

FALL 2002 RAPTOR MIGRATION STUDY AT SMITH POINT, TEXAS

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The Smith Point Raptor Migration Project in southern Texas is an ongoing effort to monitor long-term population trends of raptors using this southern portion of the Gulf Coast migratory flyway (Smith et al. 2001). The project is a collaborative venture between HawkWatch International (HWI) and the Gulf Coast Bird Observatory (GCBO). During fall 2002, HWI and GCBO conducted the 6th consecutive standardized, full-season migration count at this site on Galveston Bay. Since 1997, 22 species of raptors have been observed migrating through the area, with annual counts ranging from about 26,000 to 115,000 migrants. This report provides a brief summary of the 2002 count results. HWI will present a more in-depth review of the season's results in a comprehensive, multi-site report in summer 2003.

STUDY SITE

The Smith Point project site is located on the Candy Abshier Wildlife Management Area administered by Texas Parks and Wildlife (29°31'39"N, 94°45'54"W). The site is near the southern tip of Chambers County on the east side of State Route 562 where it intersects the management area, approximately 50 km southeast of Houston. The observers work from atop a 7-m tower situated at the southwestern tip of a sharply tapering peninsula that juts into Galveston Bay. The terrain is predominantly coastal marsh, interspersed with weedy, fallow fields and oak mottes. Trinity Bay borders the peninsula to the north. East Bay borders the peninsula to the southeast, separated from the Gulf of Mexico by a long barrier island called the Bolivar Peninsula. Some birds migrating to the southwest along the Gulf of Mexico probably continue down the Bolivar Peninsula. A larger portion of the flight follows the mainland until it tapers towards Smith Point. On days with favorable winds, many migrants proceed directly from Smith Point across the bay to Eagle Point, the nearest landfall to the west about 12 km away, or head to the southwest across the bay towards the tip of Bolivar Peninsula. When winds are less favorable, many migrants retreat back to the east or northeast after reaching Smith Point, some returning later to try the crossing under more favorable conditions and others heading to the northwest around Trinity Bay.

METHODS

Two official or designated observers, assisted by several trained volunteers, conducted daily counts of the raptor migration through the area from a single traditional observation platform. This was the first full season of migration counting for both full-time observers Josh Berman and Erin O'Brien (see Appendix A for a history of observer participation). Dedicated and well-trained local volunteers Dick Benoit, Winnie Burkett, Bill Saulmon, and Wayne Nichols regularly assisted as supplemental and substitute observers, as has been the case since the project's inception. Observations usually began between 0600 and 0800 hrs and ended between 1400 and 1600 hrs Central Standard Time (CST). The flight lines at Smith Point generally follow the shorelines, which trend east–west. The observers recorded all birds seen heading to the southwest, west, or northwest as migrants, but did not count birds heading to the northeast. Migrants often retreat when faced with crossing the bay and poor weather, but it is highly likely that many make repeated attempts to cross. Thus, double counting undoubtedly occurs and it is therefore best to consider counts at this site an activity index rather than a count of distinct individuals.

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

OBSERVATION EFFORT

The observers logged 91 days and 775.66 hours of observation between 15 August and 15 November 2002. The numbers of observation days and hours were both within 2% of average (Table 1). The daily-average number of observers was 1.96, which is a significant 5% above the 1997–2001 average of 1.86 ± 95% CI of 0.079 observers/hour and the same as in 2001.

MIGRATION SUMMARY

The observers counted 80,984 migrant raptors of 20 species during the 2002 season (Table 1, and see Appendix B for daily count records). As is typical, buteos, accipiters, and kites were the predominant species groups; however, with Broad-winged Hawks excluded, the relative proportion of kites was significantly above average, whereas the proportions of other buteos, accipiters, and other non-falcon species were significantly below average (Figure 1). Species that accounted for 1% or more of the total count included Broad-winged Hawk (81%), Mississippi Kite (10%), Sharp-shinned Hawk (4%), Cooper's Hawk (2%), American Kestrel (2%), and Turkey Vulture (1%).

The 2002 median passage date for Broad-winged Hawks of 23 September was only 1 day later than average. Among other commonly encountered species, five showed later than average timing, eight showed earlier than average timing, and four showed average timing. Thus, there was little overall consistency in pattern across species; however, both Swallow-tailed and Mississippi Kites and all other common buteos besides Broad-winged Hawks were significantly earlier than average, while both common accipiters (Sharp-shinned and Cooper's Hawks) were significantly later than average. The overall seasonal activity pattern with Broad-winged Hawks excluded showed two unusually concentrated periods of activity (Figure 2). The first peak in late August reflected an unusually concentrated passage of Mississippi Kites, while the second in mid-October reflected unusually concentrated passage of Sharp-shinned and Cooper's Hawks.

The count of 65,255 Broad-winged Hawks was the second highest total documented for this species since 1997 (52% above average; Table 1). Significantly above-average and record-high counts (since 1997) were established for Swallow-tailed and Mississippi Kites (although more than 10,000 were recorded at the site one year prior to 1997), American Kestrels, and Peregrine Falcons (Table 1). No other species showed significantly above-average counts in 2002, whereas five species showed significantly below-average counts (Turkey Vulture, Red-tailed Hawk, Osprey, Northern Harrier, and Red-shouldered Hawk), with counts dropping to record-lows for the latter three species.

In comparing the Smith Point count results to those from other sites around the Gulf Coast, a considerable degree of pattern variation across species occurred in 2002. In the Florida Keys, five species showed higher than average counts (Bald Eagle, Osprey, Broad-winged Hawk, Short-tailed Hawk, and Peregrine Falcon) and 10 species below average counts (>50% below average for six species). At both of HWI's Texas sites (the other being near Corpus Christi), roughly half of the species showed counts that were 10% or more below average and the other half above average counts. Moreover, in comparing the two Texas sites, 13 species showed highly dissimilar patterns of variation when comparing the 2002 counts against long-term averages, while only 10 species showed similar changes at the two sites. This continuing, high degree of dissimilarity between count patterns at the two Texas sites likely reflects a combination of differences in source populations (Corpus Christi drawing from a much broader geographic range) and how weather effects the counts at the two sites (Smith et al. 2001). In Veracruz, Mexico, 10 commonly encountered species showed below average counts, while six such species showed above average counts (including the four most abundant species: Turkey Vultures, Mississippi Kites, Broad-winged Hawks, and Swainson's Hawks). The only entirely consistent patterns across all four Gulf Coast sites were that Northern Harriers were down at least slightly everywhere and Peregrine Falcons were up at least slightly everywhere. For seven other species, however, the patterns were similar at three of the four sites (mostly down for Merlins and Sharp-shinned, Red-shouldered and Red-tailed Hawks; mostly up for Broad-winged Hawks and Swallow-tailed and Mississippi Kites).

VISITOR PARTICIPATION AND PUBLIC OUTREACH

Documented visitation in 2002 totaled 831 individuals and 70 repeat visits, with visitors originating in 18 states, the Netherlands, Sweden, and Alberta, Canada. This is close to three times higher than the 2001 visitation level.

ACKNOWLEDGMENTS

Primary funding for this year's project was provided by ExxonMobil Corporation, the Houston Endowment, the Trull Foundation, and HWI and GCBO members. We are also indebted to Texas Parks and Wildlife for hosting the count on the Candy Abshier Wildlife Management Area, and to members of the Ornithology Group of the Houston Outdoor Nature Club and Houston Audubon Society for their volunteer efforts and moral support. Special thanks to Dick Benoit for serving as Volunteer Field Coordinator, and to our other dedicated volunteers—Winnie Burkett, Bill Saulmon, and Wayne Nicholas—for their assistance. Lastly, special thanks to Joe and Annette Whitehead for generously providing housing and friendship for our primary observers.

LITERATURE CITED

- Smith, J. P. 2002. Fall 2001 raptor migration study at Smith Point, Texas. HawkWatch International, Salt Lake City, Utah, and Gulf Coast Bird Observatory, Lake Jackson, Texas. 20 pp.
- Smith, J. P., J. Simon, S. W. Hoffman, and C. Riley. 2001. New full-season autumn hawkwatches in coastal Texas. Pages 67–91 *in* K. L. Bildstein and D. Klem (Editors). Hawkwatching in the Americas. Hawk Migration Association of North America, North Wales, Pennsylvania, USA.

Table 1. Observation effort and raptor counts by species: 1997–2002.

	1997	1998	1999	2000	2001	MEAN \pm 95% CI	2002	% CHANGE
Start date	17-Aug	15-Aug	15-Aug	12-Aug	15-Aug	15-Aug \pm 1.2	15-Aug	–
End date	20-Nov	15-Nov	12-Nov	15-Nov	15-Nov	15-Nov \pm 2.5	15-Nov	–
Observation days	94	91	90	94	93	92 \pm 1.90	91	-1
Observation hours	860.11	677.25	696.68	823.08	743.33	760.09 \pm 69.485	775.66	+2
SPECIES	RAPTOR COUNTS							
Black Vulture	130	105	341	4	379	192 \pm 141.3	59	-69
Turkey Vulture	1,225	581	1,295	1,059	2,488	1,330 \pm 617.9	678	-49
TOTAL VULTURES	1,355	686	1,636	1,063	2,867	1,521 \pm 728.0	737	-52
Osprey	54	68	54	60	62	60 \pm 5.2	48	-19
Northern Harrier	445	262	537	372	472	418 \pm 92.2	144	-66
Swallow-tailed Kite	40	34	52	46	74	49 \pm 13.5	150	+205
White-tailed Kite	11	25	18	17	26	5 \pm 5.1	8	+54
Mississippi Kite	2,124	2,362	2,975	4,788	3,253	3,100 \pm 917.8	7,879	+154
TOTAL KITES	2,175	2,421	3,045	4,851	3,353	3,155 \pm 925.8	8,037	+155
Sharp-shinned Hawk	4,780	3,231	3,896	1,484	3,878	3,454 \pm 1,079.3	3,142	-9
Cooper's Hawk	1,137	1,136	1,207	1,088	1,281	1,170 \pm 66.0	1,233	+5
Unknown small accipiter ¹	–	–	–	–	15	–	17	–
Unknown large accipiter ¹	–	–	–	–	0	–	0	–
Unknown accipiter	49	170	113	14	15	69 \pm 62.5	1	–
TOTAL ACCIPITERS	5,966	4,537	5,216	2,586	5,174	4,696 \pm 1,125.0	4,393	-6
Harris's Hawk	0	0	0	0	2	0 \pm 0.8	0	-100
Red-shouldered Hawk	45	36	34	61	54	46 \pm 10.1	23	-50
Broad-winged Hawk	30,417	16,137	34,243	29,956	103,612	42,873 \pm 30,365.8	65,255	+52
Swainson's Hawk	137	56	129	255	321	180 \pm 93.3	168	-6
White-tailed Hawk	0	1	2	11	12	5 \pm 5.1	8	+54
Red-tailed Hawk	331	35	204	77	273	184 \pm 110.5	44	-76
Ferruginous Hawk	0	0	2	0	2	1 \pm 1.0	1	+25
Rough-legged Hawk	0	0	2	0	3	1 \pm 1.2	0	-100
Unidentified buteo	86	26	31	3	4	30 \pm 29.6	5	-83
TOTAL BUTEOS	31,016	16,291	34,647	30,363	104,283	43,320 \pm 30,495.3	65,504	+51
Golden Eagle	3	0	1	1	0	1 \pm 1.1	0	-100
Bald Eagle	2	0	2	7	2	3 \pm 2.3	3	+15
TOTAL EAGLES	5	0	3	8	2	4 \pm 2.7	3	-17
Crested Caracara	6	3	4	9	16	8 \pm 4.6	7	-8
American Kestrel	1,297	1,334	1,938	1,311	1,140	1,404 \pm 270.1	1,949	+39
Merlin	88	26	47	43	70	55 \pm 21.3	56	+2
Peregrine Falcon	65	92	85	79	77	80 \pm 8.8	94	+18
Unknown small falcon ¹	–	–	–	–	0	–	3	–
Unknown large falcon ¹	–	–	–	–	0	–	0	–
Unknown falcon	25	13	9	5	1	11 \pm 8.1	5	–
TOTAL FALCONS	1,475	1,465	2,079	1,438	1,288	1,549 \pm 268.0	2,107	+36
Unidentified raptor	496	91	116	16	0	144 \pm 177.8	5	-97
GRAND TOTAL	42,993	25,824	47,337	40,766	117,517	54,887 \pm 31,497.7	80,984	+48
TOTAL W/O BW	12,576	9,687	13,094	10,810	13,905	12,014 \pm 1,513.3	15,729	+31

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

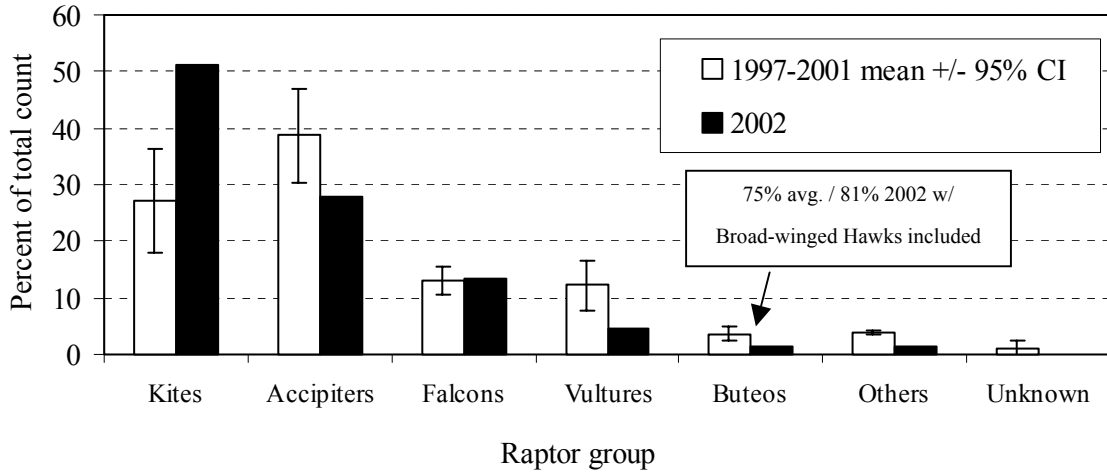


Figure 1. Composition of autumn raptor migration by major species groups at Smith Point, Texas: 1997–2001 versus 2002.

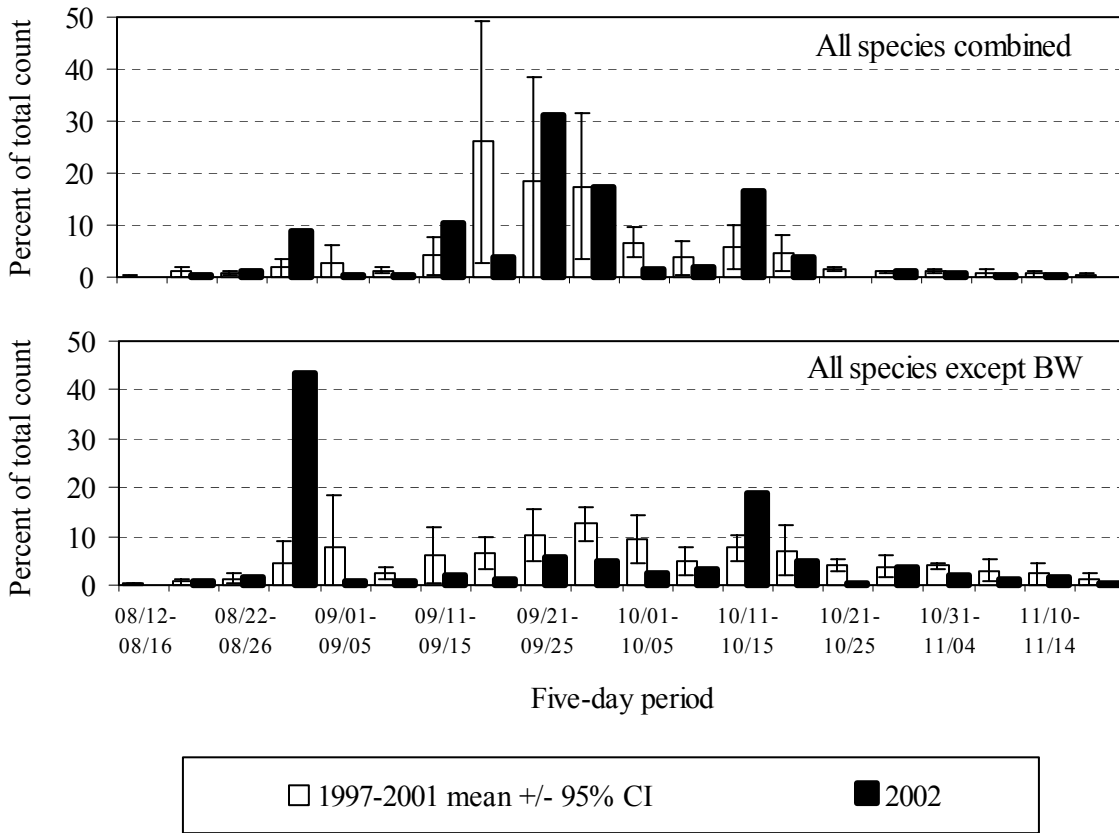


Figure 2. Combined-species flight volume by five-day periods for the autumn raptor migration at Smith Point, Texas: 1997–2001 versus 2002.

Appendix A. Common and scientific names, species codes, and regularly applied age, sex, and color-morph classifications for all migrant raptors observed at Smith Point, Texas.

Common Name	Scientific Name	Species Code	Age ¹	Sex ²	Color Morph ³
Black Vulture	<i>Coragyps atratus</i>	BV	U	U	NA
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
Swallow-tailed Kite	<i>Elanoides forficatus</i>	SK	U	U	NA
White-tailed Kite	<i>Elanus leucurus</i>	WK	U	U	NA
Mississippi Kite	<i>Ictinia mississippiensis</i>	MK	A I U	U	NA
Unknown kite	<i>see above</i>	UK	U	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
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
Harris' Hawk	<i>Parabuteo unicinctus</i>	HH	A I U	U	NA
Red-shouldered Hawk	<i>Buteo lineatus</i>	RS	A I U	U	NA
Broad-winged Hawk	<i>Buteo platypterus</i>	BW	A I U	U	D L U
Swainson's Hawk	<i>Buteo swainsoni</i>	SW	U	U	D L U
White-tailed Hawk	<i>Buteo albicaudatus</i>	WT	A I U	U	NA
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	A S I NA U ⁴	U	NA
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BE	A S2 S1 I NA U ⁵	U	NA
Unknown eagle	<i>Aquila</i> or <i>Haliaeetus</i> spp.	UE	U	U	NA
Crested Caracara	<i>Caracara cheriway</i>	CC	U	U	NA
American Kestrel	<i>Falco sparverius</i>	AK	U	M F U	NA
Merlin	<i>Falco columbarius</i>	ML	AM Br	M U	NA
Prairie Falcon	<i>Falco mexicanus</i>	PR	U	U	NA
Peregrine Falcon	<i>Falco peregrinus</i>	PG	A I U	U	NA
Unknown small falcon	<i>F. sparverius</i> or <i>columbarius</i>	SF	U	U	NA
Unknown large falcon	<i>F. mexicanus</i> or <i>peregrinus</i>	LF	U	U	NA
Unknown falcon	<i>Falco</i> spp.	UF	U	U	NA
Unknown raptor	Falconiformes	UU	U	U	NA

¹ A = adult, I = immature (HY), Br = brown (adult female or immature), U = unknown age.

² M = male, F = female, U = unknown.

³ D = dark or rufous, L = light, U – unknown, NA = not applicable.

⁴ Golden Eagle age codes: I = immature, first-year bird, bold white wing patch visible below (small patch may be visible above), bold white in the tail, no molt; S = subadult, white wing patch variable or absent, obvious white in the tail, molt or tawny bar on upper wing visible; NA = not adult, unknown age immature/subadult, obvious white in wing or tail, but rest of plumage not adequately observed; A = adult, no obvious white on wing or tail; U = plumage not adequately observed to make an age determination.

⁵ Bald Eagle age codes: I = immature, first-year bird, dark breast and tawny belly; S1 = young subadult, Basic I and II plumages, light belly or upside-down white triangle on the 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 tip to tail (may be hard to see in field) and adult with pure white head and tail; U = plumage not adequately observed to make an age determination.

Appendix B. Daily fall raptor migration count records at Smith Point, Texas: 2002.

DATE	HOURS	SPECIES ¹																												BIRDS					
		BV	TV	OS	NH	SK	WK	MK	SS	CH	SA	LA	UA	HH	RS	BW	SW	WT	RT	FH	RL	UB	GE	BE	CC	AK	ML	PG	SF	LF	UF	UU	TOTAL	/HR	
15-Aug	0.75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.0
16-Aug	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	0	0	0	0.0
17-Aug	9.25	0	0	0	0	11	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	1.4	
18-Aug	9.25	0	0	0	0	24	0	1	0	2	1	0	0	0	7	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	4.0	
19-Aug	9.00	0	0	0	0	20	0	2	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	3	0	0	0	0	0	1	28	3.1			
20-Aug	9.00	0	0	0	0	27	0	0	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0	32	3.6			
21-Aug	9.00	0	0	0	0	0	0	2	2	0	0	0	0	1	48	7	0	5	0	0	1	0	0	0	0	0	0	0	0	66	7.3				
22-Aug	8.50	0	0	0	0	14	0	2	0	2	0	0	0	0	128	2	0	0	0	0	0	0	0	0	0	0	0	0	0	148	17.4				
23-Aug	9.25	0	0	0	0	4	0	0	1	0	0	0	0	0	208	4	0	0	0	0	0	0	0	0	0	0	0	0	0	217	23.5				
24-Aug	9.00	0	0	0	0	0	0	0	0	0	0	0	0	0	51	0	0	1	0	0	0	0	0	0	0	0	0	0	1	53	5.9				
25-Aug	9.00	0	0	0	0	8	0	6	0	2	2	0	0	1	158	9	1	1	0	0	1	0	0	0	0	0	0	0	189	21.0					
26-Aug	9.00	0	0	1	0	6	0	210	0	3	0	0	0	3	63	1	0	0	0	0	0	0	0	0	0	0	0	0	287	31.9					
27-Aug	8.50	0	0	0	0	5	0	113	1	3	0	0	0	2	65	5	2	4	0	0	0	0	0	0	0	0	0	0	200	23.5					
28-Aug	10.00	0	0	0	0	9	0	2828	0	1	0	0	0	2	115	3	1	3	0	0	0	0	0	1	0	0	0	0	2963	296.3					
29-Aug	9.00	0	0	0	1	4	0	3790	0	3	2	0	0	2	228	6	0	0	0	0	0	0	0	1	0	0	0	0	4037	448.6					
30-Aug	9.00	0	0	2	0	0	0	4	0	1	0	0	0	0	42	0	0	0	0	0	0	0	0	1	0	0	0	50	5.6						
31-Aug	10.00	0	0	0	0	1	0	13	0	3	0	0	0	2	34	0	0	0	0	0	0	0	0	1	0	0	0	54	5.4						
1-Sep	9.00	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0	3	0	0	0	1	24	2.7					
2-Sep	9.00	0	0	1	1	0	0	9	2	0	0	0	0	1	34	0	0	1	0	0	1	0	0	4	0	0	0	1	55	6.1					
3-Sep	9.00	0	0	0	0	0	0	11	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	14	1.6						
4-Sep	8.50	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	0.0			
5-Sep	9.00	0	0	0	0	3	0	59	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	0	65	7.2						
6-Sep	0.00																																		
7-Sep	8.75	0	0	0	0	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	4	0.5						
8-Sep	8.75	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0.3						
9-Sep	8.00	0	0	0	0	4	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	6	0.8						
10-Sep	9.00	0	0	1	0	0	0	112	0	0	0	0	0	0	103	0	0	0	0	0	0	0	0	2	0	0	0	218	24.2						
11-Sep	9.00	0	0	0	1	0	0	0	0	1	0	0	0	0	98	0	0	0	0	0	0	0	0	1	0	0	0	101	11.2						
12-Sep	9.00	0	0	1	0	1	0	49	0	1	0	0	0	0	70	0	0	0	0	0	0	0	0	3	0	0	0	125	13.9						
13-Sep	9.50	0	0	2	0	0	0	57	0	2	0	0	0	1	2065	0	0	0	0	0	0	0	0	1	0	0	0	2128	224.0						
14-Sep	10.00	0	0	1	0	0	0	97	0	1	0	0	0	0	5243	0	0	0	0	0	0	0	0	4	1	0	0	5347	534.7						
15-Sep	4.75	0	0	0	0	0	0	91	0	0	0	0	0	0	769	0	0	0	0	0	0	0	0	1	1	0	0	862	181.5						
16-Sep	0.00																																		
17-Sep	8.56	0	0	0	0	0	0	16	0	0	0	0	0	0	84	0	0	1	0	0	0	0	0	0	1	0	0	102	11.9						
18-Sep	9.00	0	0	0	1	0	0	28	0	0	0	0	0	0	29	0	0	0	0	0	0	0	0	0	1	0	0	60	6.7						
19-Sep	7.16	0	0	0	0	0	0	2	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	1	0	0	7	1.0						
20-Sep	9.75	0	0	1	2	1	0	70	0	10	0	0	0	1	2970	1	0	2	0	0	0	0	0	1	1	19	0	3081	316.0						
21-Sep	10.17	0	0	2	5	3	0	23	0	17	0	0	0	0	1927	0	0	1	0	0	0	0	0	8	1	1	0	1988	195.5						
22-Sep	9.50	0	0	2	1	2	0	91	70	16	0	0	0	0	1248	0	0	1	0	0	0	0	0	36	2	2	0	1472	154.9						

Appendix B. continued

DATE	HOURS	SPECIES ¹																												BIRDS				
		BV	TV	OS	NH	SK	WK	MK	SS	CH	SA	LA	UA	HH	RS	BW	SW	WT	RT	FH	RL	UB	GE	BE	CC	AK	ML	PG	SF	LF	UF	UU	TOTAL	/HR
23-Sep	9.50	0	0	1	1	0	0	77	59	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32	2	2	0	0	0	0	198	20.8
24-Sep	10.25	0	0	1	5	1	0	43	128	32	0	0	1	0	0	17114	4	0	0	0	0	0	0	0	0	69	3	1	0	0	0	0	17402	1697.8
25-Sep	9.50	0	0	2	2	0	1	0	70	25	1	0	0	0	0	4140	0	0	0	0	0	0	0	0	0	20	1	3	0	0	0	0	4265	448.9
26-Sep	9.56	0	0	1	1	0	0	0	108	13	0	0	0	0	0	1107	0	0	0	0	0	0	0	0	0	15	2	5	0	0	0	0	1252	131.0
27-Sep	10.00	0	0	2	1	0	0	6	57	14	0	0	0	0	0	2741	0	0	6	0	0	0	0	0	0	23	0	5	0	0	0	0	2855	285.5
28-Sep	9.94	0	0	2	4	0	2	8	45	43	3	0	0	0	2	7544	3	1	1	0	0	0	0	0	0	33	3	8	0	0	0	0	7702	774.8
29-Sep	9.75	0	0	3	1	0	0	15	108	31	0	0	0	0	0	1349	0	0	0	0	0	0	0	0	0	35	3	3	0	0	1	0	1549	158.9
30-Sep	9.75	0	0	1	1	0	0	4	71	16	5	0	0	0	1	370	0	0	0	0	0	0	0	0	0	53	1	2	0	0	0	0	525	53.8
1-Oct	9.44	0	0	0	0	0	0	2	44	5	0	0	0	0	0	176	0	0	0	0	0	0	0	0	0	4	2	2	0	0	0	0	235	24.9
2-Oct	9.50	0	0	0	0	0	0	4	44	3	0	0	0	0	0	153	0	0	0	0	0	0	0	0	0	11	2	3	0	0	0	0	220	23.2
3-Oct	8.75	0	0	1	0	0	0	0	104	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	65	1	1	0	0	0	0	174	19.9
4-Oct	9.16	0	0	0	1	0	0	0	14	0	0	0	0	0	0	254	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	273	29.8
5-Oct	8.75	0	11	0	0	0	0	0	39	9	0	0	0	0	0	297	2	1	0	0	0	0	0	0	0	19	0	0	0	0	0	0	378	43.2
6-Oct	9.50	0	5	3	0	0	0	0	101	11	0	0	0	0	0	220	0	0	0	0	0	0	0	0	0	18	1	14	0	0	0	0	373	39.3
7-Oct	6.56	0	33	1	0	0	0	0	32	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	3	0	0	0	0	90	13.7
8-Oct	8.42	7	0	2	1	0	0	7	28	7	0	0	0	0	0	541	0	0	0	0	0	0	0	0	1	19	2	0	0	0	0	0	615	73.0
9-Oct	0.50	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	0	0	0.0
10-Oct	9.44	0	0	0	4	0	0	8	83	16	0	0	0	0	0	229	5	0	0	0	0	0	0	0	0	88	1	2	0	0	0	0	436	46.2
11-Oct	9.67	7	14	4	4	0	0	6	108	15	0	0	0	0	0	1480	7	0	0	0	0	0	0	0	0	106	2	2	0	0	0	0	1755	181.5
12-Oct	10.25	0	12	4	6	0	0	4	105	17	0	0	0	0	0	1910	9	0	2	0	0	0	0	0	0	50	3	5	1	0	0	0	2128	207.6
13-Oct	10.25	0	0	1	9	0	0	0	372	78	0	0	0	0	0	350	12	1	1	0	0	0	0	0	0	429	1	0	0	0	0	0	1254	122.3
14-Oct	9.33	2	21	0	6	0	1	1	176	117	0	0	0	0	0	2030	11	0	0	0	0	0	0	0	0	191	0	2	0	0	0	0	2558	274.2
15-Oct	9.56	4	35	0	8	0	0	0	616	159	1	0	0	0	1	4549	12	0	1	1	0	0	0	0	0	203	1	0	1	0	0	0	5592	584.9
16-Oct	9.50	3	42	2	4	0	0	1	55	43	0	0	0	0	1	1637	13	0	1	0	0	0	0	0	0	44	1	0	0	0	0	0	1847	194.4
17-Oct	9.25	5	60	1	6	0	1	1	40	31	0	0	0	0	1	517	9	0	1	0	0	0	0	0	0	22	1	0	0	0	0	0	696	75.2
18-Oct	9.00	0	0	0	3	0	0	0	21	10	0	0	0	0	0	14	0	0	0	0	0	0	0	0	0	49	3	1	0	0	0	0	101	11.2
19-Oct	8.83	0	0	0	0	0	0	0	13	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	3	1	0	0	0	28	3.2
20-Oct	9.56	0	11	0	2	0	0	0	96	92	0	0	0	0	0	122	2	0	0	0	0	0	0	0	0	79	1	1	0	0	0	0	406	42.5
21-Oct	6.33	0	0	0	0	0	0	0	8	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	11	1.7
22-Oct	4.08	0	0	0	0	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	2	0.5
23-Oct	4.83	0	0	1	0	0	1	0	3	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	11	2.3
24-Oct	6.67	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0.3
25-Oct	4.16	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1.9
26-Oct	2.75	0	0	0	0	0	0	0	7	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	2.9
27-Oct	9.00	0	0	0	0	0	0	0	21	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	33	3.7
28-Oct	3.16	0	0	0	1	0	0	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	15	4.7
29-Oct	9.00	0	31	0	7	0	0	0	107	77	1	0	0	0	1	173	15	0	0	0	0	0	0	0	0	47	4	1	0	0	0	0	464	51.6
30-Oct	9.50	0	81	0	10	0	0	0	35	51	0	0	0	0	0	56	8	1	0	0	0	0	0	0	0	26	1	0	0	0	0	0	269	28.3
31-Oct	9.00	3	73	1	1	0	0	0	51	50	0	0	0	0	0	205	0	0	1	0	0	0	0	1	0	37	1	0	0	0	0	0	424	47.1

Appendix B. continued

DATE	HOURS	SPECIES ¹																										BIRDS						
		BV	TV	OS	NH	SK	WK	MK	SS	CH	SA	LA	UA	HH	RS	BW	SW	WT	RT	FH	RL	UB	GE	BE	CC	AK	ML	PG	SF	LF	UF	UU	TOTAL	/HR
1-Nov	9.00	0	11	0	1	0	0	0	9	26	1	0	0	0	0	42	2	0	1	0	0	0	0	1	0	10	0	0	0	0	0	1	105	11.7
2-Nov	8.25	0	0	0	1	0	0	0	9	11	0	0	0	0	0	0	0	0	0	0	0	1	0	0	11	0	0	0	0	0	0	33	4.0	
3-Nov	8.67	0	0	0	0	0	0	1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0.8		
4-Nov	8.00	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	0.3		
5-Nov	9.00	0	28	0	2	0	0	0	2	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	48	5.3		
6-Nov	9.17	3	72	0	11	0	0	0	10	26	0	0	0	0	0	86	2	0	0	0	0	0	0	0	4	1	0	0	0	0	215	23.4		
7-Nov	9.00	0	0	0	5	0	0	0	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	14	1.6		
8-Nov	9.08	0	0	0	4	0	0	0	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	17	1.9		
9-Nov	9.08	0	0	0	0	0	0	0	4	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	9	1.0			
10-Nov	9.00	0	0	0	2	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	6	0.7			
11-Nov	9.00	7	46	0	5	0	1	0	6	13	0	0	0	0	0	11	3	0	3	0	0	0	0	3	0	0	0	0	0	98	10.9			
12-Nov	9.08	0	32	0	4	0	0	0	18	30	0	0	0	0	0	12	2	0	0	0	0	0	0	1	0	11	0	0	0	0	110	12.1		
13-Nov	9.08	18	33	0	3	0	0	0	1	5	0	0	0	0	0	4	0	0	3	0	0	0	0	1	0	1	0	0	0	69	7.6			
14-Nov	9.08	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	4	0.4			
15-Nov	8.33	0	27	0	4	0	0	0	4	10	0	0	0	0	0	5	2	0	0	0	0	0	0	5	0	0	0	0	0	57	6.8			
Total	775.66	59	678	48	144	150	7	7879	3142	1233	17	0	1	0	23	65255	168	8	44	1	0	5	0	3	7	1949	56	94	3	0	5	5	80984	104.4

¹ See Appendix A for full names associated with species codes.