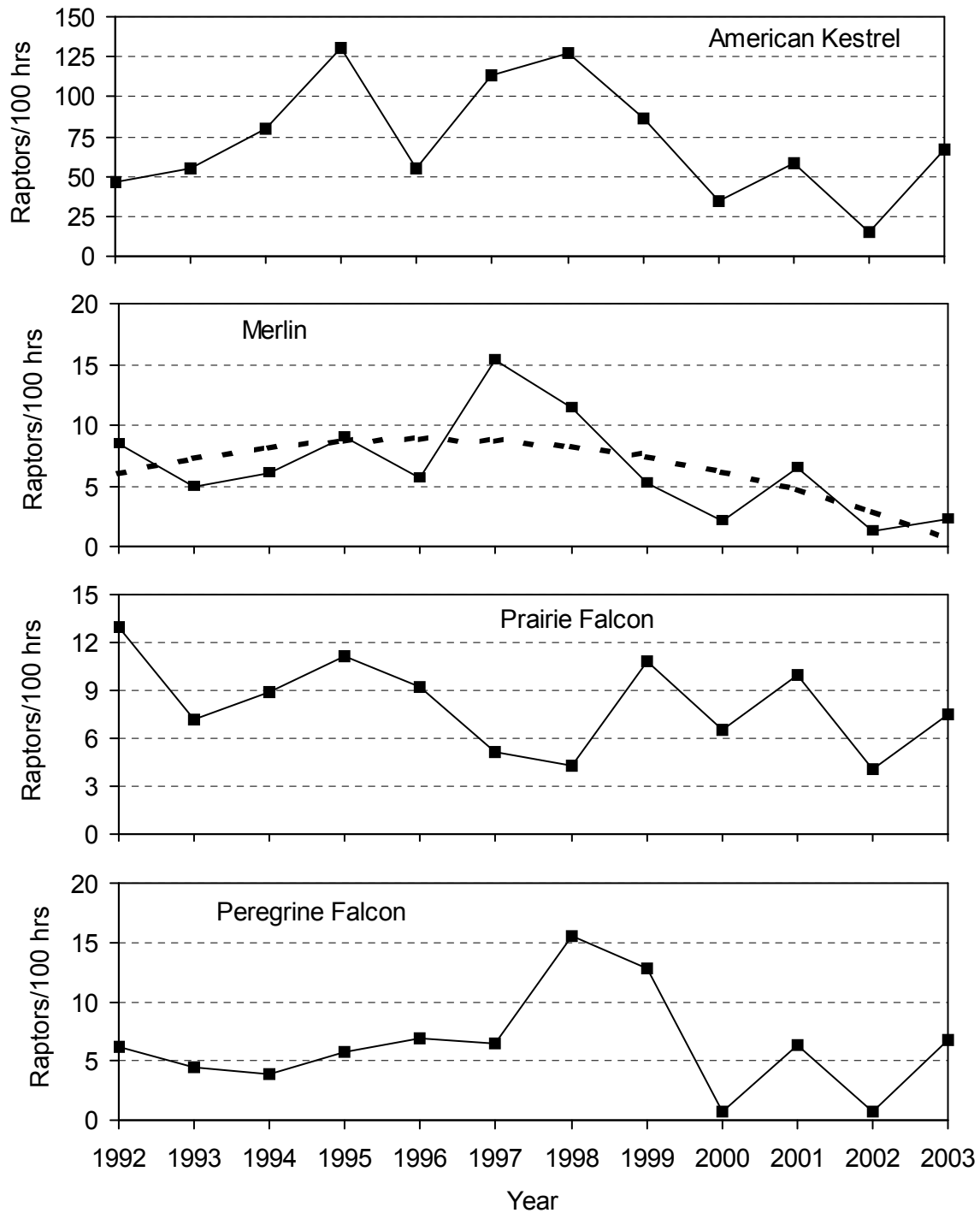


Figure 7. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons in the Bridger Mountains, MT: 1992–2003. Dashed lines indicate significant ($P \leq 0.10$) regressions.

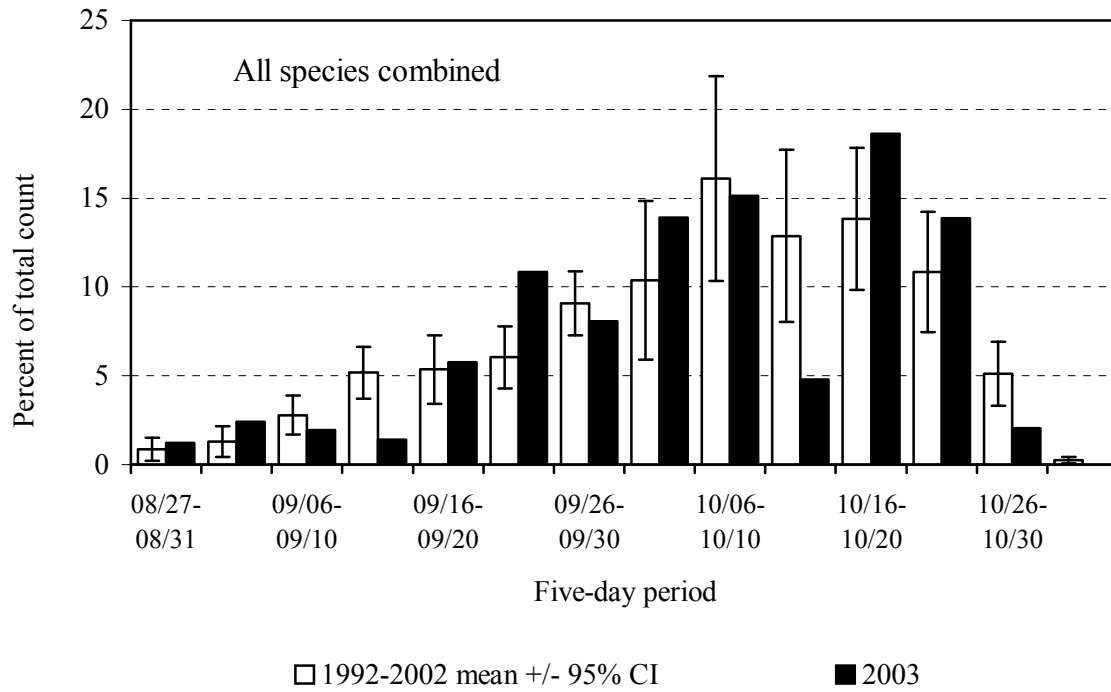


Figure 8. Combined-species, passage volume by five-day periods for migrating raptors in the Bridger Mountains, MT: 1992–2002 versus 2003.

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

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
Broad-winged Hawk	<i>Buteo platyterus</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
Gyr Falcon	<i>Falco rusticolus</i>	GY	A I U	U	W G D
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, G = gray; L = light, W = white; 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. A history of primary observers for the Bridger Mountains Raptor Migration Project.

1991: Kristian Shawn Omland (0), Phil West (1), LisaBeth Daly (2), Craig Limpach (1)

1992: Emily Teachout (1), Phil West (2)

1993: Adam Kaufman (0), Anne-Marie Gillesberg (0)

1994: Chris Gill (0), Stephanie Schmidt (1)

1995: Scott Harris (0), Sue Thomas (0)

1996: Jason Beason (0), Niels Maumenee (0)

1997: Jason Beason (1), Patty Scifres (0)

1998: Jason Beason (2), Mike Neal (0)

1999: Mike Neal (2), Greg Levandoski (1)

2000: Ryan Wagner (1), Tracy Elsey (0)

2001: Ryan Wagner (2), Jeff Maurer (4)

2002: Matt Proett (0), Marg Lomow (2; half season), and Maureen Essen (0; half season)

2003: Samantha Burrell (0) and Carl Bullock (0)

Note: Numbers in parentheses indicate number of full-seasons of previous raptor migration monitoring experience.

Appendix C. Daily observation effort, visitor disturbance ratings, weather records, and flight summaries for the Bridger Mountains Raptor Migration Project: 2003.

DATE	OBS. HOURS	OBSRVR / HOUR ¹	MEDIAN	PREDOMINANT WEATHER ³	WIND	WIND DIRECTION	TEMP (°C) ¹	BAROM.	MEDIAN	VISIB.	VISIB.	MEDIAN	BIRDS / HOUR
			VISITOR DISTURB ²		SPEED (KPH) ¹			PRESS. (IN HG) ¹	THERMAL LIFT ⁴	WEST (KM) ¹	EAST (KM) ¹	FLIGHT DISTANCE ⁵	
27-Aug	3.05	2.0	0	mc-ovc, scat fog/rain	3.5	sw	21.0	30.64	3	7	6	3	0.3
28-Aug	8.00	2.0	0	pc	3.4	sw-w	29.3	30.76	3	47	12	2	1.1
29-Aug	5.00	1.9	0	mc-ovc, AM fog	24.8	e	12.1	30.87	4	6	7	2	0.2
30-Aug	7.67	1.9	0	clr-pc, haze	8.4	e/var	18.2	30.88	2	20	14	2	0.7
31-Aug	8.17	2.0	0	clr, haze	3.3	w-wnw	25.2	30.85	3	20	22	2	1.5
1-Sep	8.00	1.9	0	clr, haze	3.7	w-wnw	21.5	30.81	2	20	16	3	1.4
2-Sep	6.92	1.9	0	clr, haze	7.2	e, w	19.4	30.90	4	15	12	2	1.0
3-Sep	8.67	2.0	0	clr, haze	1.5	s, wnw	24.0	30.96	2	10	12	2	2.8
4-Sep	7.66	1.0	0	clr-pc, haze	3.2	w	27.7	30.87	3	9	8	2	0.3
5-Sep	7.75	1.0	0	mc-ovc, haze	3.0	w-wnw	28.0	30.81	2	7	8	2	1.4
6-Sep	8.20	2.3	0	ovc, haze, scat rain	1.9	w-wnw/var	20.6	30.72	3	13	11	2	1.0
7-Sep	8.50	1.9	0	pc, haze	3.9	w-wnw	22.5	30.58	3	20	17	2	2.7
8-Sep	6.25	1.9	0	mc-ovc, rain/snow	7.3	w	13.7	30.25	4	31	39	2	0.2
9-Sep	8.50	2.0	0	pc	3.0	w-wnw	10.1	30.30	3	88	87	3	1.3
10-Sep	8.00	1.0	0	ovc, AM haze	5.7	sw-w	12.6	30.54	4	50	45	1	0.3
11-Sep	6.50	1.9	0	ovc	14.5	sw-w	9.6	30.57	4	44	53	3	0.5
12-Sep	2.90	1.8	0	ovc, fog/snow	8.6	w	2.8	30.51	4	13	9	-	0.0
13-Sep	8.50	2.2	0	mc-ovc, AM snow	6.1	w-wnw	6.8	30.78	3	80	81	2	1.2
14-Sep	8.00	2.0	0	clr-mc, PM haze	7.0	w	11.9	30.67	2	200	185	3	1.6
15-Sep	6.50	1.0	0	ovc, haze	6.0	sw-wsw	16.0	30.58	4	46	76	2	0.9
16-Sep	6.50	2.0	0	mc-ovc, fog, scat rain	12.1	ssw-wsw	7.1	30.14	4	14	30	3	6.3
17-Sep	2.25	2.0	0	ovc, fog/snow	2.2	sw	1.2	30.48	4	7	8	1	0.4
18-Sep	8.25	1.9	0	pc-mc, haze	4.2	sw-wsw	7.2	30.63	3	100	99	2	2.4
19-Sep	9.00	3.0	0	ovc-pc	5.8	wsw-w	11.9	30.55	3	100	100	2	4.8
20-Sep	8.90	1.8	0	mc, haze	6.0	wsw-wnw	8.4	30.73	3	91	74	2	3.0
21-Sep	6.83	2.3	1.5	pc-mc, haze	5.3	wsw-wnw	9.5	30.66	3	100	100	2	1.9
22-Sep	8.70	1.6	0	clr, haze	4.1	w-wnw	13.9	30.65	3	97	95	2	8.4
23-Sep	7.25	1.8	0	pc-mc, haze	13.4	w-wnw	14.8	30.50	3	98	96	3	10.3
24-Sep	8.00	1.9	0	clr, haze	3.1	w-nnw	12.6	30.72	2	100	100	2	2.6
25-Sep	7.25	1.8	0	clr-pc, haze	16.8	sw-w	16.9	30.69	3	100	99	3	9.2
26-Sep	7.50	2.2	0	clr-pc, PM haze	14.9	wsw-w	14.7	30.75	3	100	100	2	3.7
27-Sep	7.75	1.9	0	clr-pc, haze	3.7	e, w-nw	13.5	30.89	2	100	100	2	3.6
28-Sep	7.90	1.3	0	clr, haze	9.0	e-sse	12.5	30.78	4	98	98	2	5.8
29-Sep	8.00	2.0	0	pc-ovc, haze	23.9	e-se	7.8	30.74	4	94	92	2	5.5
30-Sep	8.20	1.9	0	clr, haze	7.4	se, sw	8.6	30.86	3	96	82	2	4.8
1-Oct	7.50	1.9	0	clr, haze	1.0	sw-w	14.1	30.86	2	92	83	2	3.9
2-Oct	8.75	1.6	0	clr-pc, haze	11.5	ne-e	13.5	30.67	3	95	77	2	9.9
3-Oct	9.25	1.0	2.5	pc, haze	12.8	ene-e	8.5	30.69	2	100	78	2	3.6
4-Oct	8.00	2.7	1	clr, haze	4.2	wsw-wnw	13.8	30.62	3	95	72	2	8.6
5-Oct	8.00	2.3	3.5	clr-pc, haze	3.8	wsw-w	13.0	30.71	3	90	64	2	12.6
6-Oct	7.30	1.2	0	pc-mc, haze	2.5	sw-wsw	14.4	30.68	3	93	82	3	10.1
7-Oct	6.10	2.0	0	pc/haze-ovc/rain	7.3	sw-w	13.8	30.41	4	82	65	2	12.6
8-Oct	7.50	2.3	0	pc-mc, haze	9.6	wsw	13.1	30.45	3	100	100	3	11.9
9-Oct	8.00	3.6	0	pc-ovc, haze	9.0	wsw	11.1	30.29	3	98	72	3	13.4
10-Oct	0.00			snow									
11-Oct	7.00	2.1	0	ovc	2.6	w	3.0	30.52	4	100	100	2	3.9
12-Oct	7.25	2.0	0	mc-ovc, PM snow	14.4	sw-w	1.9	30.49	4	100	100	3	4.7

Appendix C. continued

DATE	OBS. HOURS	OBSRVR / HOUR ¹	MEDIAN	PREDOMINANT WEATHER ³	WIND	WIND DIRECTION	TEMP (°C) ¹	BAROM. PRESS. (IN HG) ¹	MEDIAN	VISIB.	VISIB.	MEDIAN	BIRDS / HOUR
			VISITOR DISTURB ²		SPEED (KPH) ¹				THERMAL LIFT ⁴	WEST (KM) ¹	EAST (KM) ¹	FLIGHT DISTANCE ⁵	
13-Oct	4.66	2.7	0	fog/snow	10.1	ws-wnw	0.4	30.64	4	10	64	3	1.1
14-Oct	6.70	2.4	0	mc-ovc, fog	1.4	w-wnw	2.2	30.45	4	100	100	2	3.7
15-Oct	4.00	2.0	0	ovc, fog, PM snow	0.7	ws-w	1.8	30.58	4	88	90	2	4.8
16-Oct	6.00	2.0	0	pc-ovc	11.1	w	3.3	30.61	4	100	100	2	6.3
17-Oct	6.25	1.0	0	clr	15.8	sw-w	7.5	30.71	4	100	100	2	7.7
18-Oct	7.50	2.4	0	clr-pc	10.3	sw-w	10.1	30.81	3	100	100	3	23.5
19-Oct	6.25	2.4	0	pc, haze	10.4	sw-w	12.6	30.67	3	100	100	3	18.7
20-Oct	5.60	1.5	0	mc-ovc, haze	13.0	sw-w	11.9	30.82	4	100	100	2	8.6
21-Oct	6.60	2.4	0	mc-clr	8.6	ws-w	12.3	31.02	4	100	100	2	10.2
22-Oct	7.25	1.0	0	clr	0.2	ws-wnw/var	15.9	30.69	2	100	100	2	4.8
23-Oct	7.20	2.0	0	mc/haze-clr	10.2	ws-w	8.8	30.55	4	100	94	2	14.2
24-Oct	7.20	1.9	0	ovc-pc	9.6	w-wnw	-0.3	30.59	4	100	100	3	7.1
25-Oct	7.00	2.0	0	clr-pc, haze	18.0	w	1.2	30.87	4	100	100	2	9.0
26-Oct	6.50	1.9	0	pc-mc	20.0	ws-w	5.0	30.94	4	100	100	2	5.4
27-Oct	3.90	1.0	0	ovc, fog/snow	20.3	ws-w	5.3	30.55	4	25	40	2	0.8
28-Oct	1.50	2.0	0	ovc, fog/rain	16.5	ws-w	1.3	30.15	4	8	4	-	0.0
29-Oct	4.90	1.8	0	mc-ovc, fog	14.2	ws-w	-2.7	29.91	4	44	55	2	1.8
30-Oct	0.00			snow									
31-Oct	4.50	2.0	0	clr, fog	1.0	ws-w	-4.8	30.27	3	100	100	-	0.0

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 in the Bridger Mountains, MT: 2003.

DATE	HOURS	SPECIES ¹																							BIRDS					
		TV	OS	NH	SS	CH	NG	SA	LA	UA	BW	SW	RT	FH	RL	UB	GE	BE	UE	AK	ML	PR	PG	GY	SF	LF	UF	UU	TOTAL	/ HOUR
27-Aug	3.05	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0.3
28-Aug	8.00	0	0	2	1	0	0	1	0	0	0	0	2	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	9	1.1
29-Aug	5.00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0.2	
30-Aug	7.67	0	0	2	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	5	0.7	
31-Aug	8.17	0	0	1	5	4	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	12	1.5	
01-Sep	8.00	0	0	0	2	0	0	1	0	0	0	0	3	0	0	2	0	0	0	0	1	0	0	0	0	0	2	11	1.4	
02-Sep	6.92	0	0	2	1	0	0	0	0	0	0	0	0	0	0	1	0	0	2	0	1	0	0	0	0	0	0	7	1.0	
03-Sep	8.67	0	0	4	5	4	0	0	0	0	1	0	3	0	0	3	0	0	4	0	0	0	0	0	0	0	0	24	2.8	
04-Sep	7.66	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0.3	
05-Sep	7.75	0	0	0	2	2	0	0	0	0	0	0	1	0	0	5	0	0	0	0	0	0	0	0	0	0	1	11	1.4	
06-Sep	8.20	0	1	2	0	0	0	1	0	0	0	0	1	0	0	0	0	0	3	0	0	0	0	0	0	0	0	8	1.0	
07-Sep	8.50	0	0	2	9	2	0	0	0	0	0	0	3	0	0	5	0	0	1	0	1	0	0	0	0	0	0	23	2.7	
08-Sep	6.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0.2		
09-Sep	8.50	0	0	0	2	2	0	0	0	0	0	0	2	0	0	3	0	0	1	0	1	0	0	0	0	0	11	1.3		
10-Sep	8.00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0.3	
11-Sep	6.50	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	3	0.5	
12-Sep	2.90	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	
13-Sep	8.50	0	0	1	3	2	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	1	10	1.2	
14-Sep	8.00	0	0	0	3	1	0	0	0	0	1	0	1	0	0	2	1	0	4	0	0	0	0	0	0	0	0	13	1.6	
15-Sep	6.50	0	0	0	1	1	0	0	0	0	0	0	1	0	0	2	0	0	1	0	0	0	0	0	0	0	0	6	0.9	
16-Sep	6.50	0	1	0	14	5	0	2	0	0	1	1	2	0	0	1	1	0	0	12	0	0	0	0	0	0	1	41	6.3	
17-Sep	2.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0.4	
18-Sep	8.25	0	0	0	4	2	0	0	1	0	0	0	2	0	0	8	0	0	3	0	0	0	0	0	0	0	0	20	2.4	
19-Sep	9.00	0	0	1	9	9	1	3	0	0	0	0	5	0	0	2	7	0	0	3	0	1	0	0	0	0	2	43	4.8	
20-Sep	8.90	0	0	1	6	6	1	0	0	0	0	0	4	0	0	1	1	0	6	0	1	0	0	0	0	0	0	27	3.0	
21-Sep	6.83	0	0	0	2	0	0	2	0	0	0	1	0	0	0	2	0	0	4	0	0	1	0	0	0	0	1	13	1.9	
22-Sep	8.70	0	1	1	19	4	1	2	1	0	4	0	7	0	0	24	1	0	5	0	0	2	0	0	0	0	1	73	8.4	
23-Sep	7.25	0	0	1	12	11	0	5	0	0	0	0	6	0	0	1	16	0	0	15	0	3	2	0	0	1	0	75	10.3	
24-Sep	8.00	0	0	6	3	3	0	0	0	0	0	0	2	0	0	4	0	0	0	0	1	1	0	0	0	0	1	21	2.6	
25-Sep	7.25	0	1	0	9	10	1	3	0	0	0	0	4	0	0	1	32	0	0	6	0	0	0	0	0	0	0	67	9.2	
26-Sep	7.50	0	0	1	2	2	0	2	0	0	0	0	1	0	0	0	19	0	0	0	0	1	0	0	0	0	0	28	3.7	
27-Sep	7.75	0	0	1	7	2	0	0	0	0	0	0	2	0	0	0	13	0	0	1	0	0	0	0	0	1	0	28	3.6	
28-Sep	7.90	0	0	4	10	3	0	1	0	0	0	0	2	0	0	0	16	9	1	0	0	0	0	0	0	0	0	46	5.8	
29-Sep	8.00	0	1	1	10	2	1	0	0	0	0	0	4	0	0	0	15	3	0	5	0	1	0	0	0	0	1	44	5.5	

Appendix D. continued

DATE	HOURS	SPECIES ¹																								BIRDS				
		TV	OS	NH	SS	CH	NG	SA	LA	UA	BW	SW	RT	FH	RL	UB	GE	BE	UE	AK	ML	PR	PG	GY	SF	LF	UF	UU	TOTAL	/ HOUR
30-Sep	8.20	0	0	0	16	2	0	0	0	0	0	0	2	0	0	0	6	6	0	5	1	0	1	0	0	0	0	0	39	4.8
01-Oct	7.50	0	0	1	10	1	0	0	0	0	0	0	4	1	0	0	5	3	0	4	0	0	0	0	0	0	0	29	3.9	
02-Oct	8.75	0	0	3	10	1	3	0	0	0	1	0	8	0	0	0	51	6	1	3	0	0	0	0	0	0	0	87	9.9	
03-Oct	9.25	0	0	3	11	1	0	1	0	0	1	0	1	0	0	0	10	3	0	1	0	0	0	0	0	0	1	33	3.6	
04-Oct	8.00	0	0	0	8	1	1	0	0	0	0	0	6	0	0	0	42	5	0	4	0	1	0	0	0	0	1	69	8.6	
05-Oct	8.00	0	0	0	22	1	0	1	0	0	0	0	9	0	0	0	59	2	0	3	1	1	0	0	0	0	1	101	12.6	
06-Oct	7.30	0	0	1	8	5	0	0	0	0	0	0	4	0	0	0	51	4	0	0	0	0	1	0	0	0	0	74	10.1	
07-Oct	6.10	0	0	0	17	2	0	0	0	0	0	0	2	0	0	0	52	3	0	1	0	0	0	0	0	0	0	77	12.6	
08-Oct	7.50	0	0	1	16	6	1	0	0	0	0	0	2	0	0	0	57	5	0	1	0	0	0	0	0	0	0	89	11.9	
09-Oct	8.00	0	0	4	34	5	3	0	0	0	0	0	7	0	1	1	46	4	1	1	0	0	0	0	0	0	0	107	13.4	
10-Oct	0.00																													
11-Oct	7.00	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	22	1	0	0	0	0	1	0	0	0	0	27	3.9	
12-Oct	7.25	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	31	1	0	0	0	0	0	0	0	0	0	34	4.7	
13-Oct	4.66	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	5	1.1	
14-Oct	6.70	0	0	0	6	1	0	0	0	0	0	0	0	0	5	0	12	1	0	0	0	0	0	0	0	0	0	25	3.7	
15-Oct	4.00	0	0	1	1	0	0	0	0	0	0	0	1	0	1	0	14	0	0	1	0	0	0	0	0	0	0	19	4.8	
16-Oct	6.00	0	0	0	1	0	0	0	0	0	0	0	2	0	2	0	30	3	0	0	0	0	0	0	0	0	0	38	6.3	
17-Oct	6.25	0	0	0	5	0	0	0	0	0	0	0	0	0	1	0	40	2	0	0	0	0	0	0	0	0	0	48	7.7	
18-Oct	7.50	0	0	1	32	6	0	0	0	0	0	0	0	0	0	0	134	3	0	0	0	0	0	0	0	0	0	176	23.5	
19-Oct	6.25	0	0	0	18	4	0	1	0	0	0	0	2	0	1	0	85	4	1	0	0	0	0	0	0	0	0	117	18.7	
20-Oct	5.60	0	0	1	17	3	1	0	0	0	0	0	2	0	1	0	22	1	0	0	0	0	0	0	0	0	0	48	8.6	
21-Oct	6.60	0	0	1	23	2	1	0	1	0	0	0	2	0	1	0	35	0	0	0	0	0	0	0	0	0	1	67	10.2	
22-Oct	7.25	0	0	1	7	5	0	0	0	0	0	0	0	0	2	0	18	2	0	0	0	0	0	0	0	0	0	35	4.8	
23-Oct	7.20	0	0	0	2	4	1	0	0	0	0	0	0	0	1	0	87	7	0	0	0	0	0	0	0	0	0	102	14.2	
24-Oct	7.20	0	0	1	2	0	0	1	0	0	0	0	0	0	1	0	44	0	0	0	1	0	1	0	0	0	0	51	7.1	
25-Oct	7.00	0	0	1	1	1	3	1	0	0	0	0	0	0	1	0	46	9	0	0	0	0	0	0	0	0	0	63	9.0	
26-Oct	6.50	0	0	0	1	0	1	0	0	0	0	0	0	0	3	0	27	3	0	0	0	0	0	0	0	0	0	35	5.4	
27-Oct	3.90	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	3	0.8	
28-Oct	1.50	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	4.90	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	5	0	0	0	0	0	0	0	0	0	0	9	1.8	
30-Oct	0.00																													
31-Oct	4.50	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	443.18	0	5	54	416	132	23	29	4	0	9	2	113	1	22	6	1226	93	4	102	4	15	10	0	0	3	1	20	2294	5.2

¹ See Appendix A for interpretation of species codes.

Appendix E. Annual observation effort and fall raptor migration counts by species in the Bridger Mountains, MT: 1991–2003.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	Mean
Start date	15-Sep	6-Sep	9-Sep	13-Sep	10-Sep	1-Sep	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	27-Aug	1-Sep
End date	3-Nov	28-Oct	31-Oct	30-Oct	2-Nov	30-Oct	31-Oct	31-Oct	31-Oct	31-Oct	31-Oct	31-Oct	31-Oct	30-Oct
Observation days	32	39	46	36	42	53	62	56	57	52	58	52	64	50
Observation hours	191.1	242.58	298.50	239.25	269.17	378.25	422.92	339.33	358.24	335.40	347.49	365.84	443.18	325.48
Raptors / 100 hours	926.7	1000.1	872.0	1025.3	824.0	808.5	796.1	1040.9	871.8	630.9	636.3	556.0	517.6	808.2
Turkey Vulture	3	0	0	0	0	1	6	0	2	0	0	0	0	1
Osprey	2	2	5	5	1	14	12	13	9	6	6	2	5	6
Northern Harrier	19	13	41	59	10	38	66	230	52	20	36	15	54	50
Sharp-shinned Hawk	88	248	279	364	304	436	480	612	442	190	274	288	416	340
Cooper's Hawk	87	175	124	134	131	206	347	343	149	109	120	103	132	166
Northern Goshawk	27	96	39	17	10	37	36	50	61	34	26	2	23	35
Unknown small accipiter ¹	-	-	-	-	-	-	-	-	-	-	0	11	29	13
Unknown large accipiter ¹	-	-	-	-	-	-	-	-	-	-	0	4	4	3
Unknown accipiter	70	35	27	20	33	51	53	49	39	35	27	5	0	34
TOTAL ACCIPITERS	272	554	469	535	478	730	916	1054	691	368	447	413	604	579
Broad-winged Hawk	0	2	3	11	5	5	5	20	13	3	38	3	9	9
Swainson's Hawk	1	11	0	3	2	0	6	2	3	3	0	1	2	3
Red-tailed Hawk	26	67	65	110	79	106	130	277	121	45	117	78	113	103
Ferruginous Hawk	3	1	1	1	0	5	4	7	4	1	3	0	1	2
Rough-legged Hawk	9	10	54	48	29	17	23	66	77	26	57	11	22	35
Unidentified buteo	14	8	19	15	18	13	20	13	3	8	6	9	6	12
TOTAL BUTEOS	53	99	142	188	133	146	188	385	221	86	221	102	153	163
Golden Eagle	1280	1579	1699	1500	1322	1871	1844	1516	1870	1429	1330	1359	1226	1525
Bald Eagle	43	95	124	41	57	79	93	95	91	128	58	55	93	81
Unidentified eagle	5	2	17	0	25	14	0	15	5	3	2	15	4	8
TOTAL EAGLES	1328	1676	1840	1541	1404	1964	1937	1626	1966	1560	1390	1429	1323	1614
American Kestrel	33	38	54	67	117	82	146	141	113	39	62	16	102	78
Merlin	2	10	7	7	12	9	26	17	8	3	9	2	4	9
Prairie Falcon	9	14	10	10	14	16	10	12	20	9	14	6	15	12
Peregrine Falcon	1	7	6	4	7	10	10	18	18	1	8	1	10	8
Gyrfalcon	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Unknown small falcon ¹	-	-	-	-	-	-	-	-	-	-	0	0	0	0
Unknown large falcon ¹	-	-	-	-	-	-	-	-	-	-	0	1	3	1
Unknown falcon	5	3	2	4	2	5	17	8	6	4	3	4	1	5
TOTAL FALCONS	50	72	79	92	152	122	209	196	166	56	96	30	135	112
Unidentified raptor	44	10	27	33	40	43	33	28	16	20	15	43	20	29
GRAND TOTAL	1771	2426	2603	2453	2218	3058	3367	3532	3123	2116	2211	2034	2294	2554

¹ Designations used for the first time in 2001.