FALL 2004 RAPTOR MIGRATION STUDY IN THE BRIDGER MOUNTAINS, MONTANA

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January 2005

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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 2004 count, which marked the 13th 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 2004 annual statistics against means and 95% confidence intervals for previous seasons, I equate significance with a 2004 value falling outside the bounds of the confidence interval for the associated mean.

RESULTS AND DISCUSSION

WEATHER SUMMARY

Compared to the past seven seasons (the period of record for which detailed weather records have been compiled and analyzed), heavy rain, snow and fog events hampered observations more in 2004 than during any previous year (see Appendix C for daily weather records), entirely precluding 16 days of observation (1997–2003 average of 9 days) and reducing another 5 days to less than 4 hours of observation (average 6 days). This includes the last four days of October, when heavy snow shut down the count prematurely, and five other 2–3 day events scattered between mid-September and mid-October. In general, conditions that precluded further observations, especially low clouds and fog on the ridge, tended to set in harder and stay longer than usual. This resulted in a high number of days when no observations were possible at all; however, in between these events, fog, rain and snow were relatively scarce (occurred on only 28% of the active observation days vs. 1997–2003 average of 45%), the proportion of active observation days that featured predominantly overcast skies was below average (25% vs. average of 30%), temperatures tended to be warmer than average, and light winds prevailed more often than usual (96% of the active observation days vs. average of 76%).

The maximum daily-average temperature of 22.5°C was on the cool side (highest to date 29.6°C), but both the average daily temperature (12.8°C; an average of daily values which in turn were averages of hourly records) and minimum daily-average temperature (1.3°C; an average of hourly records for the day) were the warmest recorded since 1997. The 2004 average daily barometric pressure (29.84 in Hg;) and minimum daily-average barometric pressure (28.82 in Hg;) were both the lowest recorded since 2000 (the period of record for this variable).

Data collected in 2004 during active observations indicated that winds ranging from southeasterly to southwesterly, and to a lesser degree westerly, were proportionately more common than usual, whereas northwesterly winds were less common than usual (2004: 64% of active days featured predominantly SE-SW or SW-W winds, 2% W–NW; 1997–2003 averages: 46%, 20%).

In summary, compared to the last seven years, extended bouts of rain/snow and thick low clouds and fog that precluded entire days of observation were roughly twice as common as usual in 2004. Low average barometric pressure readings during active observation periods testify to the prevalence of low-pressure systems. However, outside of marked, generally extended periods of unfavorable weather, overcast

skies, rain/snow and fog were relatively scarce and light, warm, southerly winds prevailed more than usual. In other words, the weather during the 2004 season featured a variety of marked contrasts.

OBSERVATION EFFORT

The observers worked on 49 of 66 possible observation days between 27 August and 31 October, but unfortunately misplaced the data sheets for one day (October 5th), leaving 48 days of useable data. The number of observation days and hours were 7% and 6% below the 1992–2003 averages (51 ± 95% CI of 5.1 days, 336.7 ± 95% CI of 36.7 hours). However, this was by far the lowest level of observation effort since 1997 when HWI adopted a standardized observation period of 27 August through 31 October. This is consistent with the unusually high prevalence of inclement weather as summarized above, and stands in stark contrast to observation effort having been the highest yet in 2003 due to especially mild weather. The 2004 average of 2.0 observers per hour (including official and guest observers; value is mean of daily values, which are in turn means of hourly values) was 6% above the long-term average of 1.9 ± 95% CI of 0.11 observers per hour.

FLIGHT SUMMARY

The observers tallied 2,075 migrant raptors of 15 species during the 2004 season (Table 1, and see Appendix D for daily count records). The count was a significant 21% below average (see Appendix E for annual summaries). The count of Golden Eagles fell to a new record low for the second year in a row (Appendix E); however, 16% of the total number of eagles passed through between 25–27 October just before heavy snow shut down the operation for the last four days of schedule observations. This suggests that the early shutdown may have caused us to miss a significant portion of the eagle flight.

The flight was composed of 62% eagles, 22% accipiters, 7% buteos, 5% falcons, 2% harriers, <1% Ospreys, and 2% unidentified raptors. These values represent significantly higher than average proportions of falcons and unidentified raptors, and a significantly below average proportion of Ospreys (Figure 2). The most numerous species were the Golden Eagle (58% of the total count), Sharp-shinned Hawk (11%), Cooper's Hawk (7%), Red-tailed Hawk (5%), Bald Eagle (4%), American Kestrel (3%), Northern Harrier (2%), and Northern Goshawk (2%). All other species each comprised 1% or less of the total.

Adjusted 2004 passage rates were significantly below average for Ospreys, Northern Goshawks, and Red-tailed Hawks, but were significantly above average for Bald Eagles, American Kestrels, Merlins, and Peregrine Falcons (Table 1, Figures 3–7). Regression analyses of data through 2004 revealed a significant ($P \leq 0.05$), currently declining, quadratic trend for Ospreys (Figure 3); a highly significant ($P \leq 0.01$) linear decreasing trend for Golden Eagles, primarily reflecting a significant declining trend for immatures/subadults (Figure 6); and no significant trends for other species.

Between 1998 and 2002, several species showed distinct declining trends, which likely reflected the 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 and/or 2004 for most such species (e.g., Cooper's Hawks, Northern Goshawks, Ferruginous Hawks, American Kestrels, Merlins, Peregrine Falcons; see Figures 3–7) may signal a degree of recovery. However, among 10 species for which age-specific information can be reliably acquired, counts of immature birds were appreciably above average only for Northern Goshawks, whereas improved counts for species such as Cooper's Hawks and Red-tailed Hawks were due entirely to increased relative abundances of adults (Table 2). Similarly, the counts of positively identified immature/subadult Golden and Bald Eagles were well below average, whereas the counts of adult eagles were above average (Table 2).

Changes in effort before 1997 may confound interpretation of the overall trends; nevertheless, there is little doubt that the Golden Eagle passage rate, especially that of young eagles, dropped substantially between 1999 and 2003 (Figure 6). In 2004, after having dropped to a record low in 2003, the passage rate of adult eagles rose to among the highest levels recorded for the project, whereas the passage rate of non-adults dropped to among the lowest levels ever recorded. 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 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. In this regard, the partial recovery of adult numbers in 2004 is consistent with this hypothesis, in that weather conditions turned unusually cold and snowy by late October in 2004. As alluded to previously in relation to the marked spike in eagle activity that occurred very late in the season just before heavy snow shut down the count prematurely (comprised predominantly of adults), this pattern may have been even further accentuated had our observers been able to continue monitoring for another week.

At the species level, Golden Eagles showed a significantly early median passage date due to an unusually early, proportional concentration of activity (Figure 8) during an atypical (for the season) stretch of mostly fair weather during the last week of September and first week of October (Appendix C). In contrast, the indication of proportionately low activity during mid-October, usually the highest activity period for eagles, may be largely an artifact of inclement weather, often including heavy fog, having more frequently precluded effective observations. The seasonal distribution of Bald Eagle activity showed a very similar, atypical pattern (Figure 8).

Due to the unusually high prevalence of inclement weather that hampered observations, many species showed atypical seasonal activity patterns in 2004 (e.g., see Figure 9), with all but two species for which a comparison was possible showing either significantly late or early median passage dates (Table 3). Similar to the case with Golden Eagles, many species showed unusually high proportional concentrations of activity in late September, and as a result six species whose average median passage dates range from late September through mid-October showed significantly early median dates in 2004 (Table 3). Conversely, four species whose peak activity periods have usually passed or typically begin subsiding about that time showed significantly late median dates in 2004 (i.e., Broad-winged and Red-tailed Hawks, American Kestrels, and Peregrine Falcons). Typically late-season Rough-legged Hawks also showed a significantly late median passage in 2004 due to an unusually high proportional concentration of activity during the last few days of observation.

RESIDENT RAPTORS

The 2004 resident community included one family of Golden Eagles, with the adults present throughout the season and a first-year bird seen regularly through at least mid-October. At least one immature, light-morph Red-tailed Hawk was seen regularly on the ridge near the count site through late September, and at least one adult red-tail was seen regularly through mid-October. A pair of American Kestrels was seen regularly through the third week of September. At least one immature Sharp-shinned Hawk was seen regularly hunting in the area through early October. Other scattered sightings in September also suggested the possibility of at least one local Northern Goshawk, two immature Northern Harriers, and a Prairie Falcon, and an adult Bald Eagle sighting in late August also probably involved a resident bird. The absence of obvious local Cooper's Hawks is the only notable difference compared to previous seasons.

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 2004, due to the unusual prevalence of inclement weather, overall visitation to the site was low, at less than 100 individuals. Ironically, however, despite the high overall prevalence of inclement weather, this was the second year in a row that both the weather and flight volume cooperated nicely during the annual Bridger Raptor Festival, with an average of 20 visitors present at the count site throughout the primary field day.

In 2004, 326 hourly assessments by the primary observers of visitor disturbance resulted in the following ratings: 89% none, 7% low, 2% moderate, and 2% high.

ACKNOWLEDGMENTS

Funding for the 2004 project was provided by Gallatin National Forest, New Belgium Brewing Company, and HWI private donors and members. Gallatin National Forest and Bridger Bowl Ski Area provided essential logistical support. Special thanks to Jeff Pentel, Steve Hoffman, John Parker, Bob Peterson, Bev Dixon, and Randy Elliot for their observational, logistical, and/or housing assistance.

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Sherrington, P. 2003. Trends in a migratory population of Golden Eagle (*Aquila chrysaetos*) in the Canadian Rocky Mountains. Bird Trends Canada 9:34–39.

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: 1992–2003 versus 2004.

SPECIES	COUNTS			RAPTORS/100HRS		
	1992–2003[1]	2004	%CHANGE	1992–2003[1]	2004	%CHANGE
Turkey Vulture	1 ± 1.0	0	-100	16.7 ± 10.81	12.1	-28
Osprey	7 ± 2.5	1	-85	135.6 ± 25.56	98.7	-27
Northern Harrier	53 ± 33.3	39	-26	134.4 ± 37.16	118.4	-12
Sharp-shinned Hawk	361 ± 67.7	229	-37	12.3 ± 5.68	16.5	+34
Cooper's Hawk	173 ± 48.3	142	-18	6.1 ± 3.57	3.2	-47
Northern Goshawk	36 ± 14.2	41	+14	2.2 ± 1.90	0.0	-100
Unknown small accipiter[2]	13 ± 16.6	32	+140	–	–	–
Unknown large accipiter[2]	3 ± 2.6	9	+238	–	–	–
Unknown accipiter	31 ± 9.5	7	-78	–	–	–
TOTAL ACCIPITERS	605 ± 118.4	460	-24	–	–	–
Broad-winged Hawk	10 ± 5.9	6	-38	40.0 ± 11.43	42.9	+7
Swainson's Hawk	3 ± 1.8	0	-100	0.8 ± 0.40	1.0	+26
Red-tailed Hawk	109 ± 33.5	100	-8	27.0 ± 8.96	15.6	-42
Ferruginous Hawk	2 ± 1.3	3	+29	598.7 ± 52.35	558.0	-7
Rough-legged Hawk	37 ± 12.8	20	-45	32.2 ± 5.98	37.2	+16
Unidentified buteo	12 ± 3.2	18	+57	–	–	–
TOTAL BUTEOS	172 ± 45.7	147	-15	–	–	–
Golden Eagle	1545 ± 129.3	1196	-23	72.2 ± 20.59	61.3	-15
Bald Eagle	84 ± 15.4	79	-6	6.5 ± 2.29	9.3	+43
Unidentified eagle	9 ± 4.7	2	-76	–	–	–
TOTAL EAGLES	1638 ± 134.4	1277	-22	–	–	–
American Kestrel	81 ± 23.9	65	-20	8.3 ± 1.65	10.2	+23
Merlin	10 ± 3.7	11	+16	6.4 ± 2.40	9.7	+52
Prairie Falcon	13 ± 2.1	12	-4	7.1 ± 5.21	5.4	-24
Peregrine Falcon	8 ± 3.1	10	+20	5.3 ± 2.13	10.3	+96
Gyrfalcon	0.1 ± 0.2	0	-100	–	–	–
Unknown small falcon[2]	0 ± 0.0	3	–	–	–	–
Unknown large falcon[2]	1 ± 1.7	3	+125	–	–	–
Unknown falcon	5 ± 2.4	9	+83	–	–	–
TOTAL FALCONS	117 ± 31.7	113	-3	–	–	–
Unidentified raptor	27 ± 6.4	38	+39	–	–	–
GRAND TOTAL	2620 ± 292.2	2075	-21	–	–	–

[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: 1992–2003 versus 2004.

	Total and Age-classified Counts								Immature : Adult Ratio	
	1992–2003 Average			2004			% Unknown Age			
	Total	Imm.	Adult	Total	Imm.	Adult	1992–2003[1]	2004	1992–2003[1]	2004
Northern Harrier	53	26	11	39	22	9	33 ± 6.8	21	4.3 ± 4.82	2.4
Sharp-shinned Hawk	361	70	133	229	47	111	44 ± 8.2	31	0.6 ± 0.13	0.4
Cooper's Hawk	173	52	52	142	30	67	40 ± 7.4	32	1.0 ± 0.30	0.4
Northern Goshawk	36	13	16	41	23	9	20 ± 8.7	22	1.5 ± 0.67	2.6
Broad-winged Hawk	10	2	4	6	1	4	36 ± 22.0	17	1.2 ± 1.11	0.3
Red-tailed Hawk	109	38	47	100	26	65	23 ± 4.8	9	0.8 ± 0.46	0.4
Golden Eagle	1545	598	552	1196	353	668	26 ± 4.8	15	1.1 ± 0.21	0.5
Bald Eagle	84	30	52	79	19	59	3 ± 17.9	1	0.6 ± 0.12	0.3
Peregrine Falcon	8	0.4	5	10	2	1	43 ± 17.9	70	0.1 ± 0.1	2.0

[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 2004, with a comparison of 2004 and 1992–2003 average median passage dates.

	2004				1992–2003
Species	First Observed	Last Observed	Bulk Passage Dates[1]	Median Passage Date[2]	Median Passage Date[3]
Osprey	26-Sep	26-Sep	–	–	16-Sep ± 3.4
Northern Harrier	6-Sep	26-Oct	7-Sep – 26-Oct	29-Sep	22-Sep ± 5.6
Sharp-shinned Hawk	28-Aug	26-Oct	18-Sep – 13-Oct	30-Sep	02-Oct ± 2.0
Cooper's Hawk	28-Aug	15-Oct	11-Sep – 30-Sep	24-Sep	22-Sep ± 2.9
Northern Goshawk	4-Sep	25-Oct	9-Sep – 11-Oct	25-Sep	10-Oct ± 6.4
Broad-winged Hawk	18-Sep	11-Oct	18-Sep – 11-Oct	25-Sep	20-Sep ± 2.3
Red-tailed Hawk	27-Aug	15-Oct	10-Sep – 6-Oct	25-Sep	20-Sep ± 2.9
Ferruginous Hawk	6-Sep	26-Sep	–	–	29-Sep ± 15.7
Rough-legged Hawk	30-Sep	27-Oct	11-Oct – 27-Oct	25-Oct	12-Oct ± 2.8
Golden Eagle	29-Aug	27-Oct	25-Sep – 25-Oct	6-Oct	12-Oct ± 2.5
Bald Eagle	17-Sep	26-Oct	25-Sep – 26-Oct	9-Oct	15-Oct ± 2.8
American Kestrel	6-Sep	9-Oct	16-Sep – 3-Oct	25-Sep	21-Sep ± 2.5
Merlin	6-Sep	11-Oct	16-Sep – 11-Oct	26-Sep	02-Oct ± 2.4
Prairie Falcon	4-Sep	13-Oct	6-Sep – 6-Oct	18-Sep	24-Sep ± 5.7
Peregrine Falcon	26-Sep	25-Oct	26-Sep – 22-Oct	2-Oct	24-Sep ± 3.0
All species	6-Sep	27-Oct	18-Sep – 25-Oct	2-Oct	08-Oct ± 1.5

[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.

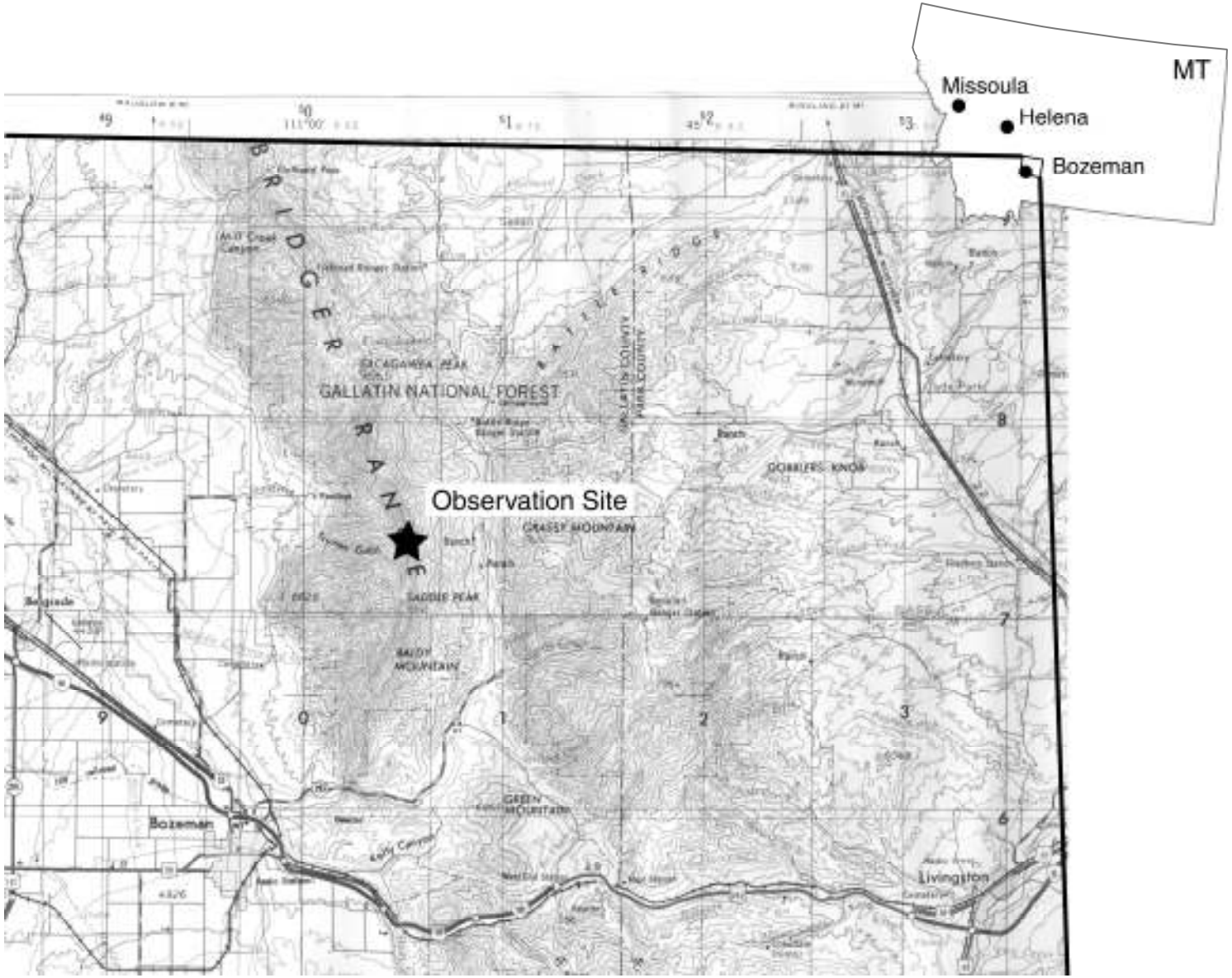

Figure 1. Location of the Bridger Mountains Raptor Migration Project study site.

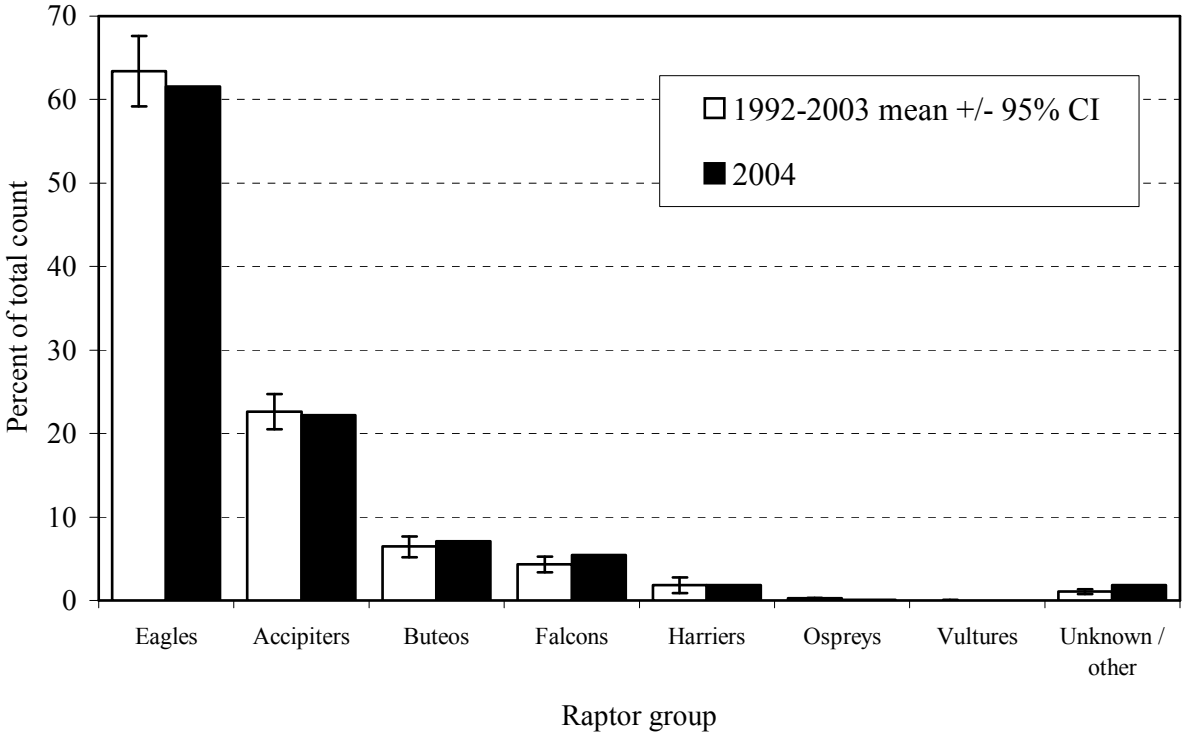

Figure 2. Composition of the fall raptor migration in the Bridger Mountains by major species groups: 1992–2003 versus 2004.

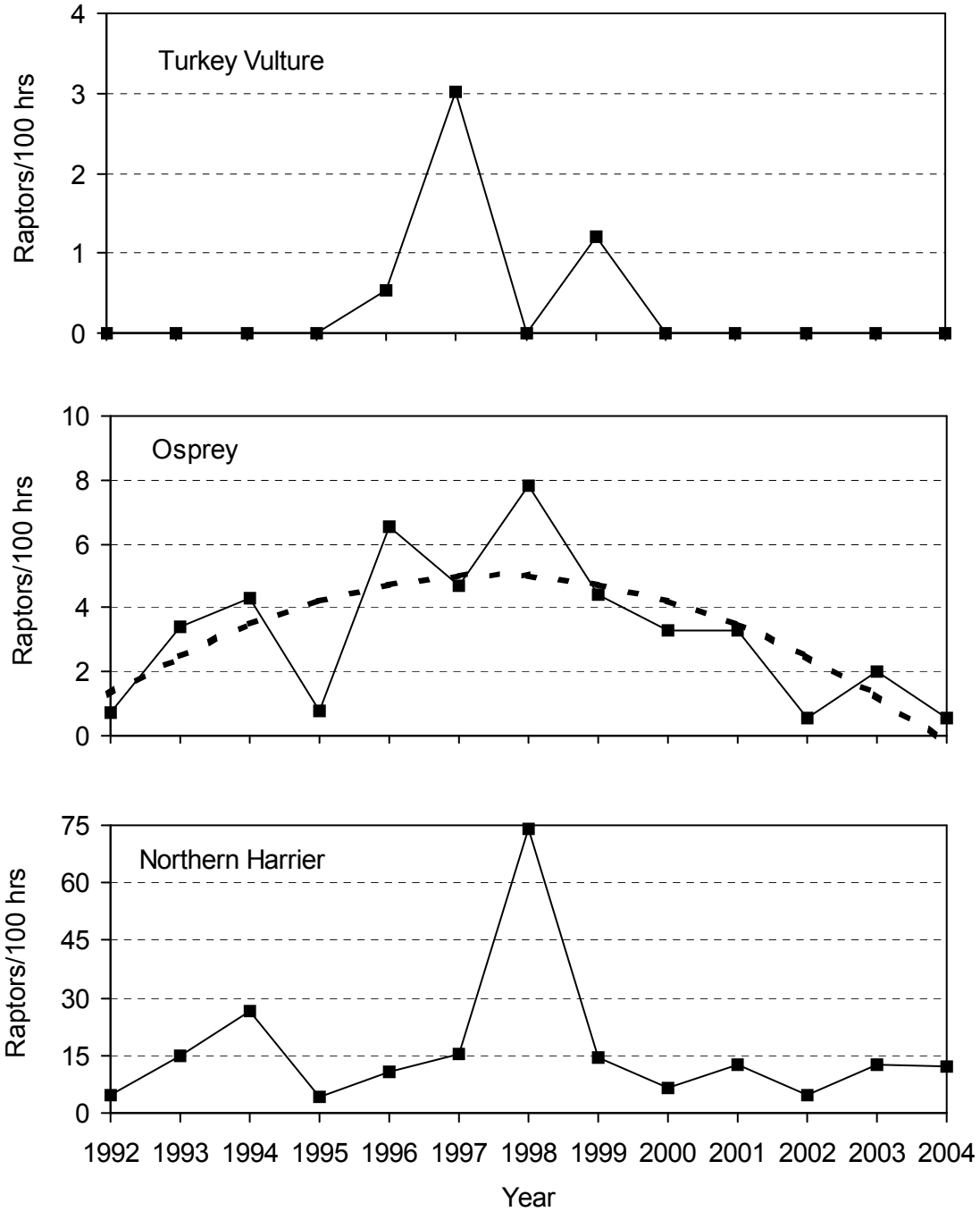

Figure 3. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Turkey Vultures, Ospreys, and Northern Harriers in the Bridger Mountains, MT: 1992–2004. Dashed lines indicate significant ($P \leq 0.10$) regressions.

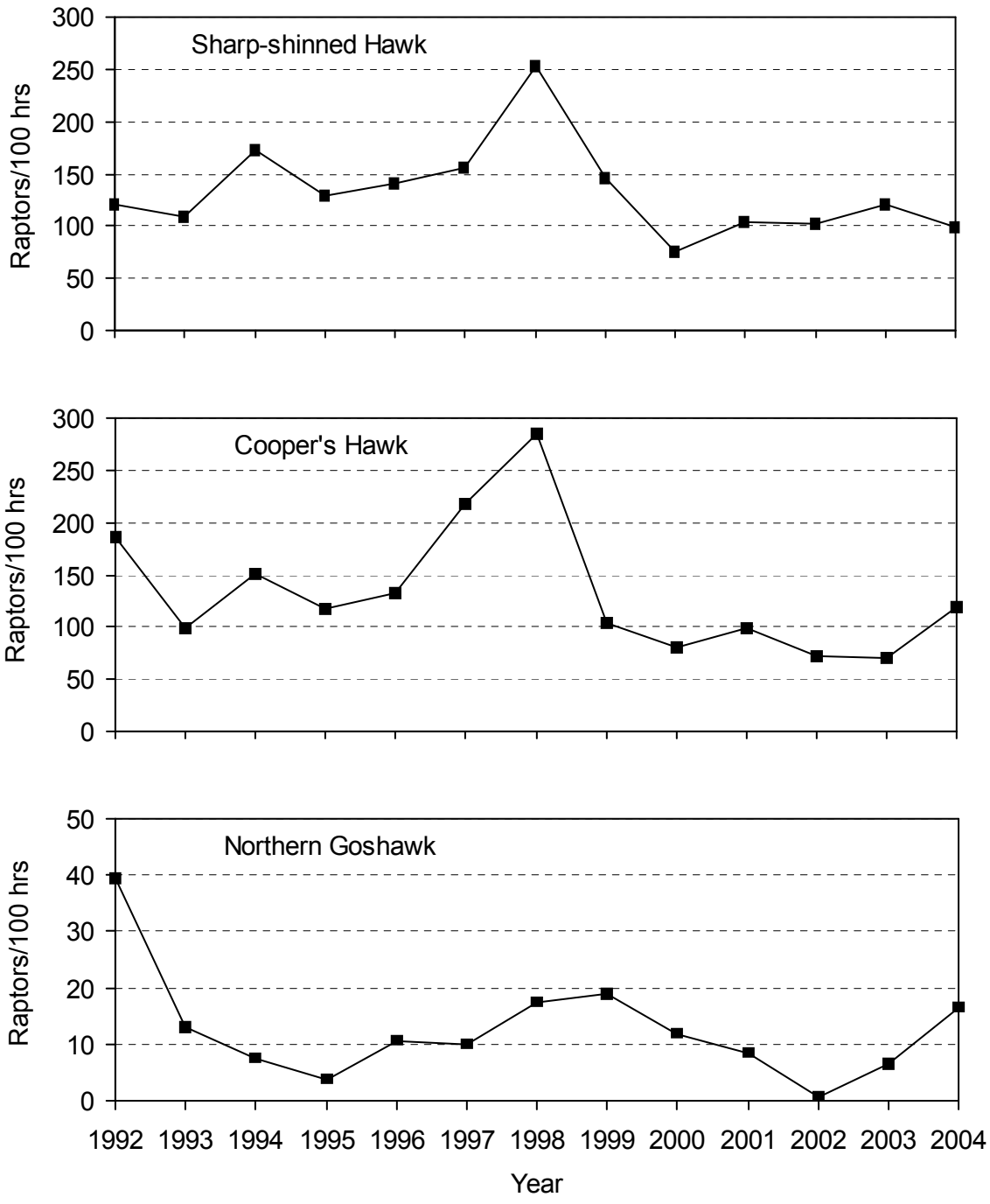

Figure 4. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Sharp-shinned Hawks, Cooper's Hawks, and Northern Goshawks in the Bridger Mountains, MT: 1992–2004. Dashed lines indicate significant ($P \leq 0.10$) regressions.

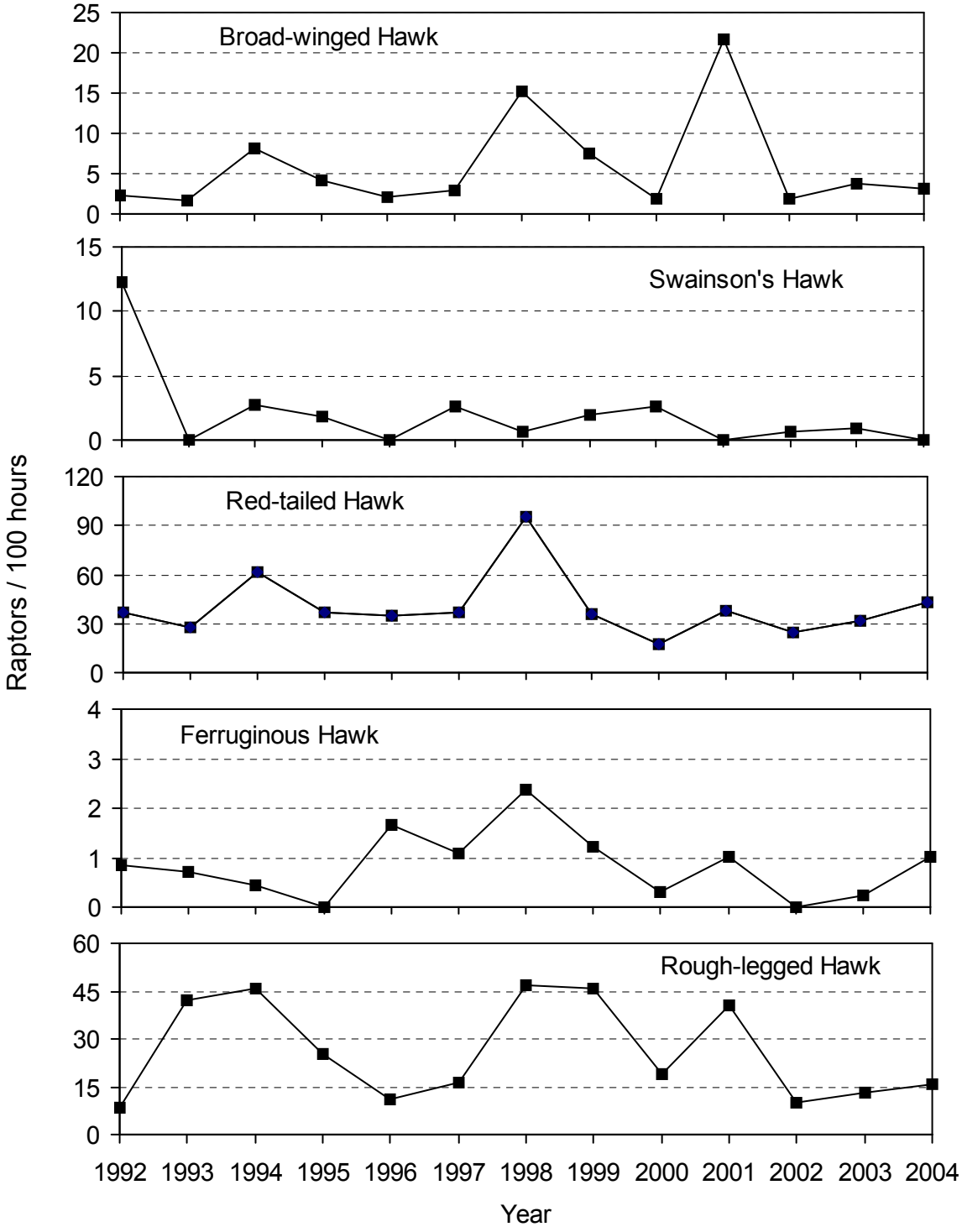

Figure 5. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Broad-winged, Swainson's, Red-tailed, Ferruginous, and Rough-legged Hawks in the Bridger Mountains, MT: 1992–2004. Dashed lines indicate significant ($P \leq 0.10$) regressions.

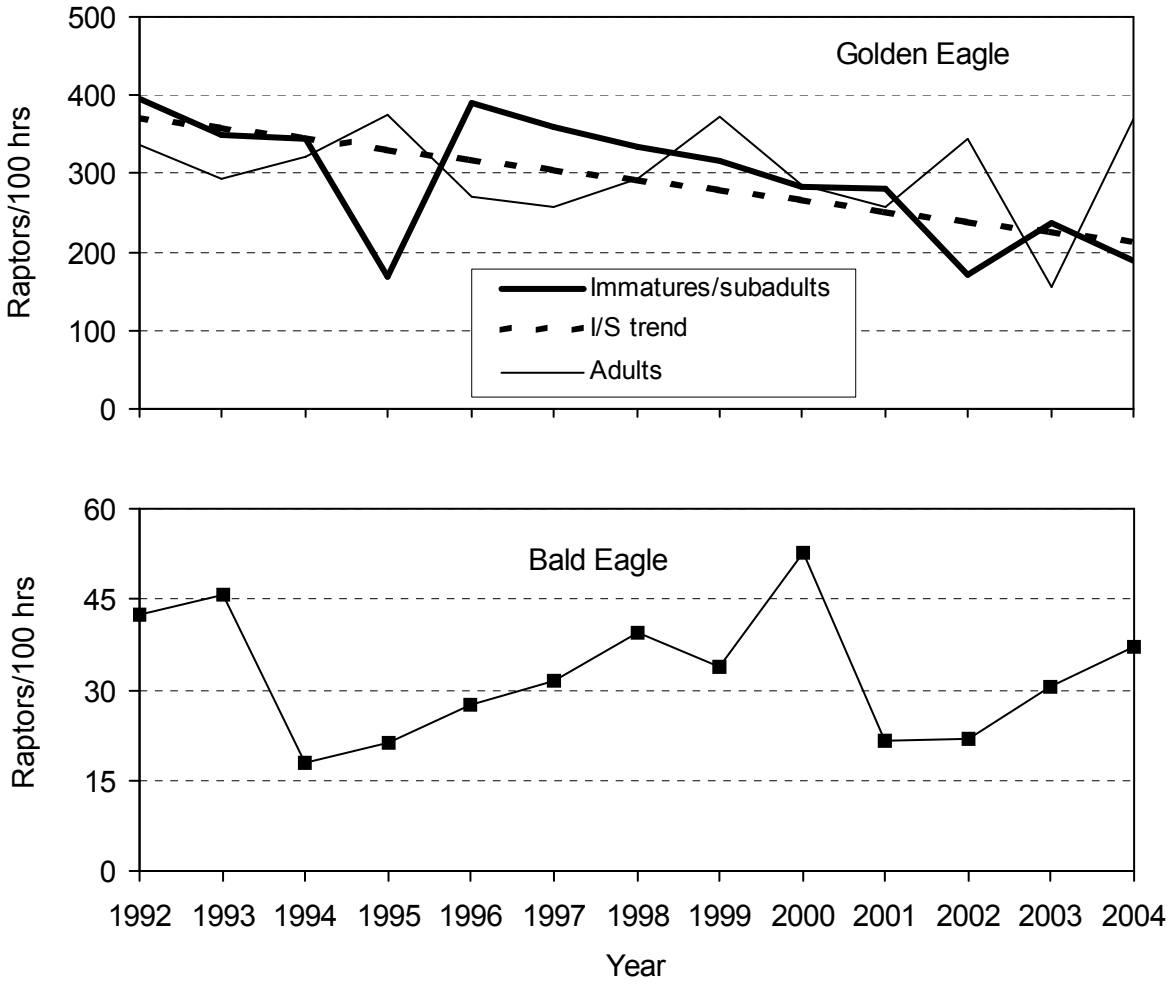

Figure 6. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Golden and Bald Eagles in the Bridger Mountains, MT: 1992–2004. Dashed lines indicate significant ($P \leq 0.10$) regressions.

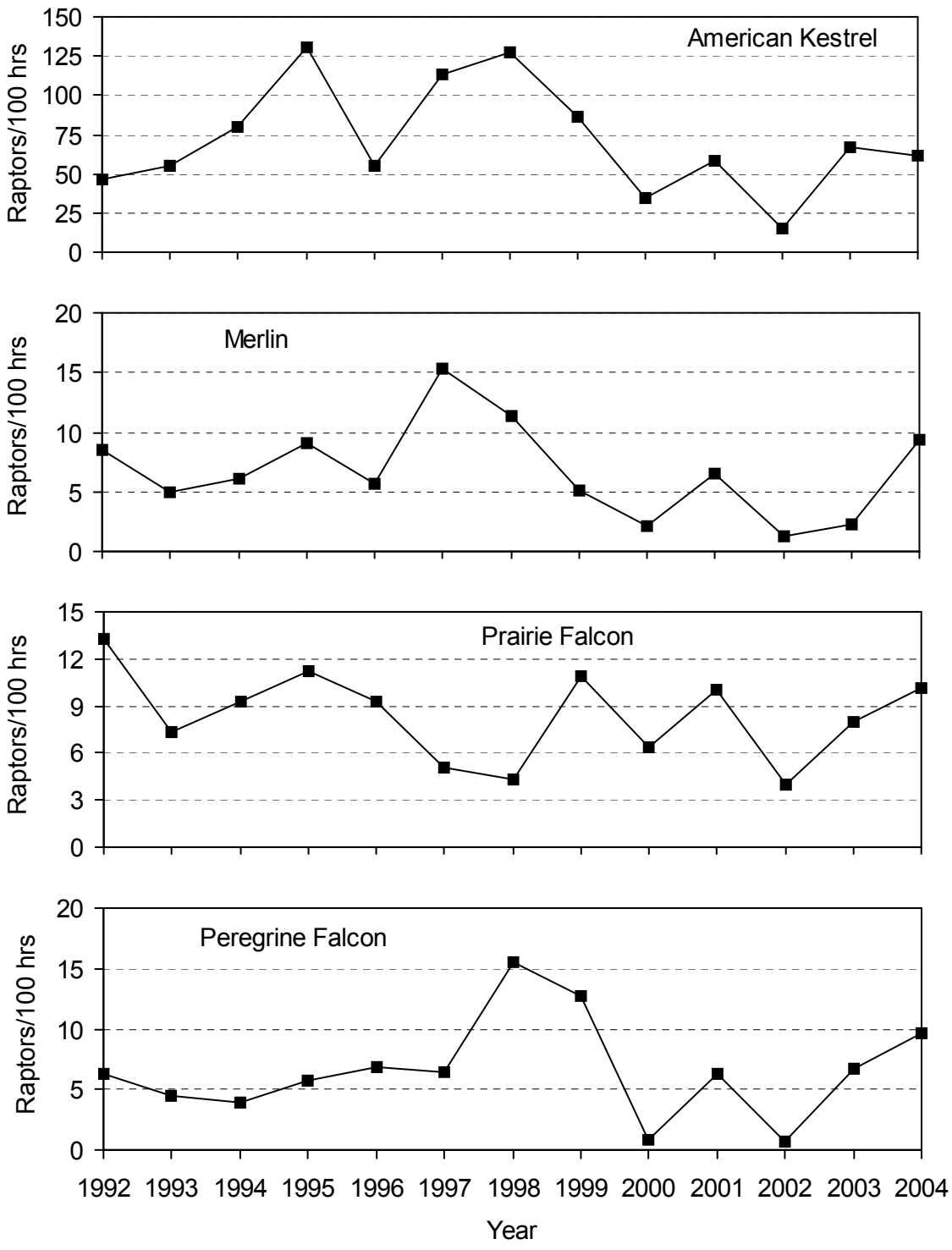

Figure 7. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for American Kestrels, Merlins, Prairie Falcons, and Peregrine Falcons in the Bridger Mountains, MT: 1992–2004. Dashed lines indicate significant ($P \leq 0.10$) regressions.

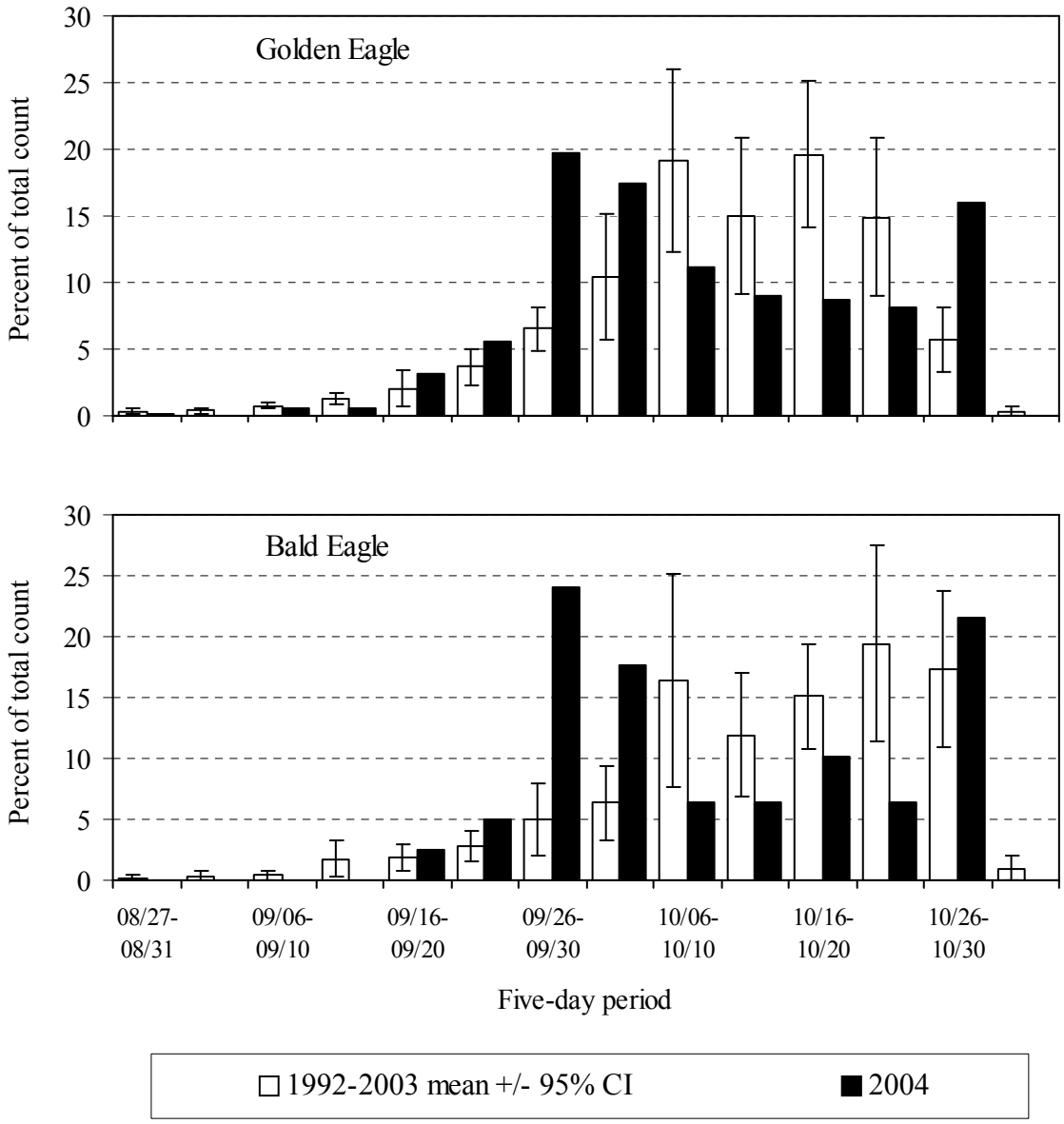

Figure 8. Passage volume by five-day periods for migrating Golden and Bald Eagles in the Bridger Mountains, MT: 1992–2003 versus 2004.

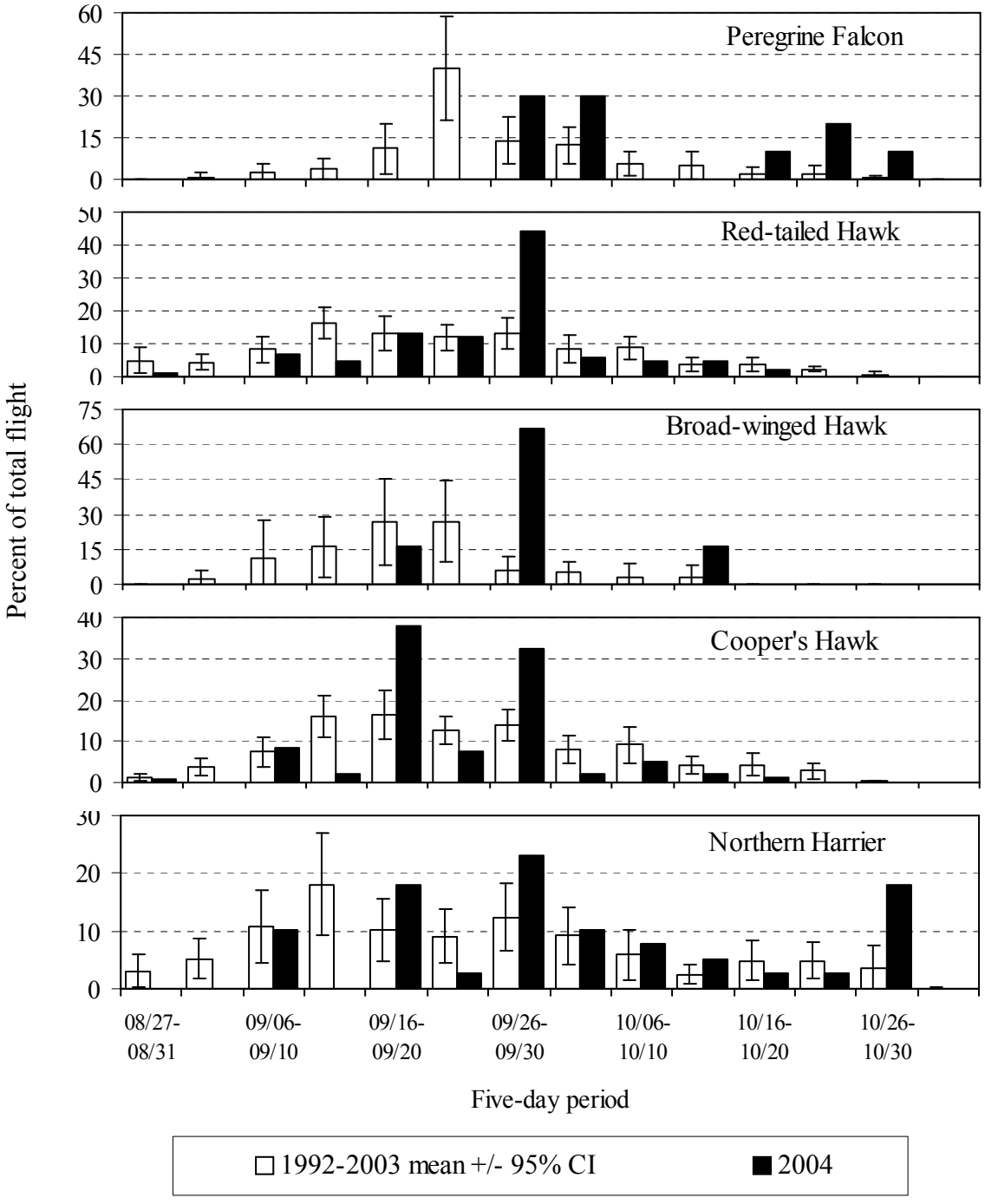

Figure 9. Passage volume by five-day periods for selected species of migrating raptors in the Bridger Mountains, MT: 1992–2003 versus 2004.

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	*Cathartes aura*	TV	U	U	NA
Osprey	*Pandion haliaetus*	OS	U	U	NA
Northern Harrier	*Circus cyaneus*	NH	A I Br U	M F 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
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	AM U	NA
Prairie Falcon	*Falco mexicanus*	PR	U	U	NA
Peregrine Falcon	*Falco peregrinus*	PG	A I U	U	NA
Gyrfalcon	*Falco rusticolus*	GY	A I U	U	W G D
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, 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)

2004: Allison Peterson (0) and John Bell (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: 2004.

Date	Obs. Hours	Obsrvr / Hour[1]	Median Visitor Disturb[2]	Predominant Weather[3]	Wind Speed (kph)[1]	Wind Direction	Temp (°C)[1]	Barom. Press. (in Hg)[1]	Median Thermal Lift[4]	Visib. West (km)[1]	Visib. East (km)[1]	Median Flight Distance[5]	Birds / Hour
27-Aug	6.00	2.0	0	pc-ovc	0.3	calm-sw	20.8	-	4	100	85	2	0.3
28-Aug	7.00	2.5	0	pc-ovc	2.6	sw	14.3	28.98	4	89	94	1	0.4
29-Aug	7.00	2.0	0	pc-ovc	1.6	sw	19.4	29.03	3	100	100	2	0.6
30-Aug	6.00	2.0	0	clr	0.8	sw-w	20.0	29.07	2	100	100	-	0.0
31-Aug	0.00	Ski area maintenance activities precluded observations											
1-Sep	8.00	2.0	0	mc-ovc	2.9	ssw-sw	22.5	28.94	4	64	55	-	0.0
2-Sep	0.00			fog/snow									
3-Sep	6.50	2.0	0	mc-ovc	0.5	calm-sw	7.5	28.82	-	60	81	-	0.0
4-Sep	7.50	2.2	0	pc-ovc, clr	2.2	w	15.3	28.87	4	89	78	2	0.3
5-Sep	7.50	2.4	0	pc-mc	3.7	sw	11.7	28.91	4	79	68	2	0.1
6-Sep	8.00	1.6	0	clr	0.1	calm-sw	14.8	29.04	2	94	85	2	3.6
7-Sep	8.00	1.9	0	clr-mc	1.0	w	14.9	28.98	3	86	70	3	1.8
8-Sep	7.50	1.0	0	clr-pc	1.0	w	17.8	28.96	3	92	87	2	1.2
9-Sep	8.00	2.0	0	mc-ovc	1.2	sw	19.1	28.91	3	79	66	3	1.9
10-Sep	7.00	2.0	0	mc-ovc	1.7	w	18.1	30.24	3	100	88	3	1.1
11-Sep	8.00	2.1	0	clr, mc-ovc	2.9	sw	20.6	30.26	2	90	77	3	2.3
12-Sep	2.50	2.0	0	ovc, fog	3.0	w	15.0	30.08	4	0	0	-	0.0
13-Sep	0.00			rain/snow									
14-Sep	0.00			snow									
15-Sep	6.75	1.9	0	mc-ovc	1.7	sw, w	10.3	30.02	4	100	94	2	1.0
16-Sep	6.00	2.0	0	pc-ovc, AM fog	1.1	w	9.6	30.14	4	69	68	1	2.0
17-Sep	8.00	2.4	0	mc-ovc, pc	1.6	s, sw	18.8	29.99	4	100	83	3	4.9
18-Sep	5.50	2.8	0	clr-pc, haze	0.9	e	15.9	29.85	3	37	41	1	23.6
19-Sep	0.00			rain/fog									
20-Sep	0.00			snow									
21-Sep	4.50	1.9	0	ovc, fog/snow	2.0	sw-w	6.5	30.24	4	80	74	1	1.3
22-Sep	0.00			fog									
23-Sep	0.00			rain/fog									
24-Sep	8.00	2.0	0	clr	1.4	w	12.8	30.41	3	91	84	3	15.1
25-Sep	8.00	3.0	0	clr	0.5	sw	18.8	30.37	2	91	81	2	17.3
26-Sep	8.00	2.8	0	clr-mc	0.9	e	15.9	30.40	3	90	60	3	17.8
27-Sep	6.00	2.9	0	clr	3.0	e	11.8	30.45	3	68	56	1	10.0
28-Sep	7.25	3.0	0	clr-pc	1.2	ssw, w	15.9	30.19	3	94	69	2	7.6
29-Sep	8.00	2.2	0	clr	0.1	e	12.3	30.12	3	88	65	1	10.9
30-Sep	7.00	1.2	0	clr/haze, pc-mc	0.4	se, sw-wsw	16.4	30.05	3	69	60	1	7.1
1-Oct	7.50	1.0	0	pc-mc, scat fog	0.9	calm, w	10.6	30.23	4	50	32	1	1.3
2-Oct	8.00	2.0	2.5	clr-pc, haze	2.3	sw-w	20.0	30.35	2	61	53	2	13.0
3-Oct	8.00	2.4	1.5	clr	0.7	calm-w	14.2	30.55	3	89	57	3	11.0
4-Oct	8.00	2.0	0	clr-pc, haze	0.5	sw, calm, w	11.2	30.36	3	71	60	1	7.5
5-Oct	0.00			data lost									
6-Oct	7.75	1.1	0	clr-pc, haze	1.3	wsw-w	13.7	30.22	4	90	62	3	10.6
7-Oct	3.50	1.0	0	pc-ovc	1.4	sw	11.4	30.30	4	98	90	1	3.1
8-Oct	8.25	2.6	0	pc	0.5	sw-w	15.3	30.31	3	93	79	2	7.9
9-Oct	5.25	1.8	0	ovc	3.1	ssw	14.1	30.00	4	70	67	1	11.6
10-Oct	0.00			fog									
11-Oct	7.50	2.2	0	clr-pc	1.2	w	5.4	30.32	4	91	79	2	9.3
12-Oct	2.50	1.8	0	ovc, snow	0.8	sw-w	6.5	30.33	4	100	80	2	2.8
13-Oct	7.25	2.0	0	clr-pc	5.7	w	10.2	30.40	4	100	70	3	9.0
14-Oct	6.00	1.3	0	ovc	11.5	sw	9.3	30.22	4	96	90	2	2.0

Appendix C. continued

Date	Obs. Hours	Obsrvr / Hour[1]	Median Visitor Disturb[2]	Predominant Weather[3]	Wind Speed (kph)[1]	Wind Direction	Temp (°C)[1]	Barom. Press. (in Hg)[1]	Median Thermal Lift[4]	Visib. West (km)[1]	Visib. East (km)[1]	Median Flight Distance[5]	Birds / Hour
15-Oct	7.50	2.0	0	clr/haze	2.0	ssw	13.8	30.26	3	86	73	3	14.1
16-Oct	1.50	2.0	0	ovc, rain/snow	5.0	wnw	8.0	29.67	4	6	70	-	0.0
17-Oct	0.00			rain/snow									
18-Oct	0.00			snow									
19-Oct	7.50	1.7	0	clr-mc	13.3	e-se	2.1	29.77	4	94	73	2	3.5
20-Oct	5.70	1.7	0	ovc/fog/snow	4.3	w	7.8	29.68	4	68	51	2	3.5
21-Oct	7.00	1.2	0	pc, ovc/fog/snow	6.1	w	5.6	29.49	4	73	69	2	7.3
22-Oct	5.50	2.0	0	pc-ovc, AM fog	11.0	w, sw	1.3	29.65	4	71	66	3	8.4
23-Oct	0.00			snow									
24-Oct	0.00			fog/snow									
25-Oct	6.00	1.9	0	pc-ovc	0.0	calm	1.7	29.78	4	100	100	3	16.0
26-Oct	5.50	1.9	0	clr, mc-ovc	1.9	se, s	8.0	29.55	4	100	100	3	24.4
27-Oct	3.50	1.0	0	pc, ovc	0.1	se, w	7.1		4	100	66	1	2.6
28-Oct	0.00			snow									
29-Oct	0.00			snow									
30-Oct	0.00			snow									
31-Oct	0.00			snow									

[1] Average of hourly records.

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

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

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

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

Appendix D. Daily observation effort and fall raptor migration counts by species in the Bridger Mountains, MT: 2004.

		Species[1]																											Birds
Date	Hours	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	6.00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0.3
28-Aug	7.00	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.4
29-Aug	7.00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	4	0.6
30-Aug	6.00	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-Aug	0.00																													
01-Sep	8.00	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
02-Sep	0.00																													
03-Sep	6.50	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	0.0
04-Sep	7.50	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0.3
05-Sep	7.50	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	1	0	1	0.1
06-Sep	8.00	0	0	2	3	9	1	0	0	1	0	0	4	1	0	0	2	0	0	2	1	1	0	0	0	0	0	2	29	3.6
07-Sep	8.00	0	0	2	1	1	1	2	0	1	0	0	2	0	0	0	1	0	0	1	0	0	0	0	0	1	0	1	14	1.8
08-Sep	7.50	0	0	0	2	2	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	1	0	0	0	0	0	1	9	1.2
09-Sep	8.00	0	0	0	2	0	2	0	0	2	0	0	0	0	0	0	2	0	0	1	0	1	0	0	0	0	3	2	15	1.9
10-Sep	7.00	0	0	0	1	1	0	1	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	1	0	0	0	8	1.1
11-Sep	8.00	0	0	0	1	2	1	1	0	2	0	0	3	0	0	1	4	0	0	0	0	1	0	0	1	0	0	1	18	2.3
12-Sep	2.50	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	0.0
13-Sep	0.00																													
14-Sep	0.00																													
15-Sep	6.75	0	0	0	1	1	1	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0	0	0	0	0	7	1.0
16-Sep	6.00	0	0	0	2	1	1	0	1	0	0	0	0	0	0	0	3	0	0	3	1	0	0	0	0	0	0	0	12	2.0
17-Sep	8.00	0	0	0	4	5	0	1	1	0	0	0	4	0	0	2	15	1	0	2	0	0	0	0	0	0	0	4	39	4.9
18-Sep	5.50	0	0	7	23	47	3	4	0	0	1	0	9	0	0	1	17	1	0	13	2	1	0	0	0	0	0	1	130	23.6
19-Sep	0.00																													
20-Sep	0.00																													
21-Sep	4.50	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	6	1.3
22-Sep	0.00																													
23-Sep	0.00																													
24-Sep	8.00	0	0	1	9	11	7	1	1	1	0	0	12	0	0	3	62	4	0	5	0	1	0	0	0	0	1	2	121	15.1
25-Sep	8.00	0	0	0	16	25	4	1	0	0	4	0	21	0	0	1	52	4	0	6	1	0	0	0	0	0	0	3	138	17.3
26-Sep	8.00	0	1	1	15	16	1	4	1	0	0	0	17	2	0	1	68	2	0	10	1	0	1	0	0	0	0	1	142	17.8
27-Sep	6.00	0	0	2	12	4	1	1	0	0	0	0	2	0	0	0	35	2	0	0	0	1	0	0	0	0	0	0	60	10.0
28-Sep	7.25	0	0	0	4	0	1	1	0	0	0	0	2	0	0	0	34	5	0	4	0	1	0	0	0	0	0	3	55	7.6
29-Sep	8.00	0	0	6	12	1	0	2	1	0	0	0	2	0	0	0	47	6	0	4	1	0	2	0	0	0	2	1	87	10.9
30-Sep	7.00	0	0	1	9	2	3	1	0	0	0	0	0	0	1	0	27	3	0	3	0	0	0	0	0	0	0	0	50	7.1

Appendix D. continued

		Species[1]																										Birds	
Date	Hours	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
01-Oct	7.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	10	1.3
02-Oct	8.00	0	0	1	4	0	0	2	0	0	0	0	3	0	0	3	76	2	0	2	0	1	3	0	0	2	0	5	104	13.0
03-Oct	8.00	0	0	2	14	1	1	2	0	0	0	0	3	0	0	2	47	7	0	7	1	0	0	0	0	0	0	1	88	11.0
04-Oct	8.00	0	0	0	9	0	1	0	0	0	0	0	0	0	0	0	48	2	0	0	0	0	0	0	0	0	0	0	60	7.5
05-Oct	0.00																													
06-Oct	7.75	0	0	1	12	0	1	0	0	0	0	0	4	0	0	0	60	0	0	1	1	1	0	0	1	0	0	0	82	10.6
07-Oct	3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	11	3.1
08-Oct	8.25	0	0	1	21	3	3	0	0	0	0	0	0	0	0	0	32	0	0	0	0	0	0	0	0	0	0	5	65	7.9
09-Oct	5.25	0	0	1	15	4	0	0	1	0	0	0	1	0	0	0	31	5	0	1	0	0	0	0	0	0	1	1	61	11.6
10-Oct	0.00																													
11-Oct	7.50	0	0	2	10	0	4	2	0	0	1	0	3	0	1	0	44	0	0	0	2	0	0	0	0	0	0	1	70	9.3
12-Oct	2.50	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	5	0	0	0	0	0	0	0	0	0	0	0	7	2.8
13-Oct	7.25	0	0	0	3	3	0	2	1	0	0	0	2	0	1	0	48	4	0	0	0	1	0	0	0	0	0	0	65	9.0
14-Oct	6.00	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	10	1	0	0	0	0	0	0	0	0	0	0	12	2.0
15-Oct	7.50	0	0	0	6	2	0	3	0	0	0	0	2	0	0	0	91	1	0	0	0	0	0	0	0	0	0	1	106	14.1
16-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	0.0
17-Oct	0.00																													
18-Oct	0.00																													
19-Oct	7.50	0	0	1	2	0	1	0	0	0	0	0	0	0	1	0	13	7	0	0	0	0	1	0	0	0	0	0	26	3.5
20-Oct	5.70	0	0	1	3	0	0	0	0	0	0	0	0	0	2	0	11	3	0	0	0	0	0	0	0	0	0	0	20	3.5
21-Oct	7.00	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	45	0	1	0	0	0	1	0	0	0	1	0	51	7.3
22-Oct	5.50	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	41	2	0	0	0	0	1	0	0	0	0	0	46	8.4
23-Oct	0.00																													
24-Oct	0.00																													
25-Oct	6.00	0	0	2	1	0	1	0	0	0	0	0	0	0	6	0	76	7	1	0	0	0	1	0	0	0	0	1	96	16.0
26-Oct	5.50	0	0	5	6	0	0	1	1	0	0	0	0	0	1	0	110	10	0	0	0	0	0	0	0	0	0	0	134	24.4
27-Oct	3.50	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	5	0	0	0	0	0	0	0	0	0	0	0	9	2.6
28-Oct	0.00																													
29-Oct	0.00																													
30-Oct	0.00																													
31-Oct	0.00																													
Total	316.70	0	1	39	229	142	41	32	9	7	6	0	100	3	20	18	1196	79	2	65	11	12	10	0	3	3	9	38	2075	6.6

[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: 1991–2004.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	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	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	27-Oct	29-Oct
Observation days	32	39	46	36	42	53	62	56	57	52	58	52	64	48	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	316.70	324.85
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	655.2	797.2
SPECIES	RAPTOR COUNTS														
Turkey Vulture	3	0	0	0	0	1	6	0	2	0	0	0	0	0	1
Osprey	2	2	5	5	1	14	12	13	9	6	6	2	5	1	6
Northern Harrier	19	13	41	59	10	38	66	230	52	20	36	15	54	39	49
Sharp-shinned Hawk	88	248	279	364	304	436	480	612	442	190	274	288	416	229	332
Cooper's Hawk	87	175	124	134	131	206	347	343	149	109	120	103	132	142	164
Northern Goshawk	27	96	39	17	10	37	36	50	61	34	26	2	23	41	36
Unknown small accipiter[1]	-	-	-	-	-	-	-	-	-	-	0	11	29	32	18
Unknown large accipiter[1]	-	-	-	-	-	-	-	-	-	-	0	4	4	9	4
Unknown accipiter	70	35	27	20	33	51	53	49	39	35	27	5	0	7	32
TOTAL ACCIPITERS	272	554	469	535	478	730	916	1054	691	368	447	413	604	460	571
Broad-winged Hawk	0	2	3	11	5	5	5	20	13	3	38	3	9	6	9
Swainson's Hawk	1	11	0	3	2	0	6	2	3	3	0	1	2	0	2
Red-tailed Hawk	26	67	65	110	79	106	130	277	121	45	117	78	113	100	102
Ferruginous Hawk	3	1	1	1	0	5	4	7	4	1	3	0	1	3	2
Rough-legged Hawk	9	10	54	48	29	17	23	66	77	26	57	11	22	20	34
Unidentified buteo	14	8	19	15	18	13	20	13	3	8	6	9	6	18	12
TOTAL BUTEOS	53	99	142	188	133	146	188	385	221	86	221	102	153	147	162
Golden Eagle	1280	1579	1699	1500	1322	1871	1844	1516	1870	1429	1330	1359	1226	1196	1502
Bald Eagle	43	95	124	41	57	79	93	95	91	128	58	55	93	79	81
Unidentified eagle	5	2	17	0	25	14	0	15	5	3	2	15	4	2	8
TOTAL EAGLES	1328	1676	1840	1541	1404	1964	1937	1626	1966	1560	1390	1429	1323	1277	1590
American Kestrel	33	38	54	67	117	82	146	141	113	39	62	16	102	65	77
Merlin	2	10	7	7	12	9	26	17	8	3	9	2	4	11	9
Prairie Falcon	9	14	10	10	14	16	10	12	20	9	14	6	15	12	12
Peregrine Falcon	1	7	6	4	7	10	10	18	18	1	8	1	10	10	8
Gyrfalcon	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Unknown small falcon[1]	-	-	-	-	-	-	-	-	-	-	0	0	0	3	1
Unknown large falcon[1]	-	-	-	-	-	-	-	-	-	-	0	1	3	3	2
Unknown falcon	5	3	2	4	2	5	17	8	6	4	3	4	1	9	5
TOTAL FALCONS	50	72	79	92	152	122	209	196	166	56	96	30	135	113	112
Unidentified raptor	44	10	27	33	40	43	33	28	16	20	15	43	20	38	29
GRAND TOTAL	1771	2426	2603	2453	2218	3058	3367	3532	3123	2116	2211	2034	2294	2075	2520

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