

**FALL 2002 RAPTOR MIGRATION STUDY
IN THE BRIDGER MOUNTAINS, MONTANA**

Report prepared by:

Jeff P. Smith

Counts conducted by:

Matt Proett, Marg Lomow, and Maureen Essen

Project coordinated by:

HawkWatch International, Inc.

Principal Investigator: Dr. Jeff P. Smith

1800 S. West Temple, Suite 226, Salt Lake City, Utah 84115

(801) 484-6808



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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 (*sensu* Hoffman et al. 2002). 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. 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 provides a brief summary of the 2002 count, which marked the 11th consecutive full-season autumn count of migratory raptors at the site. 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 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). 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 season of raptor migration counting for official observers Matt Proett (full season) and Maureen Essen (second half of season), whereas observer Marg Lomow (first half of season) had conducted counts for HWI during two previous seasons. Full-time observer Matt Proett received training at HWI headquarters before the season. Local volunteers also occasionally assisted with spotting migrants.

Data gathering and recording followed standardized protocols used at all HWI migration sites and as outlined in prior reports for this project.

OBSERVATION EFFORT

The observers worked on 58 of 62 possible observation days between 27 August and 27 October, curtailing the season 4 days earlier than hoped due to heavy snow cover (Table 1). Despite the early closure, the number of observation days and hours (365.84) were 17% and 13% higher, respectively, than the 1992–2001 averages (Table 1), but were only 1% and 4% higher, respectively, than the 1997–2001 averages. The 1997 season is when HWI began to employ a standardized observation period of 27 August to 31 October.

The 2002 average of 1.7 observers per hour (includes official and guest observers; value is mean of daily values, which are in turn means of hourly values) was a significant 10% lower than the 1992–2001 average ($1.9 \pm 95\%$ CI of 0.10). This was largely due to the second observer not arriving until after the first week of observations and likely had little impact on the overall count.

FLIGHT SUMMARY

The observers tallied 2,034 migrant raptors of 15 species during the 2002 season (Table 1, and see Appendix B for daily count records). This is the lowest total count recorded since 1991 (see Appendix C for annual summaries). Counts fell to record lows for Northern Goshawks, American Kestrels, and Prairie Falcons (Appendix C). The flight was composed of 70% eagles, 20% accipiters, 5% buteos, 2% falcons, 1% harriers, <1% Ospreys, and 2% unidentified raptors. These values represent significantly higher than average proportions of eagles and unidentified raptors, and below-average proportions for all other groups (Figure 1). The most numerous species were the Golden Eagle (67% of the total count), Sharp-shinned Hawk (14%), Cooper's Hawk (5%), Red-tailed Hawk (4%), and Bald Eagle (3%). All other species each comprised <1% of the total.

No consistent pattern of variation in seasonal timing across species emerged this season; however, the overall combined-species seasonal distribution of activity differed significantly from the average pattern in showing consistently below-average activity levels from mid-September through early October followed by proportionately high activity levels during mid-October (Figure 2). The atypical lull in activity was influenced by three multiple-day episodes of bad weather.

Adjusted (to standardize for sampling period and adjust for birds identified only to genus) 2002 passage rates were below average for all 16 commonly observed species, significantly so for all but Swainson's Hawks (Table 1). Regression analyses of adjusted passage rates indicated significant quadratic trends for Ospreys, American Kestrels, and Merlins, tracking stable to increasing patterns through the mid-1990s but steep declines since (Figure 3). This is a common pattern seen at most of HWI's western migration sites, which we believe 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 1997/1998. Other species that have shown similar patterns in the Bridgers, but for which statistical significance could not be demonstrated at this time include all three accipiters (Sharp-shinned and Cooper's Hawks and Northern Goshawks), Ferruginous Hawks, and Peregrine Falcons.

In addition, although changes in effort before 1997 may confound interpretation of the overall trends, there is little doubt that the passage rate of immature/subadult Golden Eagles migrating through the Bridgers also has been dropping steadily since the mid-1990s, reaching a record-low level in 2002 (Figure 4). Similarly, the recent drop-off pattern evident for Northern Goshawks actually applied only to immature birds and, although statistical significance was not demonstrated for the immature count alone, a highly significant quadratic regression fit a convex pattern of variation in the immature : adult ratio for goshawks (Figure 5). In fact, all eight species for which a comparison was possible showed below-average immature : adult ratios in 2002, with significant drops shown for Sharp-shinned Hawks, Cooper's Hawks, and Golden Eagles. This suggests that productivity and juvenile recruitment were probably below average for most species within the Bridger source populations in 2002, and the age-ratio statistics appear to demonstrate a continuing problem for at least two prominent species.

ACKNOWLEDGMENTS

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LITERATURE CITED

Hoffman, S. W., J. P. Smith, and T. D. Meehan. 2002. Breeding grounds, winter ranges, and migratory routes of raptors in the Mountain West. *Journal of Raptor Research* 36:97-110.

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: 1992–2001 versus 2002.

	1992–2001 ¹	2002	%CHANGE	1992–2001 ¹	2002	%CHANGE
Start date	2-Sep ± 4.2	27-Aug				
End date	30-Oct ± 0.8	27-Oct				
Observation days	50 ± 5.2	58	+17			
Observation hours	323.11 ± 37.118	365.84	+13			
SPECIES	COUNTS			RAPTORS / 100 HRS		
Turkey Vulture	1 ± 1.2	0	-100	0.5 ± 0.60	0.0	-100
Osprey	7 ± 2.8	2	-73	4.0 ± 1.43	0.6	-85
Northern Harrier	57 ± 39.5	15	-73	18.5 ± 12.60	4.1	-78
Sharp-shinned Hawk	363 ± 79.7	288	-21	140.5 ± 29.84	101.9	-27
Cooper's Hawk	184 ± 55.5	103	-44	149.5 ± 41.03	73.5	-51
Northern Goshawk	41 ± 15.1	2	-95	14.0 ± 6.21	0.7	-95
Unknown small accipiter ²	0	11	–	–	–	–
Unknown large accipiter ²	0	4	–	–	–	–
Unknown accipiter	37 ± 6.9	5	–	–	–	–
TOTAL ACCIPITERS	624 ± 137.2	413	-34	–	–	–
Broad-winged Hawk	11 ± 6.9	3	-71	6.8 ± 4.18	1.8	-73
Swainson's Hawk	3 ± 2.1	1	-67	1.5 ± 1.26	0.4	-74
Red-tailed Hawk	112 ± 40.0	78	-30	42.6 ± 13.43	25.7	-40
Ferruginous Hawk	3 ± 1.4	0	-100	1.0 ± 0.43	0.0	-100
Rough-legged Hawk	41 ± 14.0	11	-73	30.1 ± 9.66	10.1	-66
Unidentified buteo	12 ± 3.6	9	-27	–	–	–
TOTAL BUTEOS	181 ± 53.0	102	-44	–	–	–
Golden Eagle	1596 ± 132.7	1359	-15	627.8 ± 39.17	514.0	-18
Bald Eagle	86 ± 17.5	55	-36	32.8 ± 7.00	21.4	-35
Unidentified eagle	8 ± 5.4	15	+81	–	–	–
TOTAL EAGLES	1690 ± 138.6	1429	-15	–	–	–
American Kestrel	86 ± 25.1	16	-81	77.3 ± 20.84	14.6	-81
Merlin	11 ± 4.0	2	-81	7.1 ± 2.13	1.2	-83
Prairie Falcon	13 ± 2.1	6	-53	8.6 ± 1.73	4.1	-53
Peregrine Falcon	9 ± 3.4	1	-89	7.9 ± 3.09	0.8	-90
Gyr Falcon	0.1 ± 0.20	0	-100	–	–	–
Unknown small falcon ²	0	0	–	–	–	–
Unknown large falcon ²	0	1	–	–	–	–
Unknown falcon	5 ± 2.8	4	–	–	–	–
TOTAL FALCONS	124 ± 33.4	30	-76	–	–	–
Unidentified raptor	27 ± 6.8	43	+62	–	–	–
GRAND TOTAL	2711 ± 320.1	2034	-25	–	–	–

¹ Mean ± 95% confidence interval.

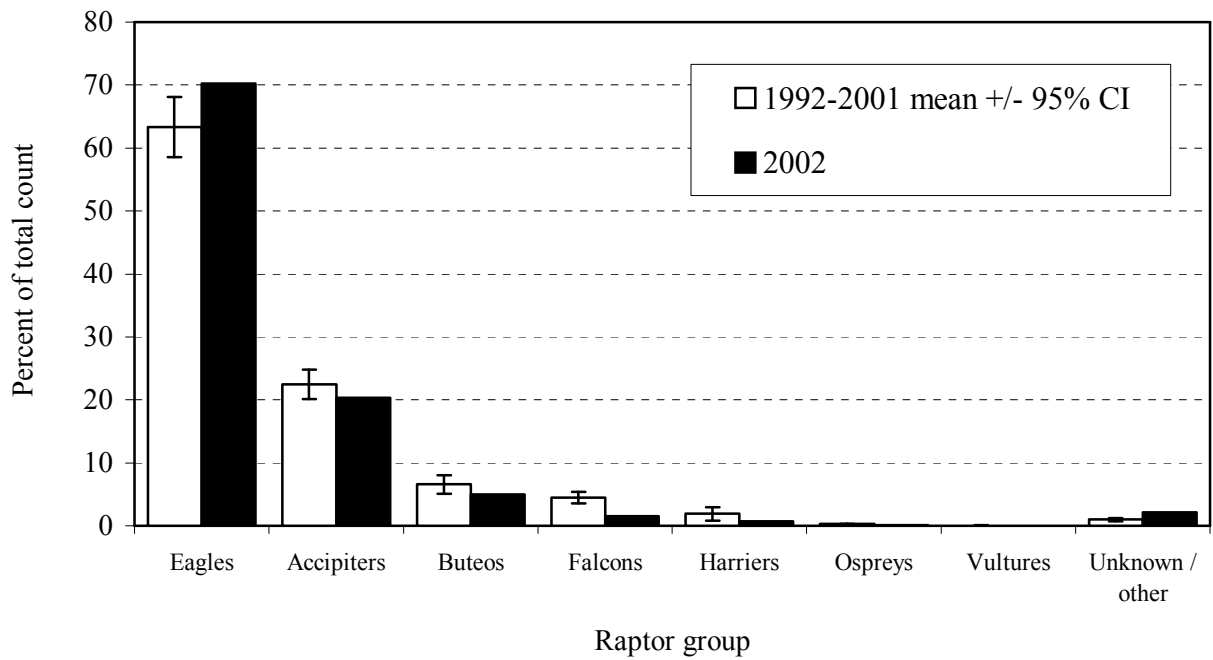


Figure 1. Composition of the fall raptor migration in the Bridger Mountains by major species groups: 1992–2001 versus 2002.

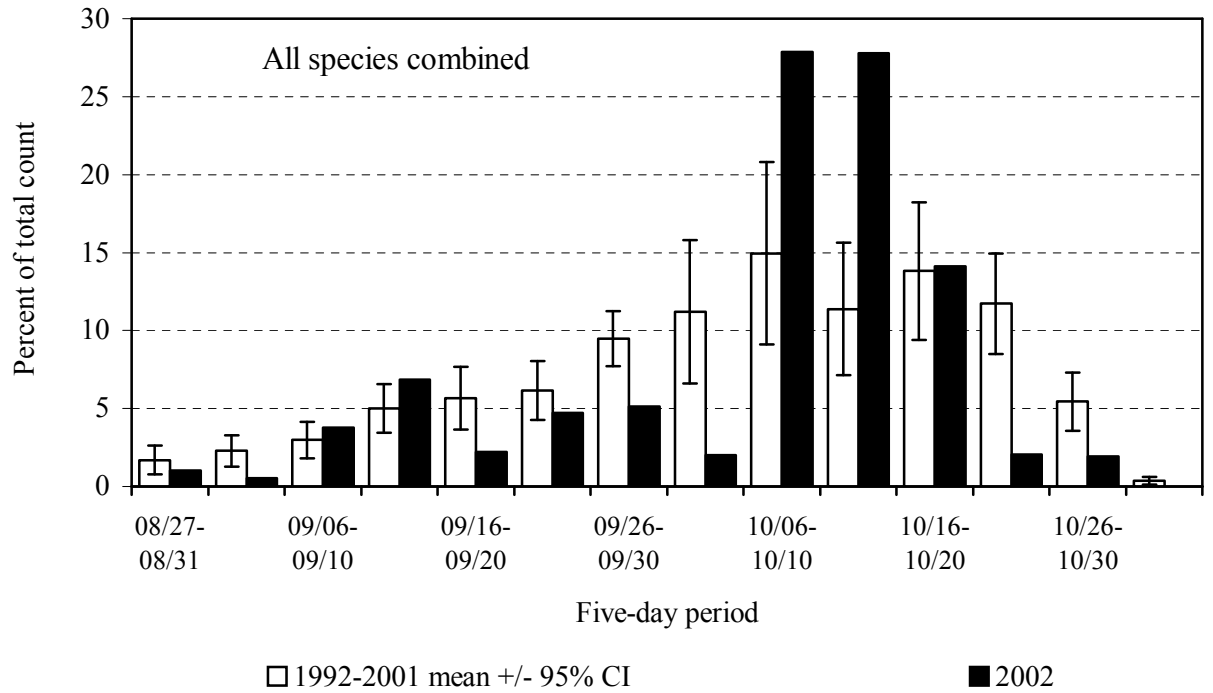


Figure 2. Combined-species, passage volume by five-day periods for migrating raptors in the Bridger Mountains, MT: 1992–2001 versus 2002.

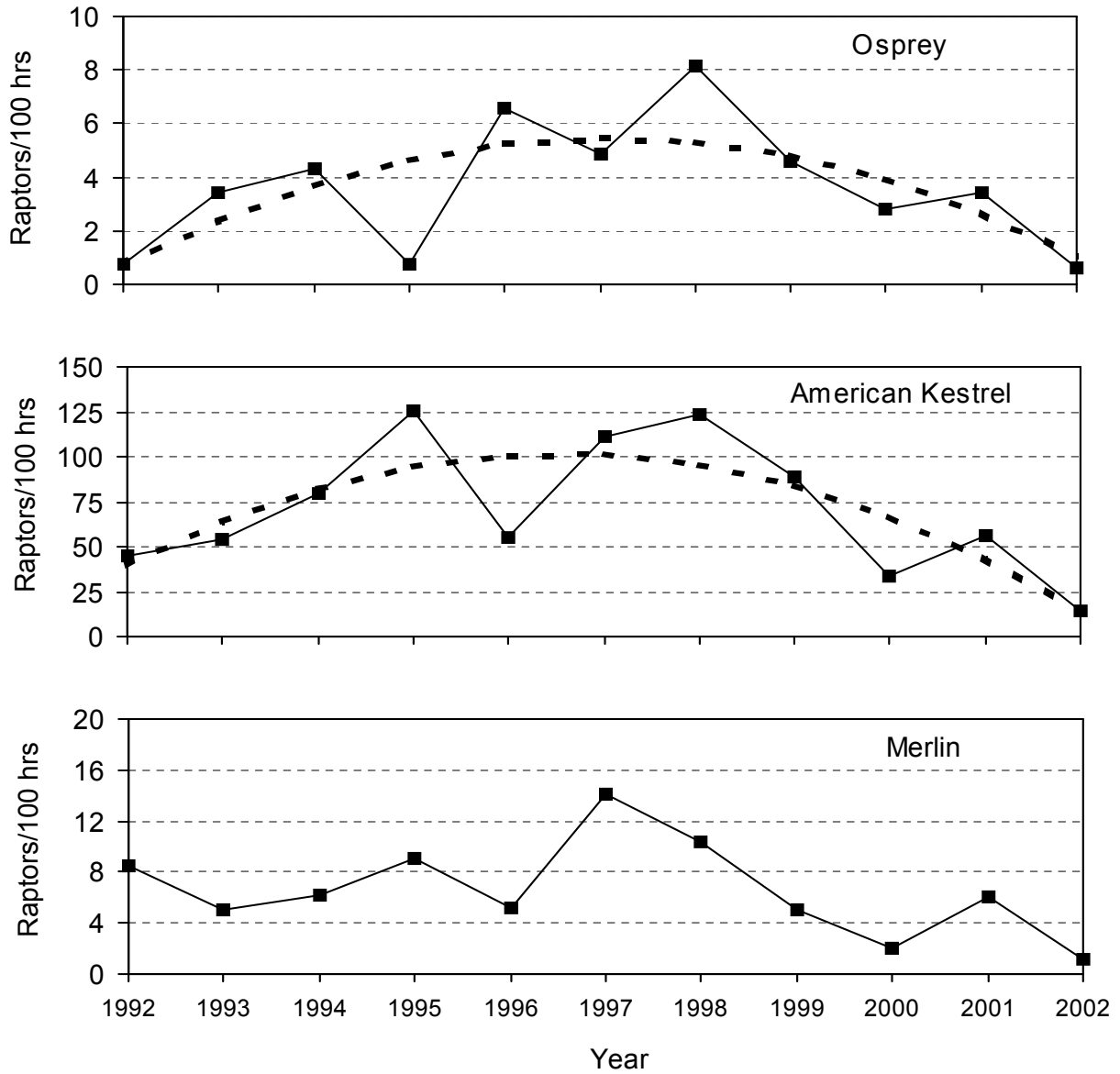


Figure 3. Adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Ospreys, American Kestrels, and Merlins in the Bridger Mountains, MT: 1992–2002. Dashed lines indicate significant ($P \leq 0.10$) regressions.

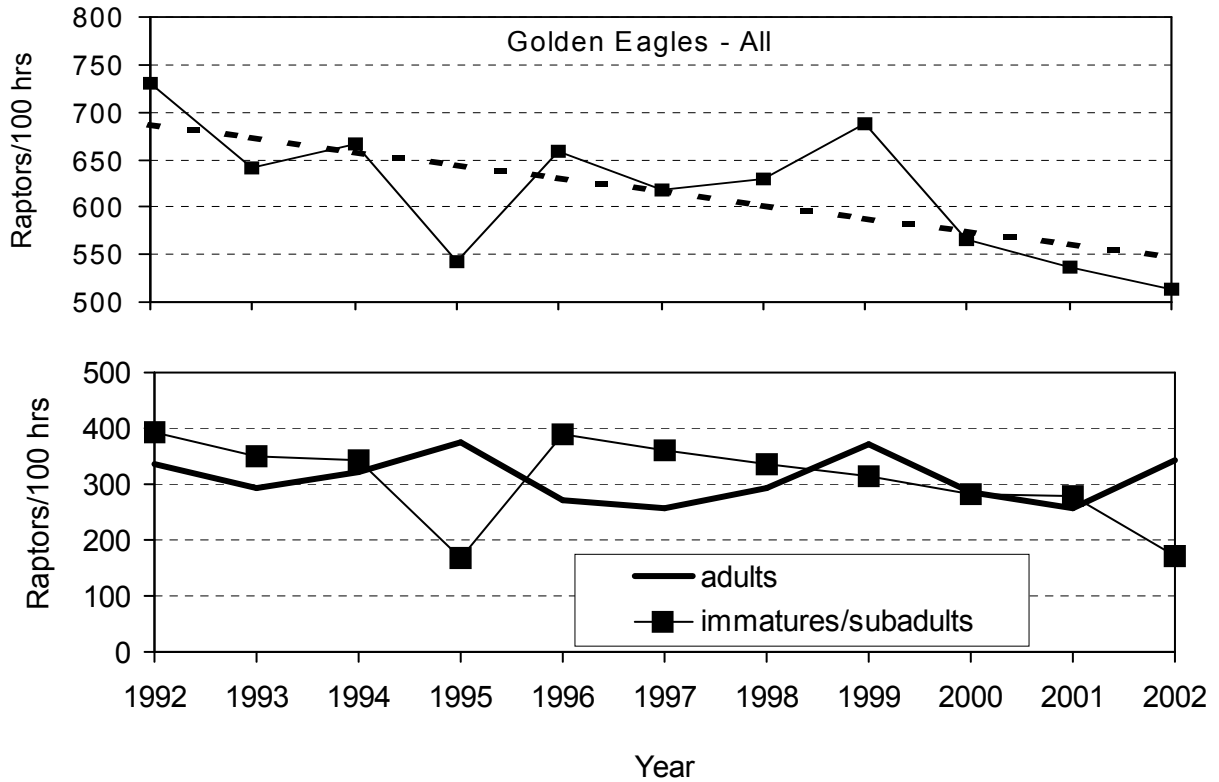


Figure 4. Trends in adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates for Golden Eagles in the Bridger Mountains, MT: 1992–2002. Dashed line indicates significant ($P \leq 0.10$) regression.

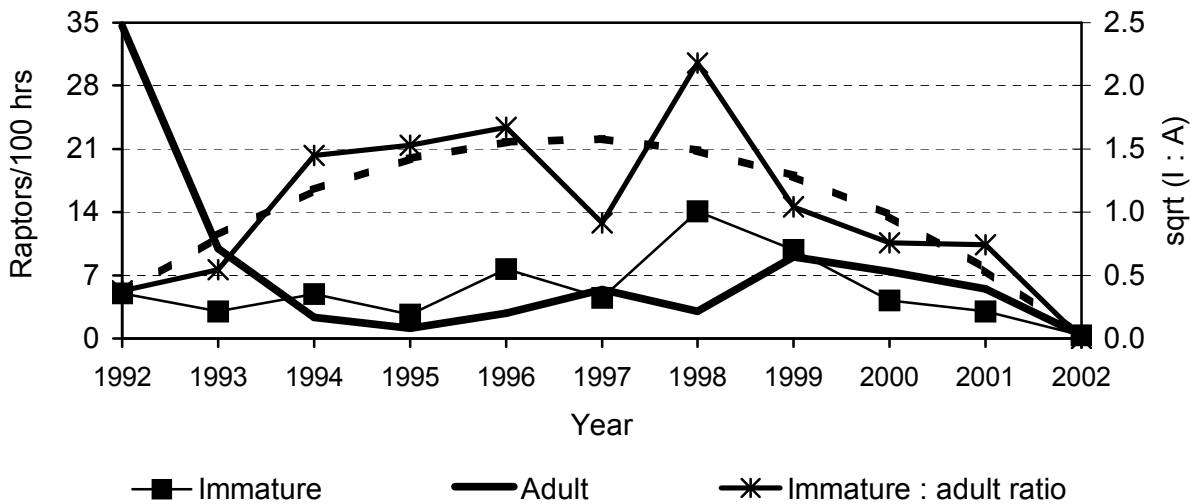


Figure 5. Trends in adjusted (truncated to standardized annual sampling periods and adjusted for incompletely identified birds) fall-migration passage rates and immature : adult ratios for Northern Goshawks in the Bridger Mountains, MT: 1992–2002. Dashed line indicates significant ($P \leq 0.10$) regression.

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 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
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. Daily observation effort and fall raptor migration counts by species in the Bridger Mountains, MT: 2002.

DATE	OBS.	SPECIES ¹																									BIRDS				
	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	3.25	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	3	0.9
28-Aug	4.50	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	5	1.1
29-Aug	7.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	2	5	0.7
30-Aug	8.00	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3	7	0.9
31-Aug	7.50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0.1
01-Sep	8.00	0	0	0	2	0	0	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
02-Sep	7.00	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	4	0.6
03-Sep	4.00	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	2	0.5	
04-Sep	8.00	0	0	0	1	0	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	
05-Sep	7.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0.1	
06-Sep	0.00																														
07-Sep	0.00																														
08-Sep	6.50	0	0	0	1	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0.8	
09-Sep	8.00	0	0	1	1	8	0	0	1	0	0	0	1	0	0	0	7	0	0	0	0	0	0	0	0	0	0	1	20	2.5	
10-Sep	7.50	0	0	2	7	7	0	1	0	1	0	0	4	0	0	1	11	0	6	3	0	0	0	0	0	0	0	9	52	6.9	
11-Sep	7.00	0	0	0	3	3	0	0	0	0	0	0	3	0	0	0	4	0	5	1	0	0	0	0	0	0	0	0	19	2.7	
12-Sep	8.50	0	0	3	5	14	0	0	0	0	0	1	8	0	0	0	2	0	0	0	0	0	0	0	0	0	0	1	34	4.0	
13-Sep	7.50	0	0	0	10	3	0	0	0	0	0	0	1	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	19	2.5	
14-Sep	7.00	0	0	0	12	4	0	0	0	0	0	0	7	0	0	0	4	0	0	0	0	2	0	0	0	0	0	0	29	4.1	
15-Sep	8.00	0	0	0	11	9	0	0	0	0	0	0	7	0	0	0	8	0	0	2	1	0	0	0	0	0	0	0	38	4.8	
16-Sep	7.00	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	1	0	0	0	0	0	1	10	1.4	
17-Sep	0.00																														
18-Sep	0.00																														
19-Sep	7.75	0	0	0	10	3	0	0	0	0	1	0	3	0	0	0	5	0	0	1	0	0	0	0	0	0	1	1	25	3.2	
20-Sep	8.00	0	0	0	4	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	10	1.3	
21-Sep	7.00	0	0	0	4	5	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	13	1.9	
22-Sep	7.50	0	0	0	3	1	0	0	1	0	0	0	2	0	0	0	8	0	0	1	0	0	0	0	0	0	0	0	16	2.1	
23-Sep	7.50	0	0	0	7	8	0	1	0	0	0	0	2	0	0	0	4	0	0	0	0	1	0	0	0	1	0	2	26	3.5	
24-Sep	7.50	0	0	0	17	10	0	0	0	0	0	0	4	0	0	0	6	1	0	2	0	0	1	0	0	0	0	0	41	5.5	
25-Sep	0.00																														
26-Sep	8.00	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	8	1	1	1	0	0	0	0	0	0	0	1	17	2.1	
27-Sep	0.00																														
28-Sep	4.75	0	0	0	6	2	0	0	0	0	0	0	1	0	0	0	9	1	0	0	0	1	0	0	0	0	0	0	20	4.2	
29-Sep	7.25	0	0	0	8	3	0	0	1	1	1	0	1	0	0	0	35	1	0	0	0	0	0	0	0	0	0	5	56	7.7	
30-Sep	7.00	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	11	1.6	

Appendix B. continued

DATE	OBS.		SPECIES ¹																								BIRDS					
	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	0.00																															
02-Oct	3.67	0	0	0	1	2	0	0	0	0	0	0	1	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	11	3.0	
03-Oct	0.00																															
04-Oct	4.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	1	0	0	0	0	0	0	0	0	0	0	23	5.8		
05-Oct	6.50	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	7	1.1		
06-Oct	7.67	0	0	0	5	0	0	1	0	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	0	0	0	0	47	6.1		
07-Oct	8.50	0	0	0	22	2	0	0	0	1	1	0	4	0	0	0	95	0	0	1	0	0	0	0	0	0	0	4	130	15.3		
08-Oct	8.00	0	0	0	16	3	0	1	0	0	0	0	1	0	0	0	99	3	0	0	0	0	0	0	0	0	1	2	126	15.8		
09-Oct	8.00	0	0	0	24	0	0	3	0	0	0	0	0	0	0	0	61	0	0	4	0	0	0	0	0	0	2	1	95	11.9		
10-Oct	8.00	0	0	0	29	2	0	0	0	0	0	0	0	0	0	0	137	1	0	0	0	0	0	0	0	0	0	0	169	21.1		
11-Oct	3.75	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	8	0	0	0	0	0	0	0	0	0	0	9	2.4			
12-Oct	8.00	0	0	0	5	2	0	0	0	0	0	0	0	0	2	0	39	0	0	0	0	0	0	0	0	0	0	0	48	6.0		
13-Oct	8.00	0	0	0	11	0	0	3	0	0	0	0	2	0	0	0	101	2	0	0	0	0	0	0	0	0	0	0	119	14.9		
14-Oct	8.00	0	0	0	11	0	1	0	0	1	0	0	4	0	0	0	184	6	0	0	0	0	0	0	0	0	0	3	210	26.3		
15-Oct	8.00	0	0	0	12	1	0	0	0	0	0	0	2	0	2	1	151	8	0	0	0	0	0	0	0	0	0	2	179	22.4		
16-Oct	7.00	0	0	1	7	0	0	0	0	0	0	0	4	0	0	0	31	3	1	0	0	0	0	0	0	0	0	0	47	6.7		
17-Oct	7.50	0	0	0	5	1	0	0	1	0	0	0	0	0	2	2	66	2	0	0	0	1	0	0	0	0	0	0	80	10.7		
18-Oct	7.75	0	0	2	2	2	0	0	0	0	0	0	2	0	2	1	32	6	1	0	0	0	0	0	0	0	0	2	52	6.7		
19-Oct	8.00	0	0	0	3	0	0	1	0	0	0	0	2	0	2	2	53	1	0	0	0	0	0	0	0	0	0	1	65	8.1		
20-Oct	7.00	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	35	2	0	0	1	0	0	0	0	0	0	1	43	6.1		
21-Oct	7.00	0	0	3	3	0	1	0	0	0	0	0	2	0	0	1	14	4	1	0	0	0	0	0	0	0	0	29	4.1			
22-Oct	0.00																															
23-Oct	0.00																															
24-Oct	7.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1	0	0	0	0	0	0	0	0	0	11	1.6			
25-Oct	7.00	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	2	0.3			
26-Oct	7.00	0	0	2	3	0	0	0	0	0	0	0	3	0	1	0	9	6	0	0	0	0	0	0	0	0	0	24	3.4			
27-Oct	7.00	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	8	4	0	0	0	0	0	0	0	0	0	15	2.1			
Total	365.84	0	2	15	288	103	2	11	4	5	3	1	78	0	11	9	1359	55	15	16	2	6	1	0	0	1	4	43	2034	5.6		

¹ See Appendix A for interpretation of species codes.

Appendix C. Annual observation effort and fall raptor migration counts by species in the Bridger Mountains, MT: 1991–2002.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	Mean
Start date	15-Sep	6-Sep	9-Sep	13-Sep	10-Sep	1-Sep	27-Aug	28-Aug	29-Aug	29-Aug	27-Aug	27-Aug	2-Sep
End date	3-Nov	28-Oct	31-Oct	30-Oct	2-Nov	30-Oct	31-Oct	31-Oct	31-Oct	29-Oct	31-Oct	27-Oct	29-Oct
Observation days	32	39	46	36	42	53	62	56	57	52	58	58	49
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	315.67
Raptors / 100 hours	926.7	1000.1	872.0	1672.3	824.0	808.5	796.1	1040.9	871.8	630.9	636.3	556.0	832.4
SPECIES	RAPTOR COUNTS												
Turkey Vulture	3	0	0	0	0	1	6	0	2	0	0	0	1
Osprey	2	2	5	10	1	14	12	13	9	6	6	2	6
Northern Harrier	19	13	41	109	10	38	66	230	52	20	36	15	50
Sharp-shinned Hawk	88	248	279	674	304	436	480	612	442	190	274	288	334
Cooper's Hawk	87	175	124	247	131	206	347	343	149	109	120	103	169
Northern Goshawk	27	96	39	25	10	37	36	50	61	34	26	2	36
Unknown small accipiter ¹	–	–	–	–	–	–	–	–	–	–	0	11	6
Unknown large accipiter ¹	–	–	–	–	–	–	–	–	–	–	0	4	2
Unknown accipiter	70	35	27	35	33	51	53	49	39	35	27	5	37
TOTAL ACCIPITERS	272	554	469	981	478	730	916	1054	691	368	447	413	577
Broad-winged Hawk	0	2	3	32	5	5	5	20	13	3	38	3	9
Swainson's Hawk	1	11	0	6	2	0	6	2	3	3	0	1	3
Red-tailed Hawk	26	67	65	213	79	106	130	277	121	45	117	78	102
Ferruginous Hawk	3	1	1	2	0	5	4	7	4	1	3	0	3
Rough-legged Hawk	9	10	54	53	29	17	23	66	77	26	57	11	36
Unidentified buteo	14	8	19	24	18	13	20	13	3	8	6	9	12
TOTAL BUTEOS	53	99	142	330	133	146	188	385	221	86	221	102	164
Golden Eagle	1280	1579	1699	2275	1322	1871	1844	1516	1870	1429	1330	1359	1550
Bald Eagle	43	95	124	57	57	79	93	95	91	128	58	55	80
Unidentified eagle	5	2	17	0	25	14	0	15	5	3	2	15	9
TOTAL EAGLES	1328	1676	1840	2332	1404	1964	1937	1626	1966	1560	1390	1429	1638
American Kestrel	33	38	54	133	117	82	146	141	113	39	62	16	76
Merlin	2	10	7	11	12	9	26	17	8	3	9	2	9
Prairie Falcon	9	14	10	20	14	16	10	12	20	9	14	6	12
Peregrine Falcon	1	7	6	8	7	10	10	18	18	1	8	1	8
Gyr Falcon	0	0	0	0	0	0	0	0	1	0	0	0	0
Unknown small falcon ¹	–	–	–	–	–	–	–	–	–	–	0	0	0
Unknown large falcon ¹	–	–	–	–	–	–	–	–	–	–	0	1	1
Unknown falcon	5	3	2	8	2	5	17	8	6	4	3	4	5
TOTAL FALCONS	50	72	79	180	152	122	209	196	166	56	96	30	110
Unidentified raptor	44	10	27	59	40	43	33	28	16	20	15	43	29
GRAND TOTAL	1771	2426	2603	4001	2218	3058	3367	3532	3123	2116	2211	2034	2576

¹ Designations used regularly for the first time in 2001 (see Appendix A).