

**FALL 2008 RAPTOR MIGRATION STUDY
NEAR CORPUS CHRISTI, TEXAS**



**HawkWatch International, Inc.
Salt Lake City, Utah**



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INTRODUCTION

The Corpus Christi Raptor Migration Project in southern Texas is an ongoing effort to monitor long-term population trends of raptors using the Gulf Coast migratory flyway (Smith et al. 2001, 2008a). During fall 2008, HawkWatch International (HWI) conducted the twelfth consecutive, full-season migration count at Hazel Bazemore County Park near Corpus Christi. Previously, local volunteers conducted peak-season counts at this “Coastal Bend” site each year between 1988 and 1996 following protocols of the Hawk Migration Association of North America (HMANA). The December 1997 issue of the HMANA Journal of Hawk Migration Studies includes a summary of these counts. Since HWI began full-season counts at the site in 1997, 30 species of raptors have been observed migrating through the project area. Previous annual counts have ranged from roughly 445,000 to more than 1,000,000 migrants, with Broad-winged Hawks (see Appendix A for common and scientific names of all raptor species observed at the site) comprising 88–98% of the total count each year. This report summarizes the count results from the 2008 season.

The Corpus Christi project was 1 of 14 long-term, annual migration counts conducted or sponsored by HWI in North America during 2008. The primary objective of these efforts is to track long-term population trends of diurnal raptors in western North America and around the Gulf Coast region (Hoffman and Smith 2003, Smith et al. 2008a, b). Raptors feed atop food pyramids, inhabit most ecosystems, occupy large home ranges, and are sensitive to environmental contamination and other human disturbances. For these reasons, they serve as important biological indicators of ecosystem health (Bildstein 2001). Moreover, due to the remoteness and widespread distribution of most raptor populations, migration counts represent one of the most cost-effective and efficient methods for monitoring the regional status and trends of multiple raptor species (Zalles and Bildstein 2000, Bildstein et al. 2008).

STUDY SITE

The nine-county area around Corpus Christi is commonly called the Coastal Bend. This includes Aransas, Refugio, San Patricio, Nueces, and Kleberg counties along the coast, and Goliad, Bee, Live Oak, and Jim Wells counties to the west. The Texas coast runs from the northeast to the southwest between the Louisiana border and Corpus Christi Bay, and then shifts to a north–south direction. Hazel Bazemore Park (HBP) is approximately 27 km west of Corpus Christi Bay near the town of Calallen (27°52'3.0"N, 97°38'30.1"W; Figure 1). This geographic location is ideal for monitoring the autumn raptor migration through the region. Past records show that this is a major migration path for Broad-winged Hawks (Rappole and Blacklock 1985).

The HBP monitoring site is situated at an elevation of 28 m above mean sea level, which is the highest elevation along the coast in a four-county area. The park sits on the southern bank of the Nueces River at a horseshoe bend where the river changes from a southeast to north–northwest flow. Fall 2008 marked the inaugural season for a new viewing platform centered atop the grassy area that previously served as the central viewshed area. The deck-like structure can hold up to 150 people, affords a sweeping 180° viewscape, and includes a backside ramada for shade. The watch site offers clear visibility to the west, north, and east, but the southward view is restricted by trees and topography at a similar elevation. The Nueces River bottomlands feature a transitional riparian forest. Characteristic plants include hackberry (*Celtis* spp.), Mexican ash (*Fraxinus berlandieriana*), anacua (*Ehretia anacua*), black persimmon (*Diospyros texana*), chittimwood (*Bumelia lanuginosa*), and cedar elm (*Ulmus crassifolia*). Many species of raptors use this forested area for nocturnal roosting during migration (Rappole and Blacklock 1985). Open farmland predominates to the north and south, open ranchland to the west. Corpus Christi Bay, which is an industrial and urbanized area, lies to the east.

METHODS

This season, three official or designated observers were assigned to the count throughout the season, with on-site project coordinator Libby Even serving half time as one of those official observers. Due to damage caused by Hurricane Katrina, which shut down HWI's other Texas count at Smith Point for the season in mid-September, two additional counters from that site also joined the Corpus Christi team during the peak month of the season. Official observer Libby Even served previously as a half- or full-time observer at the site in 2006 and 2007, and in 2008 also took the lead in coordinating local volunteers, fundraising, and events (see Appendix B for a complete history of official observer participation). This was official observer Dane Ferrell's eighth full season of migration counting for HWI, including six seasons in Texas. This was official observer Leslie Park's first season of migration counting at Corpus Christi, but she had gained exposure to migration monitoring in the past. Smith Point transplant Kevin Georg had two previous full seasons of experience plus an additional decade of periodic volunteer experience at an eastern hawkwatch. This was the first season of migration counting experience for our other Smith Point transplant, Bob Baez. Several other experienced local volunteers, in particular former site coordinator Joel Simon and long-time local observer Bob Creglow, routinely assisted with the count, as has been the case most years.

The official observers assigned a specific task to each actively participating individual to maximize accuracy of the counts and ensure quality participation by all interested volunteers. Counters were responsible for counting large flights of raptors, usually Broad-winged Hawks. Spotters were responsible for scanning the sky for both large flights and single raptors, and notifying the counters of their sightings. Other individuals were responsible for scanning through large flights of Broad-winged Hawks and recording occurrences of other species. Other volunteer assignments included keeping up with the visitor log, taking weather observations when the primary observer was too busy with counts, and serving as data recorder on busy days.

Weather permitting, observations typical began by 0800 H and ended by 1600 H Central Standard Time (CST). 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). The observers generally tallied raptors only by species, because the demands of counting during peak flight periods usually precluded paying close attention to details other than species identification. High flight altitudes also frequently limited the attainable detail. Because of these limitations, we do not focus attention in this report on the age, sex, or color-morph data.
2. Hour of passage for each migrant; e.g., the 1000–1059 H CST.
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 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 updated through 2008 follows Hoffman and Smith (2003). In comparing 2008 annual statistics against means and 95% confidence intervals for previous seasons, we equate significance with a 2008 value falling outside the bounds of the confidence interval for the associated mean.

RESULTS AND DISCUSSION

WEATHER

Inclement weather did not fully preclude any days of potential observations in 2008, but observation time was reduced to ≤ 4 hours due to inclement weather on three days (see Appendix C for daily weather records). The long-term averages for the site are 2.9 and 2.7 days, respectively. Fair skies predominated on 33% of the active observation days, transitional weather (i.e., skies changed from fair to mostly cloudy/overcast, or vice versa, during the day) on 34%, and mostly cloudy to overcast skies on 34% of the active days. The long-term averages for the site are 33% fair, 41% transitional, and 26% mostly cloudy to overcast. The proportion of days with scattered rain and thunderstorms (11%) was significantly below average (25%), whereas the proportion of days with visibility-reducing fog and especially haze (78%) was substantially above average (58%). The latter contributed to slight reductions in average visibility: 8 km east and 10 km west versus averages of 9.3 km east and 10.4 km west.

The 2008 season was slightly less windy than usual, which likely contributed to increased haziness. Light winds (< 12 kph) prevailed on 76% of the active observation days and moderate winds (12–28 kph) on 24%, compared to long-term averages of 71% light, 29% moderate, and 1% strong (> 28 kph). In terms of wind directions, E–S winds prevailed on 26% of the active observation days, E–S winds with a calm/variable component on another 11%, N–E winds on 23%, and overall calm/variable winds on 13% of the active observation days, with a variety of other combinations occurring on the remainder of days. The basic distribution of prevailing wind directions very closely matched the long-term average pattern for the site, except that days with overall calm/variable winds were substantially more common than usual (13% vs. average of 3%).

Daily-average (mean of hourly readings) temperatures during active observation periods averaged 30.1°C, ranging from 18.9–36.8°C. All three values are above average for the site and among the highest yet recorded. Daily-average (mean of hourly readings) barometric pressure readings during active observation periods averaged 29.99 inHg, ranging from 29.63–30.53 inHg. All three values are typical for the site.

In 2008, 62% of the active observation days received a median thermal-lift rating of good to excellent, which is a record high to date and well above the long-term average of 37%.

In summary, weather data collected on site by our observers during active observation periods revealed overall average cloud cover; a lower than usual prevalence of scattered thundershowers, but increased fog/haze with attendant reductions in average visibility; above average temperatures and average barometric pressure regimes; slightly calmer winds than usual but a fairly typical array of wind directions; and a record high prevalence of thermal-lift conditions rated by the observers as good to excellent.

OBSERVATION EFFORT

Observations occurred on 93 of 93 possible days within the usual study period of 15 August through 15 November (see Appendix D for daily count records). In 2008, we continued a two-year exploratory effort to assess the degree to which beginning the season two weeks earlier would better capture the migration of Swallow-tailed Kites. Official observer Dane Ferrell was the primary observer during this first two weeks, assisted by Leslie Parks and various local volunteers. The number of observation days and hours

(683.75) conducted between the typical study period of 15 August through 15 November were a non-significant 2% and 3% higher, respectively, than the 1997–2007 averages of $91 \pm 95\%$ CI of 3.4 days and 701.98 ± 31.97 hours of observation per season. The 2008 average of 5.22 observers per hour (includes official and guest observers; value is mean of daily values, which are in turn means of hourly values) was significantly higher than the 1997–2007 average of 3.6 ± 0.19 observers/hr and the highest rate recorded to date, primarily reflecting the presence of two additional full-time observers for the peak month of the season. The difference undoubtedly influenced the count, but to an unknown degree. From the standpoint of long-term standardization, adding two additional observers to the count team was poor practice; however, sometimes humanitarian interests (i.e., providing an opportunity for the two displaced counters to remain “employed” for an additional month) trump practical interests.

MIGRATION SUMMARY

The observers tallied 452,414 migrating raptors of 26 species during the 2008 season (Table 1), which is a significant 37% below the long-term average for the site. The only species for which the extra, early two weeks of additional counting resulted in more than five additional birds were the Swallow-tailed Kite (205 birds; 59% of the 2008 total), Mississippi Kite (1,180, 6%), and Broad-winged Hawk (15, <1%). Note that just like in 2007, even without addition of the early birds, the 2008 tallies for Swallow-tailed and Mississippi Kites were well above average (Table 1), making it difficult to know whether the documented early birds were typical for the flight or perhaps simply reflective of it being a big year for both species.

The 2008 Broad-winged Hawk count was a significant 45% below average, whereas the total count of all other species combined (82,326) was a new record high, owing primarily to a new record high count of Swainson’s Hawks (26,093 versus the 1997-2007 long-term average of 7,338; see Appendix E for annual count summaries). Species that comprised 1% or more of the 2008 count with Broad-winged Hawks excluded included Turkey Vulture (35%), Swainson’s Hawk (32%), Mississippi Kite (26%), Sharp-shinned Hawk (2%), and Cooper’s Hawk (1%). Buteos, vultures, and kites were the predominant species groups (Figure 2). With Broad-winged Hawks excluded, the proportion of kites, accipiters, and falcons were significantly above average in 2008, whereas the proportions of all other species groups were significantly below average. Highlights of the season included the fifth season in a row that a Short-tailed Hawk was sighted moving through; a new record-high 50 migrating White-tailed Hawks; and new record-high counts of Sharp-shinned Hawks (1,927), Swallow-tailed kites (349), White-tailed Kites (14), and Bald Eagles (10). In addition, two Aplomado Falcons were recorded as migrants, which is the fourth year in a row that this species has been recorded at the site. No record low counts occurred in 2008 for commonly recorded species.

Passage Rates and Long-Term Trends

The adjusted passage rate for Broad-winged Hawks in 2008 was a significant 49% below average (Table 1). Among the remaining 19 species for which adjusted passage rates were calculated, rates were significantly below average for five species (Black Vulture, Red-shouldered Hawk, Red-tailed Hawk, Crested Caracara, and Prairie Falcon), were significantly above average for nine species, and did not differ significantly from average for five species (Turkey Vulture, Osprey, Northern Harrier, Harris’s Hawk, and Peregrine Falcon; Table 1).

Regression analyses of trends in adjusted passage rates updated through 2008 (after Hoffman and Smith 2003) indicated at least marginally significant ($P \leq 0.10$) linear increasing trends for Ospreys (Figure 3), Mississippi Kites (Figure 4), Cooper’s Hawks (Figure 5), Zone-tailed Hawks (Figure 7), American Kestrels (Figure 8), and Peregrine Falcons (Figure 9). Significant second-order, or quadratic, regressions provided the best fit to the data for Swallow-tailed Kites (Figure 4), White-Tailed Hawks (Figure 7), and Merlins (Figure 8). For these species, the quadratic models tracked patterns of accelerating increase, with

significant upward inflections commencing around 2002–2003. All remaining species showed no significant ($P > 0.10$) long-term trends.

Smith et al. (2008a) present trend analyses of data collected through 2005 for four long-term, on-going, autumn migration studies around the Gulf of Mexico, including this Corpus Christi project for the first time. These analyses (hereafter called the Raptor Population Index or “RPI” analyses; see <http://www.rpi-project.org>) are based on a more sophisticated analytical approach (also see Farmer et al. 2007) than that represented in Hoffman and Smith (2003) and used herein to present analyses updated through 2008. Among other refinements, this new approach both fits polynomial trajectories to the complete series of annual count indices and allows for estimating rates of change between various periods, while also allowing for assessments of trend significance and precision. Note, however, that restrictions related to the mathematical assumptions behind the new approach precluded analyzing data for rare species, which, compared to those species analyzed herein based on the methods of Hoffman and Smith (2003), include Harris’s, White-tailed and Zone-tailed Hawks, Crested Caracaras, and Prairie Falcons. Otherwise, with a few notable exceptions, the overall patterns of change and derived trend estimates suggested by the new modeling technique generally yielded similar inferences as those derived using the simpler methodology of Hoffman and Smith (2003).

Differences between the RPI results and those presented herein that clearly relate to addition of three more years of data include: a) addition of three new often record- or near-record-high passage rates from 2006–2008 resulted in significant overall increases for Swallow-tailed and Mississippi Kites, Cooper’s Hawks, American Kestrels, Merlins, and Peregrine Falcons, whereas the RPI analyses revealed only non-significant increases for these species through 2005; b) although followed by two additional years of low rates in 2007 and 2008, a new record-high passage rate in 2006 rendered no significant overall trend through 2008 for Red-shouldered Hawks, whereas the RPI analysis indicated a significant decline through 2005; and c) the RPI analysis indicated a significant increase for Swainson’s Hawks through 2005, whereas, although the 2008 passage rate rose to a new record high, a below-average passage rate in 2005 and a near record-low passage rate in 2007 resulted in no significant overall trend through 2008. No other noteworthy differences were apparent among the inferences generated by the RPI and updated Hoffman and Smith (2003) analyses.

Seasonal Timing

The median passage date for Broad-winged Hawks of 25 September 2008 was a non-significant 1 day earlier than average (Table 3) and the overall seasonal passage pattern confirmed a typical pattern for the species (Figure 10). Otherwise, the combined-species seasonal passage pattern with Broad-winged Hawks excluded showed two unusually high peaks in activity, one in late August corresponding to record-high passage of Swallow-tailed and White-tailed Kites, and one in early October corresponding to record-high passage of Swainson’s and Sharp-shinned Hawks (Figure 10). Overall, 10 of 21 species for which a comparison was possible showed median passage dates in 2008 that differed significantly from the long-term averages (Table 3), with Black Vulture, Turkey Vulture, Swallow-tailed Kite, Mississippi Kite, Sharp-shinned Hawk, Zone-tailed Hawk, Bald Eagle, and Crested Caracara earlier than average, and only the White-tailed Kite later than average. Note that the early median passage dates for Swallow-tailed and Mississippi Kites are atypically skewed by the two weeks of early monitoring in 2008.

RESIDENT AND LOCAL RAPTOR ACTIVITY

Turkey and Black Vultures were present throughout the season, with the growing winter population observed late in the season larger than usual. The high counts for the season of 170 Turkey Vultures and 120 Black Vultures occurred during the last week of season. Two Ospreys resided in the area throughout the season. An immature Northern Harrier was first observed acting like a resident during the third week of October. A second adult female was first observed during the first week of November.

At least one Cooper's Hawk and one Sharp-shinned Hawk resided in the area from at least the second week through the remainder of the season.

Family groups of buteos and allies that resided in the area included White-tailed Hawks with one juvenile, Red-tailed Hawks with one juvenile, Red-shouldered Hawks with two juveniles, Swainson's Hawks with one juvenile, and Harris's Hawks with one juvenile. In addition, one adult Zone-tailed Hawk was seen almost daily during the first three weeks of the season. The first Broad-winged Hawk recorded as a temporary resident was first spotted on 10 August and a second joined the scene on 24 August; both departed the area in early September, staying much longer than typical transient locals of the past.

One family of Crested Caracaras, including one juvenile, resided in the area throughout the season. The first American Kestrel recorded as a resident was an adult male first observed in late September. A second male and a female settled in within the next 10 days, and all three were still present at the end of the season. The first Peregrine Falcon recorded as a resident was observed in early September; sightings occurred periodically after that through the remainder of the season.

This is a typical array of resident activity for the site.

VISITOR PARTICIPATION AND PUBLIC OUTREACH

During the 2008 season, 850 individuals signed in at the project site, including 37 students from Sanders Elementary School, which is above average. As usual, visitation was highest during the eleventh annual *Celebration of Flight* event in late September; more than half the guests visited the project site during this time. Most of the guests attended at least one of six live-raptor programs put on by the Texas State Aquarium and one of the talks presented by former Site Coordinator, Joel Simon, HWI Southwest Monitoring Coordinator, Mike Neal, and HWI Development Director, Emile Turner. Visitors came from at least 12 states and 2 foreign countries, with many staying for up to 3–10 days during peak season.

In 2008, 856 hourly assessments by the official observers of visitor disturbance resulted in the following ratings: >94% none, <6% low, and <1% moderate. This is the highest level of visitor disturbance experienced by the official observers since 2001 when we began recording such statistics. The increase reflects the level of excitement and increased visitation stimulated by the new observation platform.

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Table 1. Fall counts and passage rates by species for migrating raptors at Hazel Bazemore Park near Corpus Christi, Texas: 1997–2007 versus 2008.

SPECIES	COUNTS			RAPTORS/100 HOURS		
	1997–2007 ¹	2008	% CHANGE	1997–2007 ¹	2008	% CHANGE
Black Vulture	550 ± 230.4	326	-41	116.2 ± 26.76	65.8	-43
Turkey Vulture	24,156 ± 8414.6	28,530	+18	9661.2 ± 2005.12	10444.0	+8
Unidentified vulture	0.8 ± 1.6	0	-100	–	–	–
TOTAL VULTURES	24,707 ± 8470.4	28,856	+17	–	–	–
Osprey	181 ± 42.5	197	+9	39.1 ± 5.57	39.6	+1
Northern Harrier	202 ± 90.5	219	+8	39.6 ± 9.91	41.2	+4
Hook-billed Kite	0.1 ± 0.2	0	-100	–	–	–
Swallow-tailed Kite	47 ± 29.1	349	+643	16.6 ± 5.80	72.8	+338
White-tailed Kite	4 ± 1.7	14	+258	–	–	–
Mississippi Kite	9,159 ± 4099.8	21,050	+130	3292.4 ± 835.95	7714.7	+134
TOTAL KITES	9,210 ± 4127.1	21,414	+133	–	–	–
Sharp-shinned Hawk	1,211 ± 231.3	1,927	+59	369.4 ± 39.35	521.9	+41
Cooper’s Hawk	797 ± 258.8	1,308	+64	213.7 ± 37.79	317.0	+48
Northern Goshawk	0.6 ± 0.6	0	-100	–	–	–
Unidentified accipiter	272 ± 46.6	264	-3	–	–	–
TOTAL ACCIPITERS	2,281 ± 425.5	3,499	+53	–	–	–
Common Black Hawk	0.1 ± 0.2	0	-100	–	–	–
Harris’ Hawk	16 ± 6.7	18	+15	2.4 ± 0.57	2.5	+8
Red-shouldered Hawk	56 ± 18.0	42	-25	8.5 ± 1.66	6.3	-25
Broad-winged Hawk	675,930 ± 139396.1	370,088	-45	398255.2 ± 51419.00	204178.4	-49
Short-tailed Hawk	0.9 ± 0.8	2	+120	–	–	–
Swainson’s Hawk	5,633 ± 3085.1	26,093	+363	2895.2 ± 942.03	13006.0	+349
White-tailed Hawk	14 ± 7.8	50	+255	2.1 ± 0.66	6.7	+224
Zone-tailed Hawk	5 ± 3.8	11	+105	0.8 ± 0.31	1.2	+48
Red-tailed Hawk	181 ± 50.1	126	-30	28.4 ± 4.48	18.8	-34
Ferruginous Hawk	3 ± 2.5	8	+132	–	–	–
Rough-legged Hawk	0.5 ± 0.7	0	-100	–	–	–
Unidentified buteo	97 ± 61.4	105	+8	–	–	–
TOTAL BUTEOS	681,937 ± 141209.4	396,543	-42	–	–	–
Golden Eagle	1.5 ± 0.6	2	+38	–	–	–
Bald Eagle	3 ± 1.3	10	+279	–	–	–
Unidentified eagle	0.1 ± 0.2	1	+1000	–	–	–
TOTAL EAGLES	4 ± 1.7	13	+211	–	–	–
Crested Caracara	12 ± 4.3	7	-42	1.8 ± 0.38	1.0	-43
American Kestrel	584 ± 171.3	1,127	+93	155.3 ± 26.53	276.8	+78
Merlin	38 ± 10.8	96	+151	9.4 ± 1.63	20.9	+122
Prairie Falcon	9 ± 5.1	8	-12	2.4 ± 0.82	1.6	-35
Peregrine Falcon	176 ± 44.7	205	+17	42.1 ± 5.96	43.1	+2
Aplomado Falcon	0.7 ± 0.7	2	+175	–	–	–
Unknown small falcon	2 ± 1.4	6	+200	–	–	–
Unknown large falcon	2 ± 2.2	4	+76	–	–	–
Unidentified falcon	33 ± 20.4	7	-79	–	–	–
TOTAL FALCONS	845 ± 211.4	1,455	+72	–	–	–
Unidentified raptor	948 ± 941.0	211	-78	–	–	–
GRAND TOTAL	720,326 ± 135512.8	452,414	-37	–	–	–

¹ Mean ± 95% confidence interval.

Table 2. First and last observed, bulk-passage, and median-passage dates by species for migrating raptors at Hazel Bazemore Park near Corpus Christi, Texas in 2008, with a comparison of 2008 and 1997–2007 average median passage dates.

SPECIES	2008				1997–2007	
	FIRST OBSERVED	LAST OBSERVED	BULK PASSAGE DATES ¹	MEDIAN PASSAGE DATE ²	MEDIAN PASSAGE DATE ^{2,3}	
Black Vulture	28-Sep	14-Nov	2-Oct – 30-Oct	19-Oct	28-Oct	± 5.5
Turkey Vulture	6-Sep	15-Nov	13-Oct – 31-Oct	18-Oct	22-Oct	± 3.4
Osprey	7-Aug	7-Nov	13-Sep – 12-Oct	28-Sep	28-Sep	± 1.7
Northern Harrier	9-Aug	15-Nov	16-Sep – 30-Oct	3-Oct	10-Oct	± 5.1
Swallow-tailed Kite	1-Aug	27-Sep	7-Aug – 25-Aug	15-Aug	24-Aug	± 2.6
White-tailed Kite	30-Aug	6-Nov	31-Aug – 25-Oct	17-Oct	03-Oct	± 4.9
Mississippi Kite	2-Aug	9-Oct	20-Aug – 3-Sep	25-Aug	29-Aug	± 3.4
Sharp-shinned Hawk	3-Sep	15-Nov	26-Sep – 17-Oct	2-Oct	08-Oct	± 3.4
Cooper's Hawk	2-Aug	12-Nov	22-Sep – 22-Oct	7-Oct	08-Oct	± 3.4
Harris' Hawk	1-Aug	24-Oct	12-Sep – 21-Oct	29-Sep	04-Oct	± 7.4
Red-shouldered Hawk	31-Aug	8-Nov	5-Sep – 25-Oct	29-Sep	03-Oct	± 7.3
Broad-winged Hawk	2-Aug	12-Nov	18-Sep – 28-Sep	25-Sep	26-Sep	± 1.7
Short-tailed Hawk	20-Aug	21-Oct	–	–	–	–
Swainson's Hawk	3-Aug	11-Nov	7-Oct – 8-Oct	8-Oct	09-Oct	± 3.3
White-tailed Hawk	1-Aug	15-Nov	1-Sep – 1-Nov	5-Oct	02-Oct	± 9.4
Zone-tailed Hawk	2-Aug	25-Oct	2-Aug – 2-Oct	23-Aug	29-Sep	± 5.5
Red-tailed Hawk	3-Aug	15-Nov	19-Sep – 7-Nov	24-Oct	19-Oct	± 6.8
Ferruginous Hawk	2-Oct	21-Oct	2-Oct – 21-Oct	10-Oct	12-Oct	± 11.6
Golden Eagle	26-Oct	27-Oct	–	–	–	–
Bald Eagle	17-Sep	1-Nov	17-Sep – 24-Oct	29-Sep	15-Oct	± 8.8
Crested Caracara	15-Sep	23-Oct	15-Sep – 23-Oct	27-Sep	14-Oct	± 7.6
American Kestrel	16-Aug	6-Nov	16-Sep – 9-Oct	1-Oct	04-Oct	± 2.5
Merlin	9-Aug	13-Nov	18-Sep – 18-Oct	2-Oct	30-Sep	± 3.3
Prairie Falcon	4-Sep	22-Oct	4-Sep – 22-Oct	2-Oct	01-Oct	± 4.6
Peregrine Falcon	3-Aug	10-Nov	17-Sep – 12-Oct	1-Oct	30-Sep	± 1.6
Aplomado Falcon	7-Oct	7-Oct	–	–	–	–
ALL SPECIES	1-Aug	15-Nov	17-Sep – 8-Oct	25-Sep	26-Sep	± 1.7

¹ Dates between which the central 80% of the flight passed the lookout.

² Date by which 50% of the flight had passed the lookout.

³ Mean of annual values ± 95% confidence interval in days; unless otherwise indicated, values are given only for species with annual counts ≥5 birds for ≥3 years.

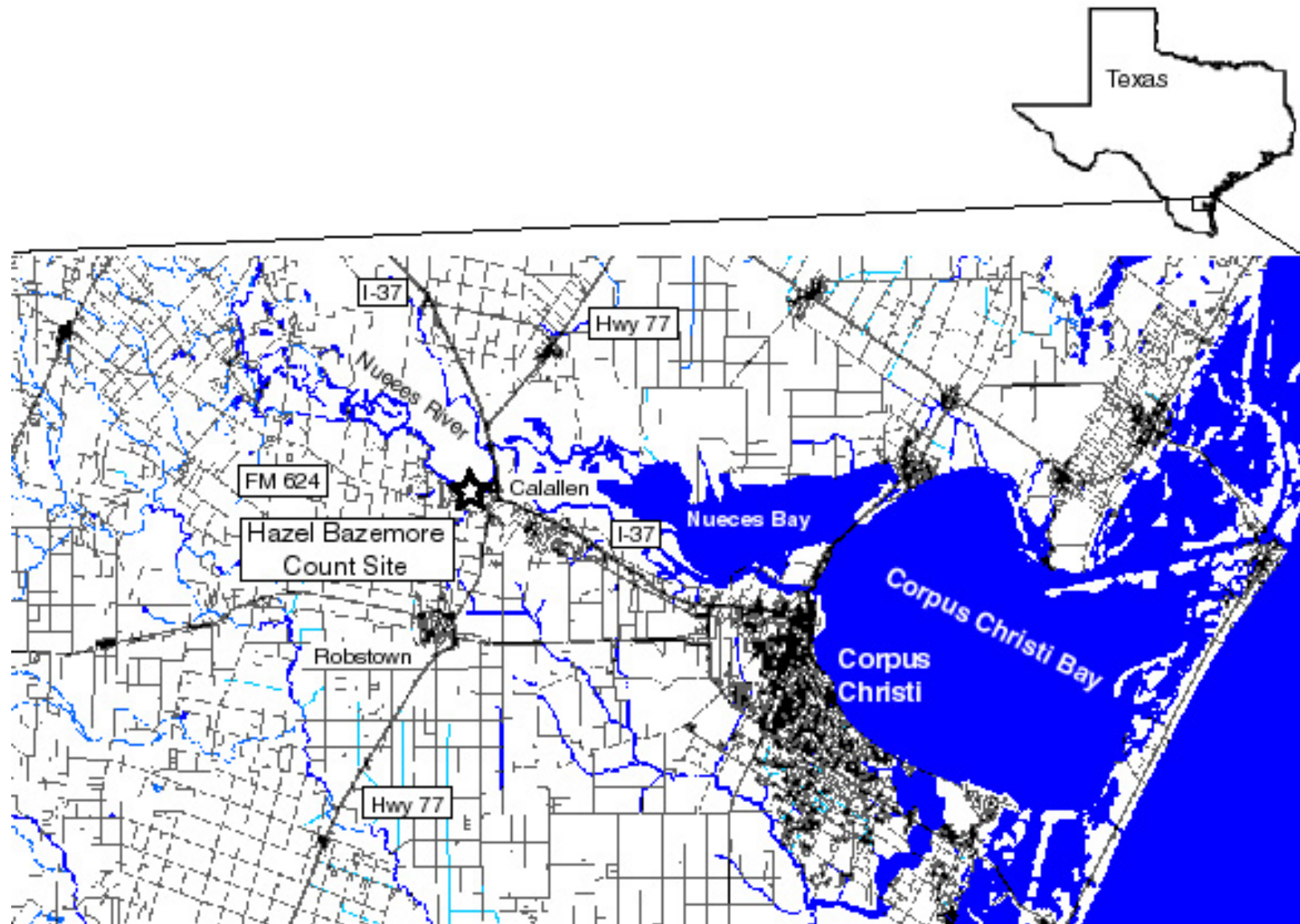


Figure 1. Location of Hazel Bazemore County Park count site near Corpus Christi, Texas.

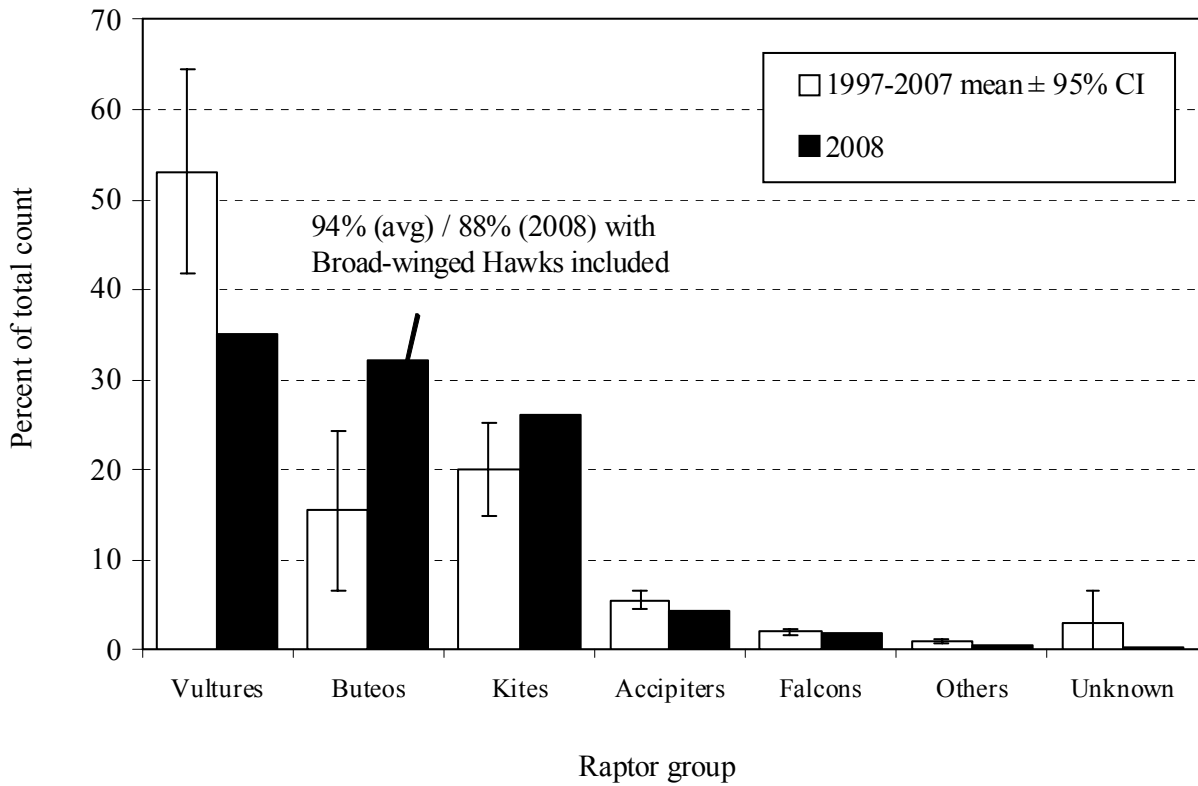


Figure 2. Composition of the fall raptor migration by species groups at Hazel Bazemore Park near Corpus Christi, Texas: 1997–2007 versus 2008.

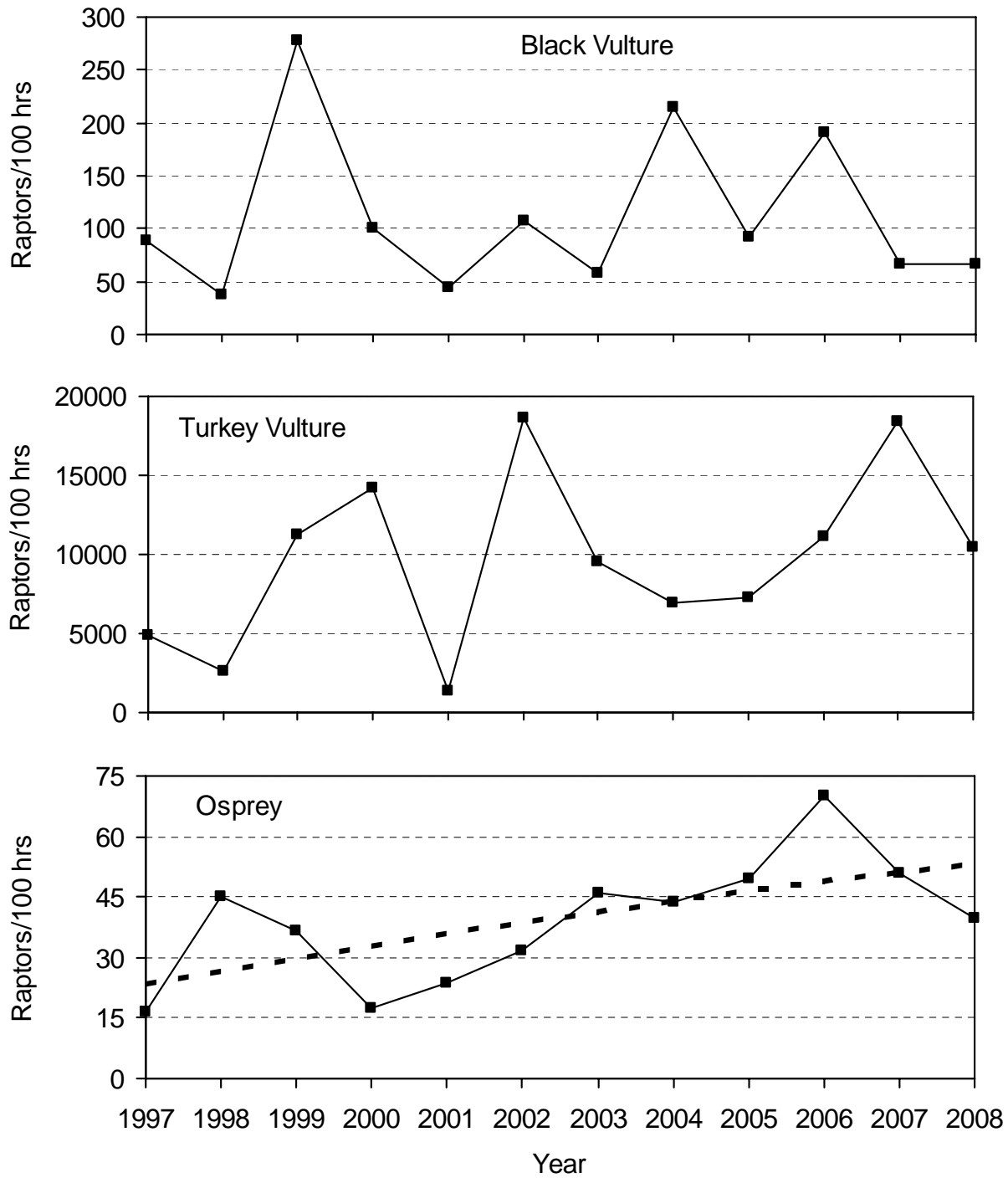


Figure 3. Adjusted fall-migration passage rates at Hazel Bazemore Park near Corpus Christi, Texas for Black Vultures, Turkey Vultures, and Ospreys: 1997–2008. Dashed lines indicate significant ($P \leq 0.10$) linear or quadratic regressions.

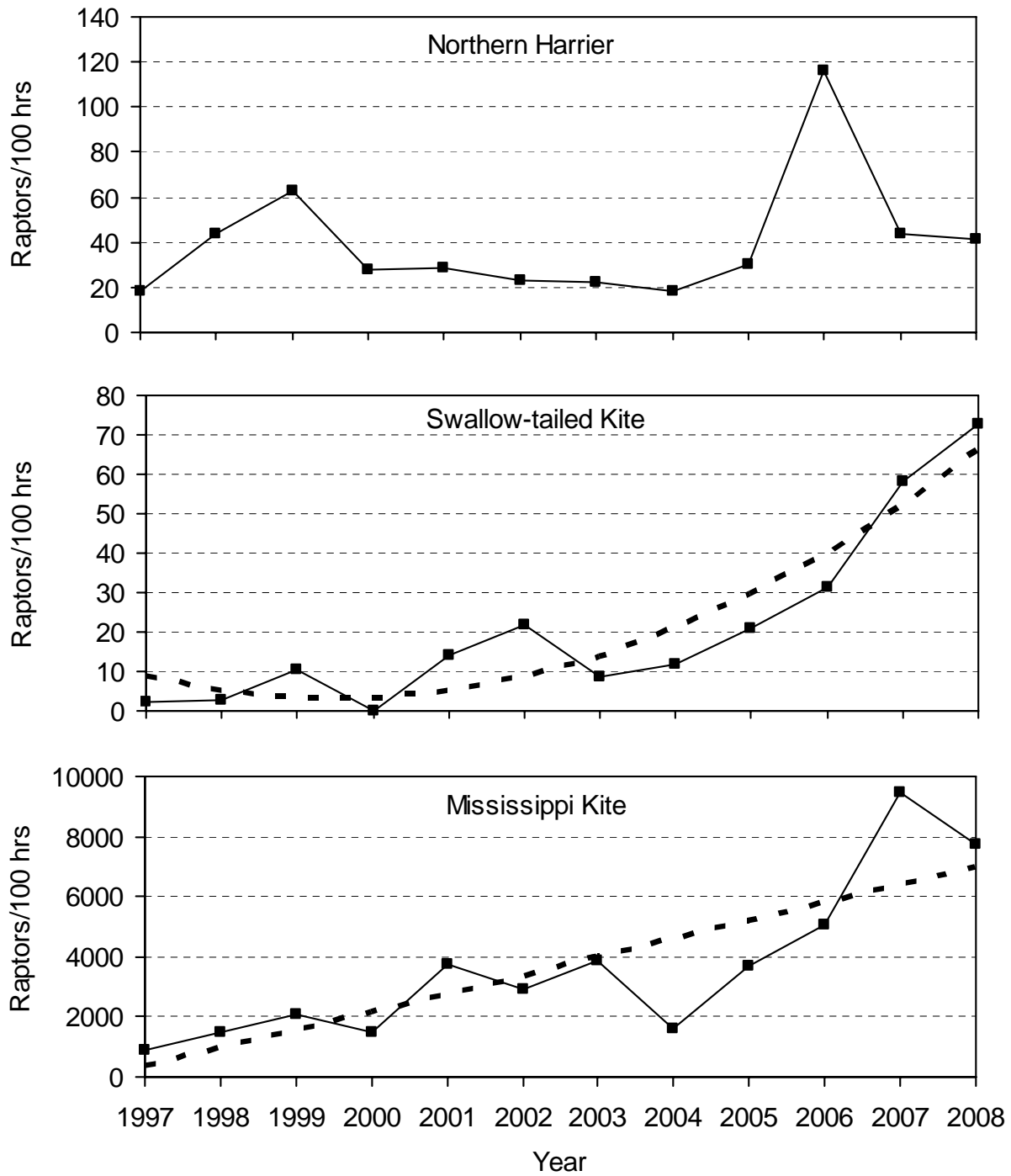


Figure 4. Adjusted fall-migration passage rates at Hazel Bazemore Park near Corpus Christi, Texas for Northern Harriers, Swallow-tailed Kites, and Mississippi Kites: 1997–2008. Dashed lines indicate significant ($P \leq 0.10$) linear or quadratic regressions.

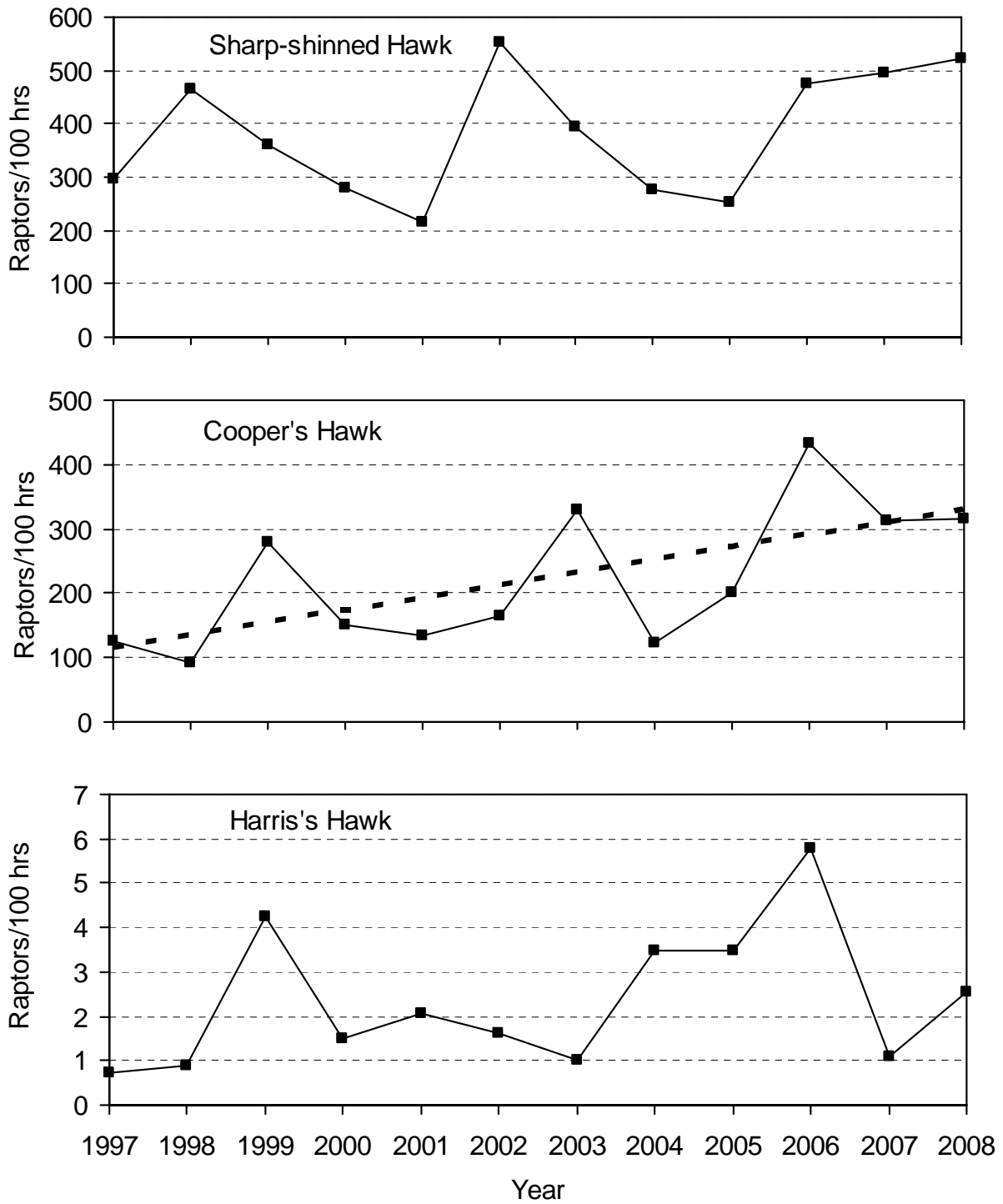


Figure 5. Adjusted fall-migration passage rates at Hazel Bazemore Park near Corpus Christi, Texas for Sharp-shinned, Cooper's, and Harris's Hawks: 1997–2008. Dashed lines indicate significant ($P \leq 0.10$) linear or quadratic regressions.

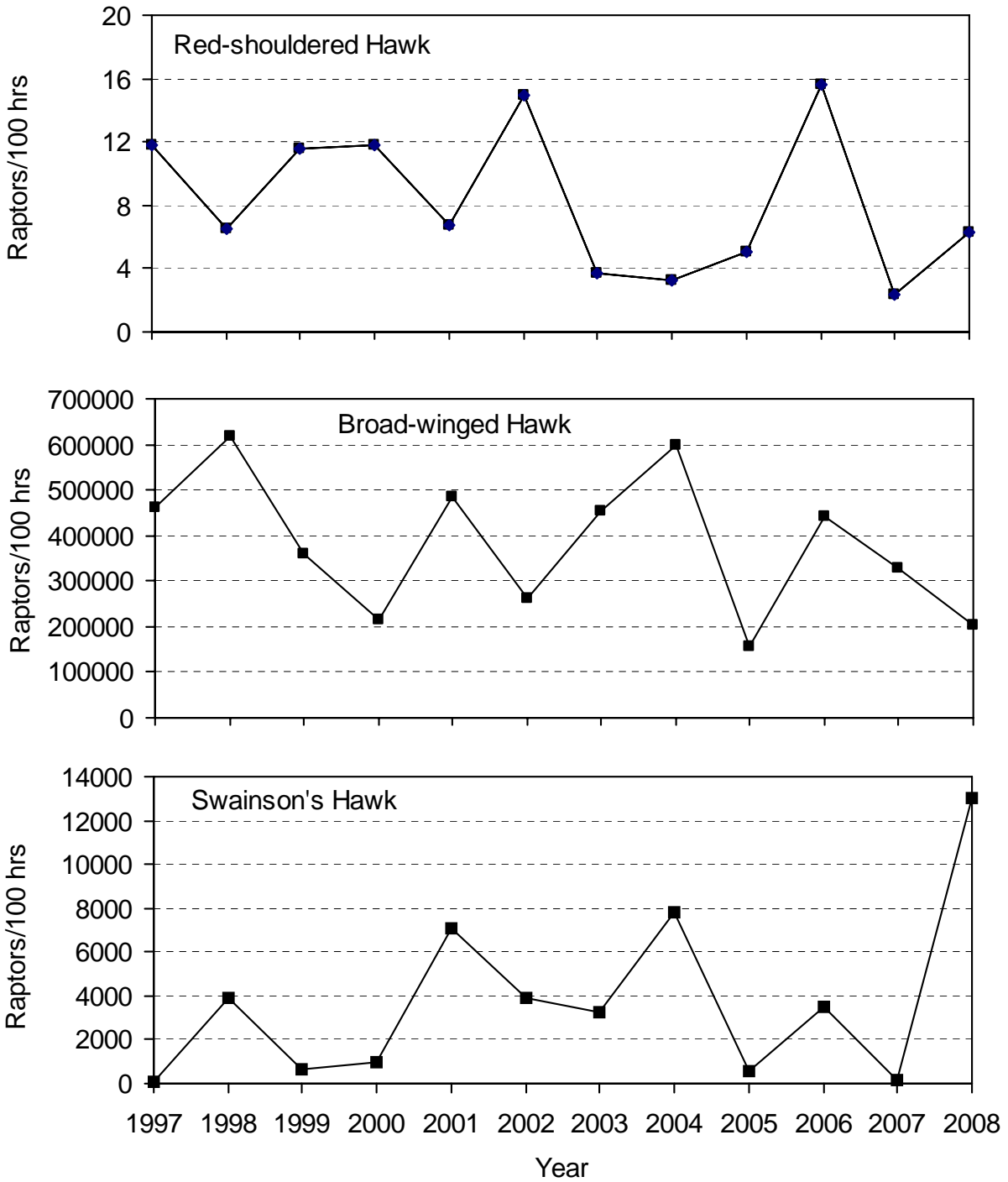


Figure 6. Adjusted fall-migration passage rates at Hazel Bazemore Park near Corpus Christi, Texas for Red-shouldered, Broad-winged, and Swainson's Hawks: 1997–2008. Dashed lines indicate significant ($P \leq 0.10$) linear or quadratic regressions.

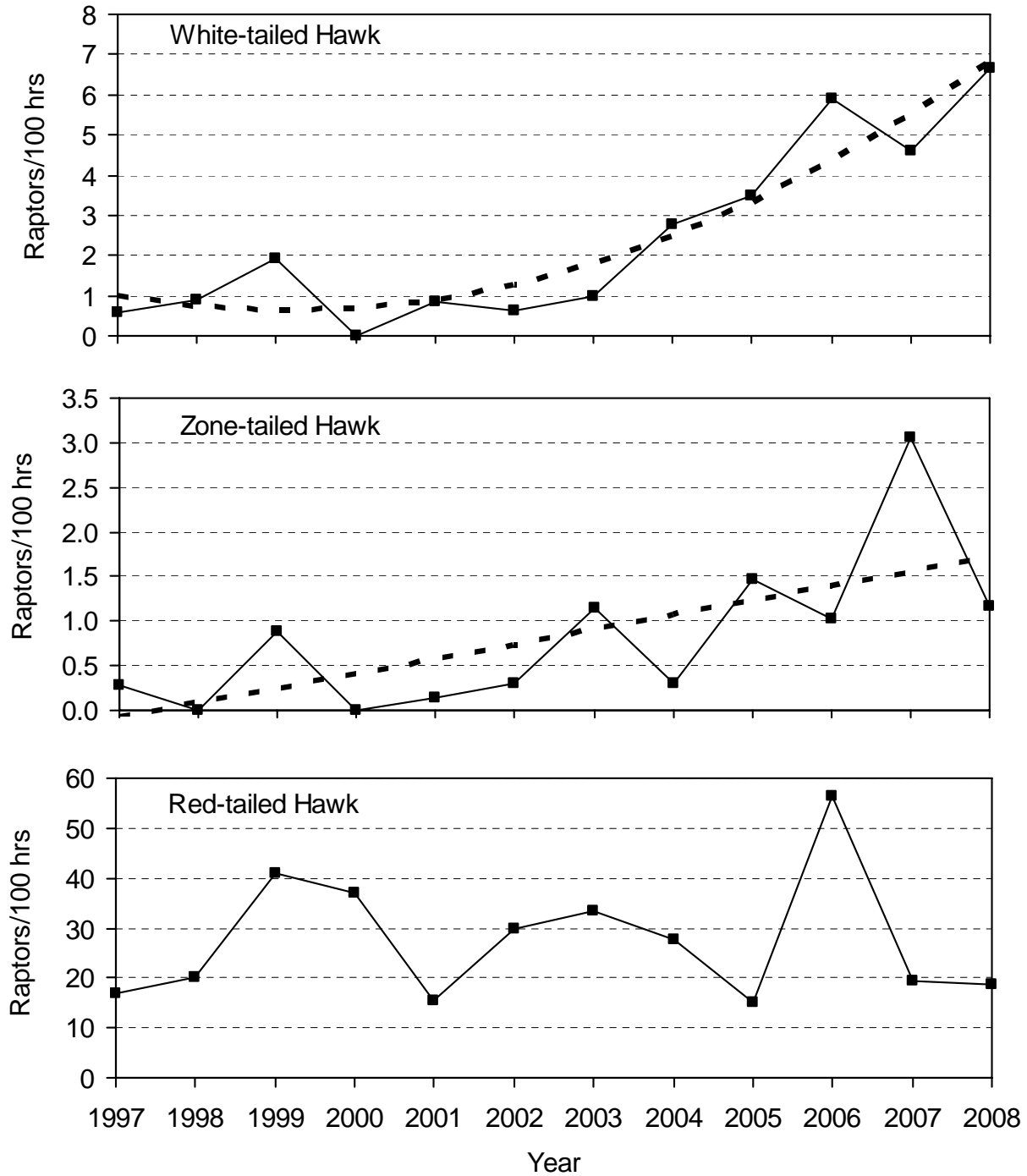


Figure 7. Adjusted fall-migration passage rates at Hazel Bazemore Park near Corpus Christi, Texas for White-tailed, Zone-tailed, and Red-tailed and Hawks: 1997–2008. Dashed lines indicate significant ($P \leq 0.10$) linear or quadratic regressions.

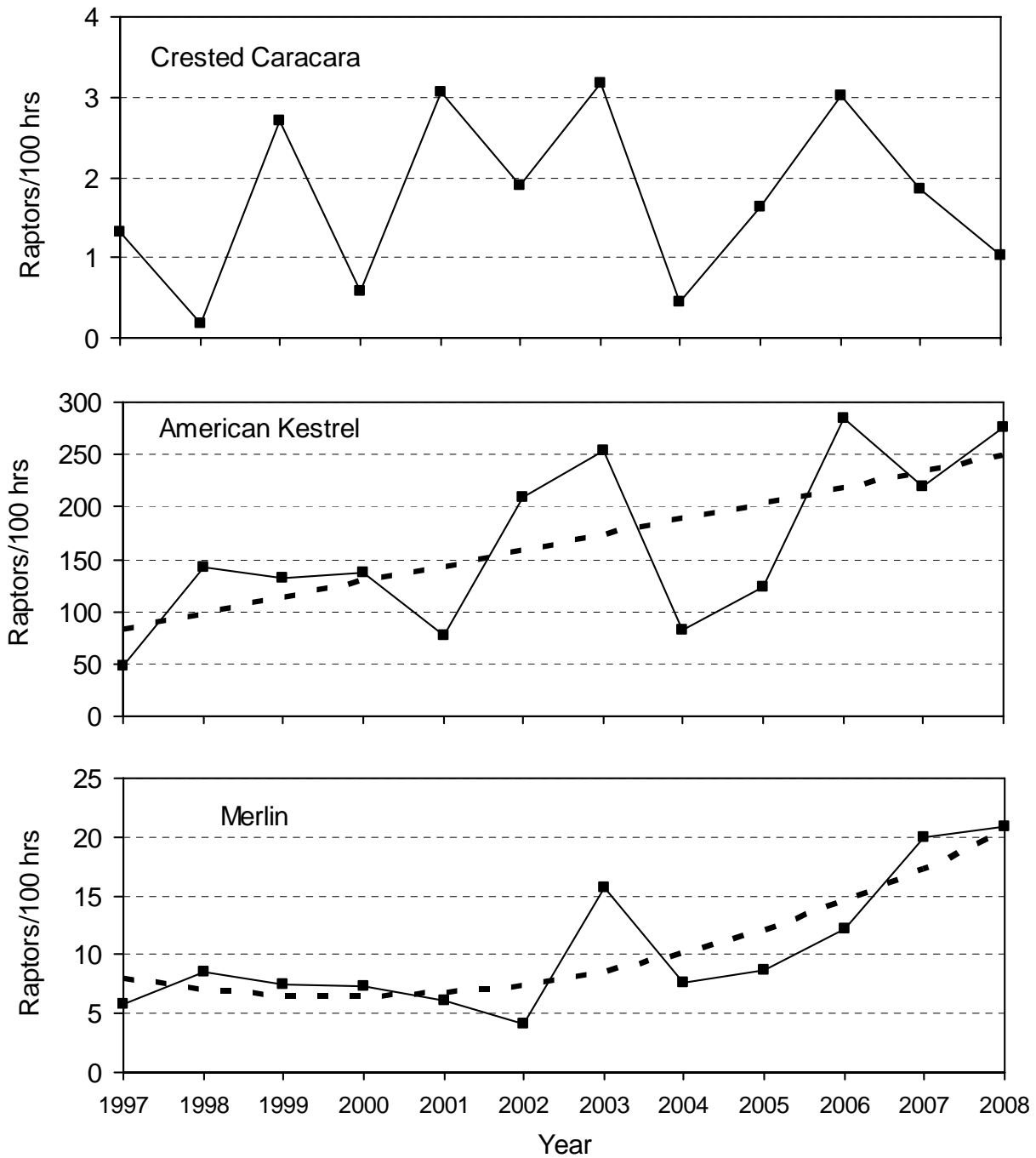


Figure 8. Adjusted fall-migration passage rates at Hazel Bazemore Park near Corpus Christi, Texas for Crested Caracaras, American Kestrels, and Merlins: 1997–2008. Dashed lines indicate significant ($P \leq 0.10$) linear or quadratic regressions.

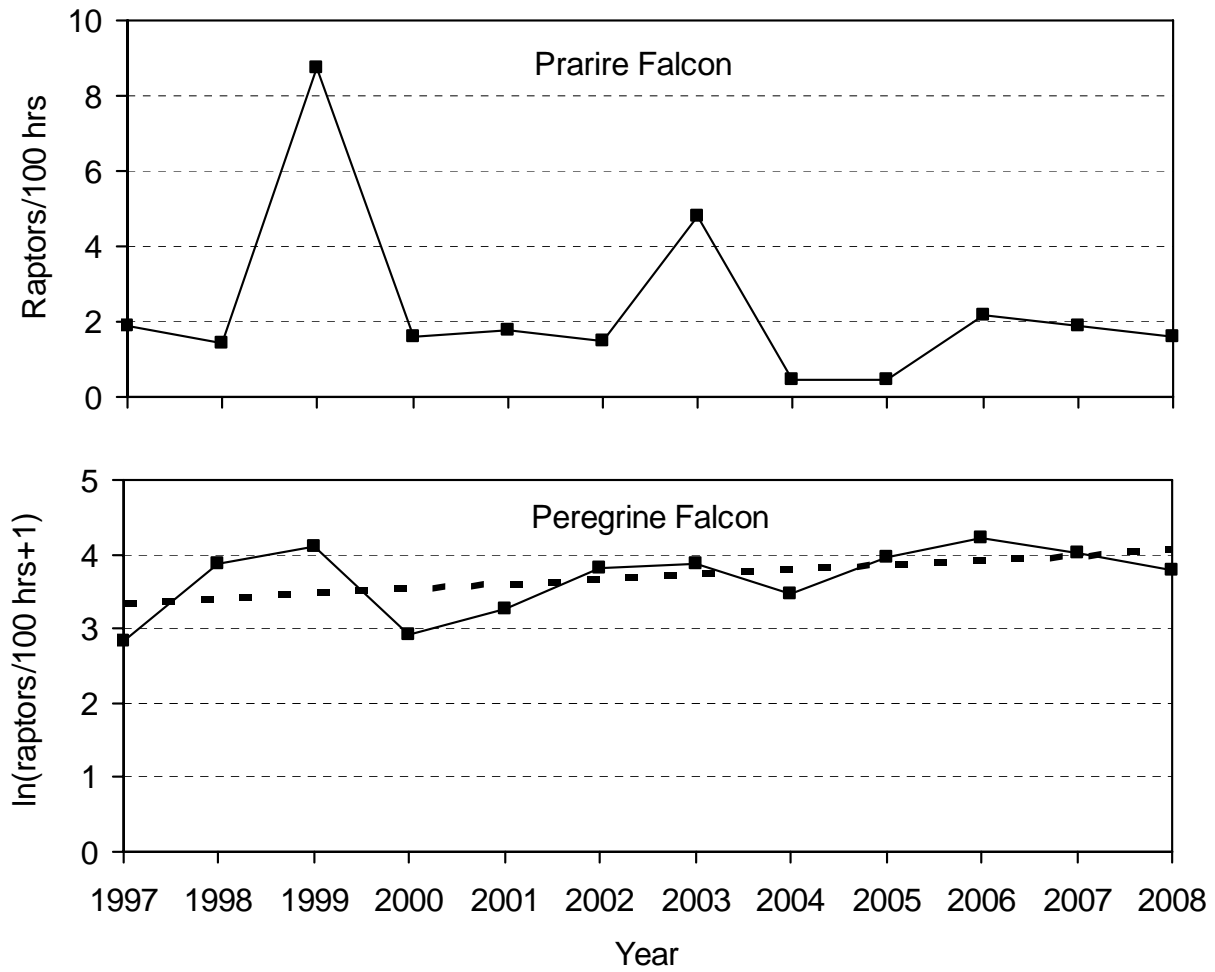


Figure 9. Adjusted fall-migration passage rates at Hazel Bazemore Park near Corpus Christi, Texas for Prairie and Peregrine Falcons: 1997–2008. Dashed lines indicate significant ($P \leq 0.10$) linear or quadratic regressions.

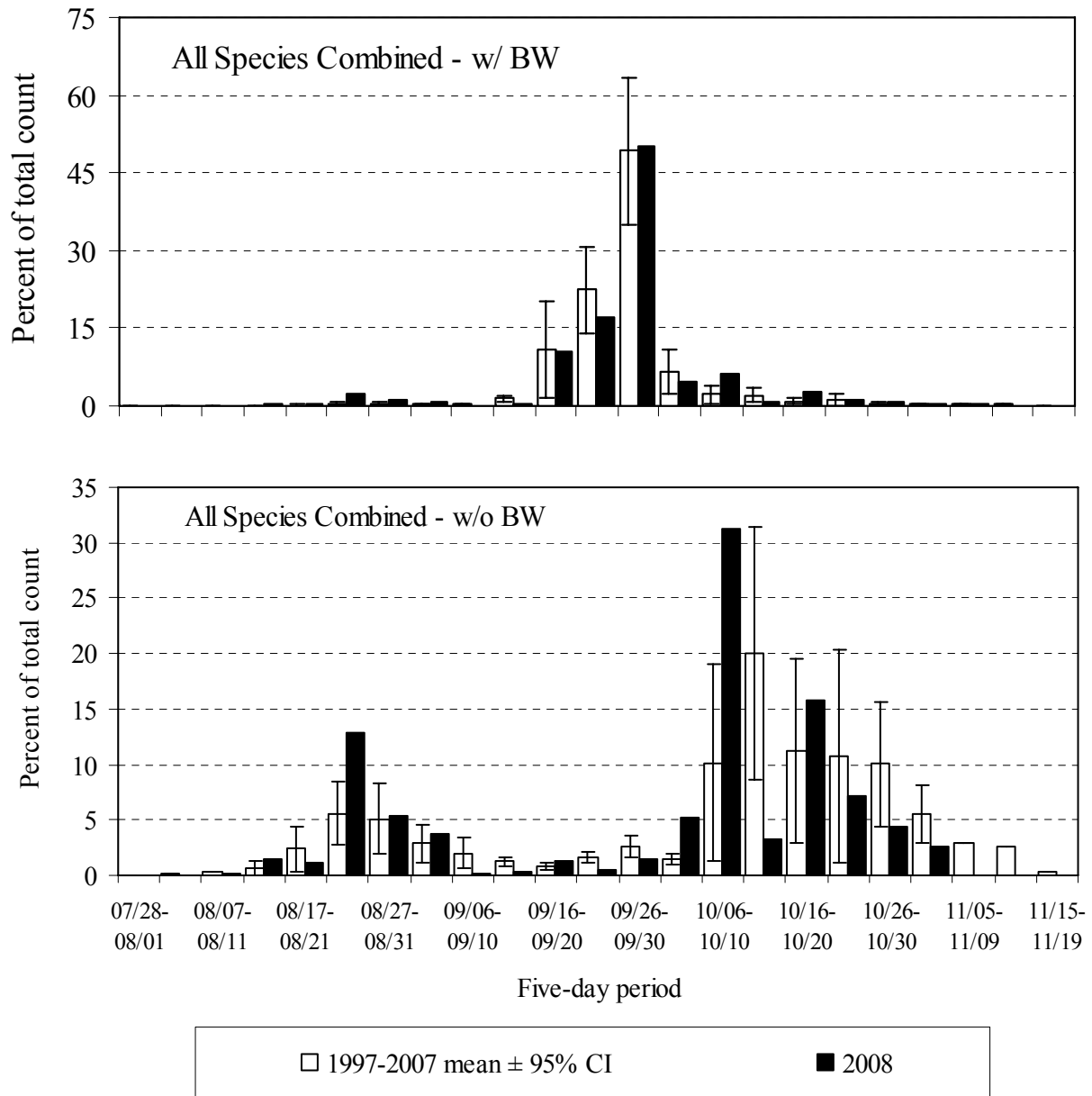


Figure 10. Combined-species flight volume by five-day periods, with and without Broad-wing Hawks, for the fall raptor migration at Hazel Bazemore Park near Corpus Christi, Texas: 1997–2007 versus 2008.

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

Common Name	Scientific Name	Species Code	Age ¹	Sex ²	Color Morph ³
Black Vulture	<i>Coragyps atratus</i>	BV	U	U	NA
Turkey Vulture	<i>Cathartes aura</i>	TV	U	U	NA
Unknown vulture	see above	UV	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
Hook-billed Kite	<i>Chondrohierax uncinatus</i>	HK	A I U	AM AF U	D L U
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	see above	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
Northern Goshawk	<i>Accipiter gentilis</i>	NG	A I U	U	NA
Unknown accipiter	<i>Accipiter</i> spp.	UA	U	U	NA
Common Black Hawk	<i>Buteogallus anthracinus</i>	CB	A I U	U	NA
Harris's 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
Short-tailed Hawk	<i>Buteo brachyurus</i>	ST	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
Zone-tailed Hawk	<i>Buteo albonotatus</i>	ZT	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
Aplomado Falcon	<i>Falco femoralis</i>	AF	A I 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. History of official observer participation in the Corpus Christi Raptor Migration Project: 1997–2008.

1997: Two observers throughout: Glenn Swartz (6 partial at this site) and Joel Simon (0), regularly assisted by several other dedicated volunteers.

1998: Two observers throughout: Glenn Swartz (1 plus 6 partial at this site) and Joel Simon (1), regularly assisted by several other dedicated volunteers.

1999: Three observers throughout: Joel Simon (2), Fernando Rincon (1), and Ryan Wagner (0), regularly assisted by several other dedicated volunteers.

2000: Rotating team working two at a time except during peak Broad-winged Hawk flight when all three worked together: Scott Rush (2), Beth Hahn (1), and Jo Creglow (several partial at this site), regularly assisted by several other dedicated volunteers.

2001: Rotating team working two at a time except during the peak Broad-winged Hawk flight when all three worked together: Greg Greene (limited experience in Idaho), Devin Taylor (0), and Karen Johnson (0), regularly assisted by several other dedicated volunteers.

2002: Rotating team working two at a time except during the peak Broad-winged Hawk flight when all three worked together: Joel Simon (3), Vicki Simon (regular volunteer on project since 1997), Kirsten McDonnell (2), Paul Sweet (0), regularly assisted by several other dedicated volunteers.

2003: Rotating team working two at a time except during the peak Broad-winged Hawk flight when all three worked together: Joel Simon (4), Ricardo Perez (0, but relevant experience in PA and El Salvador), Taylor Ellis (0, but relevant experience in FL), regularly assisted by several other dedicated volunteers.

2004: Rotating team working two at a time except during the peak Broad-winged Hawk flight when all three worked together: Joel Simon (5), Dane Ferrell (2), Scott Loss (1), regularly assisted by several other dedicated volunteers.

2005: Rotating team working two at a time except during the peak Broad-winged Hawk flight when all three worked together: Joel Simon (6), Dane Ferrell (4), Brian Bielfelt (1), regularly assisted by several other dedicated volunteers.

2006: Rotating team working two at a time except during the peak Broad-winged Hawk flight when all three worked together: Joel Simon (7), Dane Ferrell (5), Libby Even (1), regularly assisted by several other dedicated volunteers.

2007: Rotating team working two at a time except during the peak Broad-winged Hawk flight when all three worked together: Joel Simon (8), Dane Ferrell (6), Libby Even (2), regularly assisted by several other dedicated volunteers.

2008: Three-person team working two at a time throughout the season, plus two additional full-time counters from mid-September through mid-October: Full-season—Dane Ferrell (7), Leslie Parks (0), Libby Even (2+); peak-season—Kevin Georg (2+), Bob Baez (0); regularly assisted by other dedicated, local volunteers, especially Joel Simon (9) and Bob Creglow (10+).

¹ Numbers in parentheses indicate the number of previous full-seasons of experience counting migratory raptors.

Appendix C. Daily observation effort, visitor disturbance ratings, and predominant weather conditions during the fall raptor migration at Hazel Bazemore Park near Corpus Christi, TX: 2008.

DATE	OBS. HOURS	NUMBER OBSRVRS ¹	VISITOR DISTURB ²	SKY CONDITION ³	WIND SPEED (KPH) ¹	WIND DIRECTION	TEMP. (°C) ¹	BARO. PRESS. (IN HG) ¹	MEDIAN THERMAL LIFT ⁴	VISIB. EAST (KM) ¹	VISIB. WEST (KM) ¹	FLIGHT DIST. ⁵	RAPTORS / HOUR
01-Aug	8.00	6.3	0	mc-ovc, haze	7.6	sse	34.9	29.84	2	9	9	3	1.0
02-Aug	8.00	5.8	0	pc-ovc	4.7	s	33.9	29.87	1	10	10	3	1.3
03-Aug	8.00	4.4	0	clr-pc	3.0	s	35.4	29.87	1	8	10	3	2.6
04-Aug	8.00	2.9	0	pc	2.2	s	34.8	29.86	1	7	9	3	1.9
05-Aug	8.00	3.4	0	clr-mc	3.0	ssw	35.3	29.84	1	6	10	3	0.4
06-Aug	8.00	2.4	0	mc-ovc, AM haze	6.8	sw, ssw	33.7	29.92	3	8	8	2	0.5
07-Aug	8.00	4.9	0	pc-mc, AM haze	7.3	ssw	34.3	29.92	1	9	11	3	3.4
08-Aug	8.00	4.7	0	pc	6.6	ne-se, ssw	33.9	29.86	1	15	17	3	5.3
09-Aug	8.00	4.3	0	clr-pc, haze	4.6	sse, s	35.6	29.85	2	10	12	3	4.0
10-Aug	8.00	3.4	0	pc-mc, haze	8.6	s	34.2	29.77	2	8	10	2	4.9
11-Aug	7.00	3.1	0	ovc, haze	8.9	s	34.0	29.76	3	3	4	-	0.0
12-Aug	8.00	3.3	0	ovc, haze	4.1	e, sse	35.6	29.82	3	4	7	3	3.1
13-Aug	7.50	2.1	0	ovc, haze, PM scat ts/rain	2.2	calm/s	34.3	29.80	3	4	5	2	21.1
14-Aug	8.00	3.8	0	pc-ovc, haze, AM fog	3.9	sse	35.2	29.91	3	5	6	3	71.8
15-Aug	8.00	4.4	0	mc-ovc, haze	6.0	ssw	34.8	29.93	2	5	6	3	58.6
16-Aug	8.00	7.0	0	ovc, haze, AM scat rain	5.3	calm/var	32.9	29.96	3	5	8	2	95.8
17-Aug	5.00	7.2	0	ovc, haze	2.7	ese-e	32.2	29.94	3	7	7	2	1.8
18-Aug	4.50	2.2	0	ovc, haze, PM scat rain	4.9	se-s	31.1	29.88	4	3	3	3	8.4
19-Aug	2.00	6.0	0	mc-ovc, haze	2.3	ssw	30.3	29.84	2	7	6	2	3.0
20-Aug	7.75	3.3	0	mc-ovc, haze, AM fog	1.9	calm, ssw	33.3	29.87	3	4	5	2	24.5
21-Aug	8.00	3.9	0	clr-ovc, haze	7.0	sse	33.1	29.92	4	5	7	3	74.1
22-Aug	2.50	2.5	0	ovc, haze, scat rain	4.0	calm, e-s	30.8	29.99	4	3	4	-	0.0
23-Aug	8.00	5.0	0	ovc, haze	2.8	calm, ne-ese	32.4	30.00	3	7	7	3	10.8
24-Aug	8.50	5.8	0	ovc, AM haze, PM scat rain	2.6	calm/var	31.8	29.96	3	7	9	3	557.3
25-Aug	8.50	5.1	0	pc-mc, AM haze	3.4	calm/var	33.1	29.89	1	11	13	3	613.2
26-Aug	8.00	2.7	0	clr-pc, AM haze	2.0	calm/var	33.8	29.89	1	12	12	3	174.6
27-Aug	9.00	2.4	0	mc-ovc, haze	5.3	se-s	34.1	29.89	2	7	8	2	49.2
28-Aug	8.25	3.1	0	pc-mc, AM haze	6.1	se	33.2	29.88	1	11	13	3	112.2
29-Aug	8.00	2.4	0	ovc, AM haze	5.0	ne-se	31.8	29.93	3	10	10	2	198.6
30-Aug	8.50	3.7	0	pc-mc, haze, AM fog	4.9	ne-se	32.9	29.95	1	7	9	3	10.6
31-Aug	8.00	3.8	0	clr-pc, haze, AM fog	1.8	calm/var	32.9	29.91	1	4	5	3	24.1
01-Sep	8.00	4.4	1	clr-mc, haze	4.8	nw	32.2	29.78	2	5	5	2	119.9
02-Sep	8.00	2.8	0	clr-pc, AM haze	0.6	calm, nw	34.8	29.78	1	8	9	3	31.3
03-Sep	9.00	3.7	0	clr-pc, AM haze	1.8	w-nw	34.1	29.79	1	10	11	3	163.0
04-Sep	8.00	3.4	0	clr, AM haze	1.4	n-ne	32.7	29.85	2	16	17	3	50.5
05-Sep	8.00	3.4	0	clr-pc, AM haze	1.7	n-ne, s	32.9	29.89	1	14	15	3	18.5
06-Sep	8.00	4.4	0	clr-mc, AM haze	3.1	ne-e	28.6	29.97	2	10	11	2	8.8
07-Sep	8.00	3.2	0	pc-ovc, haze	2.6	calm/var	31.1	30.01	3	6	7	3	12.6
08-Sep	8.00	2.7	0	pc-mc	2.2	e	32.4	29.96	1	13	14	3	4.3
09-Sep	5.75	2.0	0	pc-ovc, haze, PM scat rain	2.9	n-ese	31.1	29.96	4	6	5	2	0.9
10-Sep	7.00	2.1	0	pc, AM haze	2.3	n-e	33.9	29.80	1	7	7	3	3.9
11-Sep	2.50	3.7	0	pc-mc, haze	0.8	e	32.0	29.90	3	5	7	3	10.8
12-Sep	8.50	5.2	0	ovc, haze	4.4	var	34.2	29.64	2	9	12	3	162.2
13-Sep	7.50	4.4	0	mc, haze	1.8	ssw	36.8	29.63	2	9	11	3	23.3
14-Sep	5.50	5.2	0	mc-ovc, PM rain	4.0	n-e	31.8	29.87	3	8	10	3	38.0
15-Sep	9.00	3.8	0	mc-ovc, AM haze	4.1	n	28.0	30.13	4	8	9	3	253.1
16-Sep	9.50	6.4	0	ovc	3.7	n-ne	26.1	30.20	2	12	12	2	936.5
17-Sep	9.50	6.1	0	pc-mc, AM haze	2.0	n-e	27.6	30.15	2	12	12	4	1883.2
18-Sep	9.50	7.9	0	ovc, AM fog, PM haze	1.9	n-ne	26.4	30.12	3	3	4	3	1343.7
19-Sep	9.00	6.1	1	clr, haze	5.2	n-ne	29.2	30.06	2	6	7	3	573.7
20-Sep	9.00	7.0	1	clr-pc, haze	4.8	n-e	30.2	30.03	2	7	8	4	2572.1
21-Sep	8.00	7.5	0	clr-pc, haze	6.7	e	30.7	30.06	1	10	12	4	2418.8
22-Sep	9.50	6.6	0	pc-mc, haze	5.8	nne, ene-ese	31.8	30.09	2	9	10	4	481.1
23-Sep	8.00	9.2	0	ovc, AM haze/rain	2.9	e-ese	28.2	30.06	4	7	8	4	501.6
24-Sep	8.00	10.9	0	ovc, AM fog/haze	5.8	ene	30.1	30.07	3	8	9	3	3225.9
25-Sep	9.50	17.1	0	pc-mc, AM haze	3.5	n-ne, se	30.5	30.10	1	11	11	3	9103.9
26-Sep	10.00	16.3	0	clr-ovc, haze	2.5	n	29.0	30.05	1	4	4	3	4356.0
27-Sep	9.50	19.1	0	pc, AM haze	1.6	n-e	30.3	30.01	1	9	10	3	6720.1
28-Sep	9.75	17.2	1	pc-ovc	1.6	n, s	30.3	30.05	2	11	11	3	2939.2
29-Sep	8.50	12.3	0	clr, AM fog	2.8	n-ne, nw	29.4	30.06	1	7	9	3	561.8
30-Sep	9.75	10.2	0	clr, haze	1.0	n	31.2	30.07	1	7	8	3	545.8

Appendix C. continued

DATE	OBS. HOURS	NUMBER OBSRVRS ¹	VISITOR DISTURB ²	SKY CONDITION ³	WIND SPEED (KPH) ¹	WIND DIRECTION	TEMP. (°C) ¹	BARO. PRESS. (IN HG) ¹	MEDIAN THERMAL LIFT ⁴	VISIB. EAST (KM) ¹	VISIB. WEST (KM) ¹	FLIGHT DIST. ⁵	RAPTORS / HOUR
01-Oct	9.00	8.5	0	clr, haze	3.9	n-e	30.1	30.02	2	7	8	3	991.1
02-Oct	8.25	8.2	0	clr, AM haze	3.1	n-e, se	30.4	29.98	1	10	12	3	505.7
03-Oct	8.00	9.0	0	clr, AM haze	5.6	calm/var	30.8	29.98	1	10	11	3	378.9
04-Oct	8.00	6.3	0	mc-ovc, haze	5.2	calm/var	30.6	30.02	2	10	13	2	34.5
05-Oct	8.00	5.3	0	pc-mc, haze	6.8	e-sse	31.2	29.96	3	10	11	3	18.1
06-Oct	8.00	4.8	0	pc-ovc, AM haze	3.4	calm, sse-s	32.3	29.87	1	9	11	3	23.6
07-Oct	10.00	6.4	0	clr-ovc, haze	6.4	var	30.7	30.00	2	8	8	3	1031.0
08-Oct	9.00	4.7	0	clr-pc	1.3	n-e	28.4	30.05	2	14	15	3	1778.7
09-Oct	8.25	7.2	0	pc-mc	2.0	n-ne	27.6	29.98	1	13	13	2	112.7
10-Oct	8.00	4.7	0	clr-pc, haze	2.4	calm, se	29.4	29.93	1	11	13	3	30.5
11-Oct	6.25	4.9	0	pc-ovc, haze	4.6	e	29.2	29.97	3	4	6	2	26.1
12-Oct	8.00	6.9	0	mc-ovc, haze	5.4	e-ese	30.6	29.94	3	5	6	2	59.3
13-Oct	5.00	4.8	0	clr-ovc, AM haze	5.5	calm/var	31.2	29.99	4	6	5	2	189.2
14-Oct	8.00	4.6	0	clr-mc, AM haze	4.9	calm/var	30.4	30.00	2	10	11	3	104.5
15-Oct	6.25	5.4	0	ovc, ts/rain	0.5	calm	29.6	30.00	4	6	7	3	9.0
16-Oct	7.50	5.0	0	ovc, fog, PM scat rain	6.4	ne, nnw	20.4	30.17	4	4	4	2	125.9
17-Oct	9.00	5.1	0	clr-pc, AM haze	4.7	n	25.4	30.16	2	9	10	3	733.4
18-Oct	8.00	6.4	0	clr, AM haze	5.4	n-ne	25.3	30.22	1	10	11	3	548.1
19-Oct	8.00	4.7	0	clr-pc, haze, AM fog	3.0	calm, e	26.7	30.19	2	8	10	2	130.5
20-Oct	8.00	4.8	0	clr-pc, AM haze	2.6	calm, e	27.1	30.17	1	10	10	3	80.9
21-Oct	8.00	6.1	0	clr-mc, haze, AM fog	3.1	ne-e	27.6	30.10	2	8	6	2	79.3
22-Oct	8.00	7.4	0	clr-pc, AM haze	2.4	calm, e, s	28.4	29.96	1	9	9	3	153.1
23-Oct	8.00	4.1	0	clr-ovc	6.8	n	20.8	30.19	2	14	13	2	182.9
24-Oct	7.50	5.6	0	clr-pc	1.3	calm, ne	25.6	30.07	1	12	13	3	256.0
25-Oct	7.50	2.5	0	pc-mc, haze	2.4	calm, ne-e	28.6	30.06	2	10	13	3	78.4
26-Oct	7.50	4.7	0	clr-mc, haze	5.4	e-se	30.1	30.07	3	9	12	2	56.9
27-Oct	7.50	3.7	0	clr-pc	9.8	n	23.0	30.52	4	11	19	3	256.0
28-Oct	7.50	3.8	0	clr, haze	3.9	ne	20.3	30.53	4	12	13	3	70.9
29-Oct	7.50	3.5	0	clr	6.0	ne-e, sse	24.6	30.32	2	14	15	2	15.3
30-Oct	7.50	3.3	0	mc	4.9	calm, e-se	26.8	30.32	2	11	10	2	37.3
31-Oct	7.50	3.7	0	clr-pc	3.5	calm, ene-e	27.0	30.36	2	12	13	3	79.7
01-Nov	7.00	3.4	0	pc-mc, AM fog	3.1	nne, se	26.6	30.29	2	10	10	2	118.3
02-Nov	7.00	3.9	0	clr-pc, haze, AM fog	2.6	calm, e	26.5	30.18	3	10	12	3	43.0
03-Nov	7.50	2.8	0	pc-ovc	3.0	calm, e-s	26.0	30.08	4	10	11	3	23.9
04-Nov	7.50	3.3	0	mc-ovc	8.8	se	29.0	30.01	3	9	11	2	14.1
05-Nov	7.00	2.9	0	mc	8.8	sse	29.8	29.87	4	12	12	-	0.0
06-Nov	7.50	3.7	0	ovc, PM haze	2.0	calm/var	27.3	29.95	4	4	5	2	24.1
07-Nov	7.50	2.7	0	mc-ovc	8.3	ne	24.4	30.05	3	8	11	2	45.1
08-Nov	7.50	4.9	0	clr, haze	1.3	calm, e	24.9	30.08	2	11	13	3	68.8
09-Nov	7.50	3.9	0	pc-ovc	8.1	e	25.4	29.99	4	13	13	3	10.0
10-Nov	7.50	3.1	0	ovc, AM fog/rain	10.5	sse-s	29.4	29.84	4	4	4	2	0.3
11-Nov	7.00	2.7	0	ovc, haze, AM fog	10.9	sse-s	30.0	29.87	4	3	4	2	0.4
12-Nov	7.50	3.4	0	pc-ovc, AM fog/haze	3.9	calm/var	27.8	29.85	3	8	8	3	2.4
13-Nov	6.17	2.9	0	mc-ovc, AM haze, PM scat ts	3.3	calm/var	22.9	29.90	4	8	8	2	0.2
14-Nov	7.50	2.6	0	pc-ovc, AM fog	3.6	sse-s	26.1	29.79	2	9	9	2	2.7
15-Nov	7.50	7.6	0	clr	11.5	ne, nw	18.9	30.39	4	15	16	2	45.6

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 fall raptor migration counts by species at Hazel Bazemore Park near Corpus Christi, Texas: 2008.

DATE	HOURS																													BIRDS														
	OBSERV.	BV	TV	UV	OS	NH	HK	SK	WK	MK	UK	SS	CH	NG	UA	HH	RS	BW	SW	WT	ZT	ST	CB	RT	FH	RL	UB	GE	BE	UE	CC	AK	ML	PR	PG	AF	SF	LF	UF	UU	TOTAL	/ HOUR		
01-Aug	8.00	0	0	0	0	0	0	6	0	0	0	0	0	0	0	1	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	0	8	1.0
02-Aug	8.00	0	0	0	0	0	0	3	0	2	0	0	1	0	0	0	0	1	0	0	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	1.3
03-Aug	8.00	0	0	0	0	0	0	2	0	13	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	21	2.6
04-Aug	8.00	0	0	0	0	0	0	7	0	7	0	0	1	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	15	1.9	
05-Aug	8.00	0	0	0	0	0	0	0	0	3	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	3	0.4	
06-Aug	8.00	0	0	0	0	0	0	2	0	0	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	4	0.5	
07-Aug	8.00	0	0	0	1	0	0	21	0	4	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	0	0	0	0	0	0	27	3.4	
08-Aug	8.00	0	0	0	0	0	0	22	0	15	0	0	2	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	0	0	42	5.3	
09-Aug	8.00	0	0	0	1	1	0	14	0	12	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	32	4.0	
10-Aug	8.00	0	0	0	0	0	0	29	0	6	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	4.9	
11-Aug	7.00	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	0	0	0	0	0	0	0.0	
12-Aug	8.00	0	0	0	1	0	0	16	0	6	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	3.1	
13-Aug	7.50	0	0	0	0	0	0	5	0	150	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	158	21.1		
14-Aug	8.00	0	0	0	0	0	0	30	0	544	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	574	71.8		
15-Aug	8.00	0	0	0	0	0	0	48	0	418	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	469	58.6		
16-Aug	8.00	0	0	0	0	0	0	12	0	751	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	766	95.8		
17-Aug	5.00	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9	1.8		
18-Aug	4.50	0	0	0	0	0	0	0	0	38	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	38	8.4		
19-Aug	2.00	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	6	3.0			
20-Aug	7.75	0	0	0	0	0	0	2	0	180	0	0	0	0	0	0	0	4	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	190	24.5			
21-Aug	8.00	0	0	0	0	0	0	27	0	560	0	0	0	0	0	0	0	1	3	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	593	74.1			
22-Aug	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	0	0	0	0	0	0	0	0	0	0	0	0.0	
23-Aug	8.00	0	0	0	0	0	0	58	0	22	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	86	10.8		
24-Aug	8.50	0	0	0	0	0	0	6	0	4712	0	0	1	0	0	0	0	5	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	2	0	0	0	0	8	4737	557.3			
25-Aug	8.50	0	0	0	0	0	0	17	0	5166	0	0	1	0	0	0	0	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5212	613.2			
26-Aug	8.00	0	0	0	2	0	0	0	0	1371	0	0	0	0	0	0	0	19	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	3	1397	174.6			
27-Aug	9.00	0	0	0	1	0	0	0	0	441	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	0	443	49.2			
28-Aug	8.25	0	0	0	1	0	0	1	0	919	0	0	0	0	1	0	0	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	926	112.2			
29-Aug	8.00	0	0	0	1	0	0	7	0	1581	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	1589	198.6				
30-Aug	8.50	0	0	0	1	0	0	0	1	72	0	0	0	0	0	0	0	13	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	90	10.6				
31-Aug	8.00	0	0	0	0	0	0	1	152	0	0	1	0	0	0	2	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	193	24.1				
01-Sep	8.00	0	0	0	0	0	0	2	0	921	0	0	3	0	0	0	0	29	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	959	119.9				
02-Sep	8.00	0	0	0	0	0	0	1	0	236	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	250	31.3				
03-Sep	9.00	0	0	0	0	1	0	2	1	1435	0	1	1	0	0	0	1	18	1	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	2	1467	163.0				
04-Sep	8.00	0	0	0	0	0	0	0	0	344	0	0	1	0	0	0	1	50	0	0	0	0	1	0	0	0	0	0	0	0	6	0	1	0	0	0	0	0	404	50.5				
05-Sep	8.00	0	0	0	1	0	0	0	0	25	0	0	2	0	1	0	1	116	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	148	18.5				
06-Sep	8.00	0	1	0	7	0	0	0	0	17	0	0	0	0	0	0	0	41	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	70	8.8					
07-Sep	8.00	0	0	0	0	0	0	0	1	22	0	0	0	0	0	0	1	72	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2	0	0	0	0	101	12.6					
08-Sep	8.00	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0	0	30	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	34	4.3					
09-Sep	5.75	0	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	0	0	0	0	0	0	0	0	0	5	0.9					
10-Sep	7.00	0	0	0	0	1	0	0	0	3	0	0	0	0	0	0	1	21	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	3.9					
11-Sep	2.50	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	25	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	10.8					
12-Sep	8.50	0	0	0	0	1	0	1	0	133	0	1	1	0	0	1	1	1237	0	1	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	1379	162.2						
13-Sep	7.50	0	0	0	2	1	0	0	0	19	0	0	0	0	0	0	0	143	9	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	175	23.3						
14-Sep	5.50	0	0	0	0	1	0	0	0	10																																		

Appendix D. continued

DATE	HOURS																												BIRDS														
	OBSERV.	BV	TV	UV	OS	NH	HK	SK	WK	MK	UK	SS	CH	NG	UA	HH	RS	BW	SW	WT	ZT	ST	CB	RT	FH	RL	UB	GE	BE	UE	CC	AK	ML	PR	PG	AF	SF	LF	UF	UU	TOTAL	/HOUR	
16-Sep	9.50	0	0	0	7	14	0	2	0	159	0	7	32	0	3	1	2	8561	3	1	0	0	0	0	0	0	2	0	0	0	0	75	1	0	1	0	0	0	0	0	26	8897	936.5
17-Sep	9.50	0	0	0	8	6	0	2	0	101	0	13	28	0	2	0	0	17641	11	1	0	0	0	2	0	0	4	0	2	0	0	52	2	0	8	0	0	0	1	6	17890	1883.2	
18-Sep	9.50	0	1	0	2	10	0	1	0	62	0	21	7	0	0	0	0	12626	4	2	0	0	0	1	0	0	0	0	0	0	20	1	0	1	0	0	0	0	6	12765	1343.7		
19-Sep	9.00	0	0	0	2	0	0	0	0	24	0	9	5	0	2	0	1	5085	7	0	0	0	0	2	0	0	3	0	1	0	0	10	1	0	2	0	0	0	9	5163	573.7		
20-Sep	9.00	0	3	0	4	1	0	0	0	14	0	9	22	0	1	0	0	23052	11	1	0	0	0	2	0	0	0	0	0	1	18	2	0	6	0	0	0	0	2	23149	2572.1		
21-Sep	8.00	0	3	0	4	3	0	0	0	23	0	5	8	0	3	0	1	19256	10	0	0	0	0	0	0	0	2	0	0	0	19	0	1	7	0	0	0	0	5	19350	2418.8		
22-Sep	9.50	0	1	0	1	2	0	0	0	25	0	25	23	0	1	0	0	4460	10	0	0	0	0	2	0	0	2	0	0	0	8	1	0	9	0	0	0	0	0	4570	481.1		
23-Sep	8.00	0	0	0	3	3	0	2	0	4	0	6	0	0	3	0	0	3980	0	0	0	0	0	0	0	0	1	0	0	0	2	2	0	6	0	0	0	0	1	4013	501.6		
24-Sep	8.00	0	2	0	6	1	0	0	0	43	0	16	17	0	2	0	0	25689	11	0	0	0	0	0	0	0	1	0	0	0	9	4	0	5	0	0	1	0	0	25807	3225.9		
25-Sep	9.50	0	23	0	3	0	0	0	0	15	0	25	33	0	1	1	1	86353	11	0	0	0	0	0	0	0	0	0	0	1	9	2	0	5	0	0	0	0	4	86487	9103.9		
26-Sep	10.00	0	42	0	12	5	0	0	0	19	0	63	38	0	6	1	2	43291	18	1	0	0	0	2	0	0	2	0	0	0	47	1	0	6	0	1	0	1	2	43560	4356.0		
27-Sep	9.50	0	31	0	10	4	0	1	0	20	1	73	58	0	5	2	2	63538	27	2	0	0	0	1	0	0	2	0	1	0	1	45	4	0	8	0	0	0	5	63841	6720.1		
28-Sep	9.75	5	26	0	9	4	0	0	1	23	0	107	54	0	16	0	0	28312	22	1	0	0	0	2	0	0	5	0	0	0	1	52	3	0	5	0	0	0	1	8	28657	2939.2	
29-Sep	8.50	1	14	0	1	1	0	0	0	5	0	38	25	0	5	1	2	4628	20	0	0	0	0	0	0	0	1	0	1	0	24	0	0	1	0	0	0	0	7	4775	561.8		
30-Sep	9.75	0	73	0	2	1	0	0	0	1	0	54	21	0	6	0	0	5087	16	2	0	0	0	0	0	0	2	0	1	0	0	42	5	0	3	0	0	0	0	6	5322	545.8	
01-Oct	9.00	0	135	0	11	6	0	0	0	16	0	185	85	0	22	0	1	8098	151	0	0	0	0	4	0	0	12	0	0	0	147	9	1	20	0	1	1	1	14	8920	991.1		
02-Oct	8.25	45	99	0	20	20	0	0	0	11	0	314	117	0	33	0	0	3261	46	2	1	0	0	2	1	0	5	0	0	0	155	10	1	15	0	1	0	0	13	4172	505.7		
03-Oct	8.00	2	106	0	7	9	0	0	0	2	0	11	15	0	1	1	0	950	1907	1	0	0	0	3	0	0	2	0	0	0	6	0	0	2	0	0	0	0	6	3031	378.9		
04-Oct	8.00	0	106	0	11	4	0	0	0	0	0	30	24	0	4	0	2	30	13	0	0	0	0	2	0	0	4	0	0	0	14	3	0	24	0	0	0	0	5	276	34.5		
05-Oct	8.00	2	95	0	1	0	0	0	0	0	0	1	2	0	0	0	0	2	30	2	0	0	0	0	1	0	1	0	0	0	1	0	0	5	0	0	1	0	1	145	18.1		
06-Oct	8.00	9	110	0	1	1	0	0	0	2	0	9	8	0	0	0	0	11	26	1	0	0	0	0	1	0	2	0	0	0	1	0	0	5	0	0	0	0	2	189	23.6		
07-Oct	10.00	22	448	0	5	8	0	0	0	1	0	225	121	0	32	1	1	1077	8187	1	0	0	0	3	0	0	5	0	0	0	135	14	0	12	2	2	0	0	8	10310	1031.0		
08-Oct	9.00	5	240	0	1	10	0	0	0	0	0	125	102	0	14	0	0	607	14859	0	0	0	0	3	0	0	6	0	0	0	30	4	0	1	0	0	0	1	0	16008	1778.7		
09-Oct	8.25	8	241	0	8	13	0	0	0	1	0	195	93	0	21	1	2	163	110	4	0	0	0	3	0	0	2	0	0	0	1	48	1	1	2	0	0	1	0	11	930	112.7	
10-Oct	8.00	3	114	0	1	4	0	0	0	0	0	32	27	0	1	1	0	27	29	1	0	0	0	0	1	0	0	0	0	2	0	0	1	0	0	0	0	0	0	244	30.5		
11-Oct	6.25	0	120	0	4	0	0	0	1	0	0	6	3	0	2	0	0	2	11	1	0	0	0	1	1	0	0	0	0	7	0	0	4	0	0	0	0	0	0	163	26.1		
12-Oct	8.00	6	402	0	7	1	0	0	0	0	0	10	4	0	0	0	0	3	29	0	0	0	0	0	1	0	1	0	0	0	3	0	0	7	0	0	0	0	0	474	59.3		
13-Oct	5.00	0	902	0	3	0	0	0	0	0	0	6	9	0	0	1	0	0	13	0	0	0	0	2	0	0	1	0	0	0	2	0	0	7	0	0	0	0	0	946	189.2		
14-Oct	8.00	10	707	0	0	4	0	0	0	0	0	46	16	0	8	0	0	8	23	0	0	0	0	0	0	0	1	0	0	0	7	3	0	1	0	0	0	1	1	836	104.5		
15-Oct	6.25	0	19	0	0	3	0	0	0	0	0	16	10	0	1	0	0	0	2	1	0	0	0	0	0	0	0	0	0	2	1	0	0	0	0	0	0	0	1	56	9.0		
16-Oct	7.50	0	662	0	0	0	0	0	0	0	0	14	2	0	2	0	0	1	251	0	0	0	0	0	0	0	1	0	0	0	6	5	0	0	0	0	0	0	0	944	125.9		
17-Oct	9.00	0	6397	0	0	4	0	0	5	0	0	37	32	0	6	0	3	5	73	2	0	0	0	6	1	0	5	0	1	0	0	19	1	1	2	0	0	0	0	1	6601	733.4	
18-Oct	8.00	6	4271	0	5	1	0	0	0	0	0	17	9	0	6	0	0	6	50	0	0	0	0	4	0	0	0	0	1	0	0	2	2	0	0	0	0	0	5	4385	548.1		
19-Oct	8.00	45	767	0	0	3	0	0	0	0	0	55	35	0	10	1	1	80	28	0	0	0	0	1	0	0	6	0	0	0	9	0	1	1	0	0	0	1	0	1044	130.5		
20-Oct	8.00	10	531	0	0	1	0	0	0	0	0	25	24	0	5	1	0	16	12	1	0	0	0	1	0	0	2	0	0	0	8	1	0	1	0	0	0	0	8	647	80.9		
21-Oct	8.00	0	547	0	3	2	0	0	0	0	0	20	25	0	0	1	1	15	5	1	0	1	0	2	1	0	0	0	0	9	0	0	0	0	0	0	0	0	1	634	79.3		
22-Oct	8.00	19	1168	0	1	0	0	0	0	0	0	4	20	0	0	0	0	5	0	0	0	0	0	1	0	0	0	0	0	1	0	1	1	0	0	0	0	4	1225	153.1			
23-Oct	8.00	0	1421	0	0	5	0	0	0	0	0	8	11	0	7	0	1	0	3	0	0	0	0	0	0	0	0	0	1	3	0	0	0	0	1	0	0	2	1463	182.9			
24-Oct	7.50	0	1815	0	2	6	0	0	1	0	0	5	33	0	14	1	2	16	5	0	0	0	0	12	0	0	2	0	1	0	0	2	0	0	0	0	0	0	3	1920	256.0		
25-Oct	7.50	26	514	0	0	6	0	0	1	0	0	6	10	0	4	0	2	4	4	0	1	0	0	3	0	0	2	0	0	0	2	1	0	0	0	0	0	0	2	588	78.4		
26-Oct	7.50	8	380	0	0	7	0	0	0	0	0	5	10	0	0	0	0	1	5	1	0	0	0	2	0	0	0	1	0	0	2	1	0	2	0	0	0	0	2	427	56.9		
27-Oct	7.50	4	1878	0	0	1	0	0	0	0	0	8	15	0	2	0	0	1	3	1	0	0	0	4	0	0	1	1	0	0	1	0	0	0	0	0	0	0	0	1920	256.0		
28-Oct	7.50	0	510	0	0	2	0	0	0	0	0	6	4	0	2	0	0	5	1	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	532	70.9		
29-Oct	7.50	0	102	0</																																							

Appendix D. continued

DATE	HOURS																										BIRDS																			
	OBSERV.	BV	TV	UV	OS	NH	HK	SK	WK	MK	UK	SS	CH	NG	UA	HH	RS	BW	SW	WT	ZT	ST	CB	RT	FH	RL	UB	GE	BE	UE	CC	AK	ML	PR	PG	AF	SF	LF	UF	UU	TOTAL	/HOUR				
01-Nov	7.00	0	796	0	0	5	0	0	0	0	0	3	9	0	3	0	0	2	0	3	0	0	0	2	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	2	828	118.3		
02-Nov	7.00	0	288	0	0	0	0	0	0	0	0	2	5	0	0	0	0	4	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	301	43.0	
03-Nov	7.50	0	171	0	0	2	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	179	23.9	
04-Nov	7.50	2	100	0	0	2	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	0	0	0	0	0	0	0	0	0	0	0	106	14.1		
05-Nov	7.00	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	0	0	0	0	0	0	0	0	0	0.0
06-Nov	7.50	0	153	0	0	0	0	0	1	0	0	9	6	0	0	0	1	0	1	0	0	0	0	3	0	0	1	0	0	0	0	5	0	0	1	0	0	0	0	0	0	0	0	181	24.1	
07-Nov	7.50	0	306	0	1	2	0	0	0	0	5	10	0	1	0	2	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	338	45.1			
08-Nov	7.50	0	494	0	0	2	0	0	0	0	4	3	0	2	0	1	2	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	516	68.8		
09-Nov	7.50	0	69	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	75	10.0		
10-Nov	7.50	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	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	0.3		
11-Nov	7.00	0	2	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	0	0	0	0	0	0	0	0	0	0	0	3	0.4		
12-Nov	7.50	0	14	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18	2.4		
13-Nov	6.17	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	0	0	0	0	0	0	1	0.2		
14-Nov	7.50	5	15	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	0	0	0	0	20	2.7		
15-Nov	7.50	0	336	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	342	45.6		
Total	719.92	326	28530	0	194	218	0	192	14	20288	1	1927	1304	0	264	17	42	370075	26090	47	9	2	0	124	8	0	103	2	10	1	7	1127	95	8	201	2	6	4	7	211	451456	627.1				

¹ See Appendix A for explanation of species codes.

Appendix E. Annual observation effort and fall raptor migration counts by species at Hazel Bazemore Park near Corpus Christi, Texas: 1997–2008.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	MEAN
Start date	15-Aug	15-Aug	14-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-Aug	15-AUG	1-AUG	1-Aug	11-Aug
End date	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Nov	15-Aug
Observation days	89	83	90	91	93	89	86	93	92	93	106	107	93
Observation hours	725.00	585.50	719.75	728.58	723.50	676.50	643.00	701.00	715.75	704.50	798.75	830.42	712.69
SPECIES	RAPTOR COUNTS												
Black Vulture	431	138	1,398	491	222	470	241	1,016	445	893	309	326	532
Turkey Vulture	11,221	5,011	30,027	36,690	4,870	42,536	22,900	17,750	19,090	29,115	46,503	28,530	24,520
Unidentified vulture	0	0	0	0	0	0	0	9	0	0	0	0	1
Total vultures	11,652	5,149	31,425	37,181	5,092	43,006	23,141	18,766	19,535	30,008	46,812	28,856	25,052
Osprey	81	179	181	88	114	146	199	207	241	321	237	197	183
Northern Harrier	93	180	331	153	162	109	100	101	157	614	223	219	204
Hook-billed Kite	0	0	0	0	0	0	1	0	0	0	0	0	0.1
Swallow-tailed Kite	7	6	31	0	37	57	22	34	56	99	168	349	72
White-tailed Kite	4	6	6	2	2	2	1	2	9	8	1	14	5
Mississippi Kite	2,974	3,584	5,513	4,569	10,155	8,394	9,753	4,441	10,004	14,073	27,285	21,050	10,150
TOTAL KITES	2,985	3,596	5,550	4,571	10,194	8,453	9,776	4,477	10,069	14,180	27,454	21,413	10,227
Sharp-shinned Hawk	936	1,208	1,348	929	698	1,869	1,193	892	880	1,643	1,725	1,927	1,271
Cooper's Hawk	418	260	1,092	555	473	645	1,083	483	815	1,719	1,222	1,308	839
Northern Goshawk	0	0	1	0	0	1	0	0	0	2	3	0	1
Unidentified accipiter	308	316	310	379	298	108	344	252	174	290	217	264	272
TOTAL ACCIPITERS	1,662	1,784	2,751	1,863	1,767	2,649	2,620	1,627	1,869	3,654	3,167	3,499	2,382
Common Black Hawk	0	0	0	0	0	1	0	0	0	0	0	0	0.1
Harris's Hawk	5	5	28	10	14	10	6	23	25	39	7	18	16
Red-shouldered Hawk	79	38	77	81	45	92	26	24	37	101	15	42	55
Broad-winged Hawk	823,602	970,025	640,258	396,774	864,355	464,772	684,815	989,957	263,101	767,730	569,839	370,088	650,443
Short-tailed Hawk	0	0	2	0	0	0	0	1	4	2	1	2	1
Swainson's Hawk	300	6,790	1,246	2,085	14,260	7,912	5,633	14,751	1,347	7,225	412	26,093	7,338
White-tailed Hawk	4	5	13	0	7	4	6	19	25	39	33	50	17
Zone-tailed Hawk	2	0	6	0	1	2	7	2	10	7	22	11	6
Red-tailed Hawk	112	121	282	237	96	182	192	180	103	363	122	126	176
Ferruginous Hawk	1	0	14	1	1	2	1	2	5	8	3	8	4
Rough-legged Hawk	1	0	4	0	0	0	0	0	0	0	0	0	0.4
Unidentified buteo	18	25	62	215	368	80	71	53	34	79	67	105	98
TOTAL BUTEOS	824,124	977,009	641,992	399,403	879,147	473,057	690,757	1,005,012	264,691	775,593	570,521	396,543	658,154
Golden Eagle	1	0	4	1	1	1	2	1	2	2	1	2	2
Bald Eagle	0	2	4	0	2	1	1	3	4	5	7	10	3
Unidentified eagle	0	0	1	0	0	0	0	0	0	0	0	1	0.2
TOTAL EAGLES	1	2	9	1	3	2	3	4	6	7	8	13	5
Crested Caracara	9	1	18	4	21	12	21	3	11	20	13	7	12
American Kestrel	189	438	483	509	292	811	860	365	485	1,137	850	1,127	629
Merlin	25	29	34	31	26	18	57	32	36	50	82	96	43
Prairie Falcon	8	5	33	6	7	4	15	2	3	10	7	8	9
Peregrine Falcon	76	163	241	65	114	176	169	144	230	309	247	205	178
Aplomado Falcon	0	0	1	0	0	0	1	0	1	1	4	2	1
Unknown small falcon ¹	-	-	-	-	-	4	5	4	1	2	6	6	4
Unknown large falcon ¹	-	-	-	-	-	5	9	0	0	2	9	4	4
Unidentified falcon	14	39	92	103	41	25	47	11	5	15	2	7	31
TOTAL FALCONS	312	674	884	714	480	1,043	1,163	554	761	1,526	1,207	1,455	896
Unidentified raptor	220	4,376	3,874	506	837	98	133	89	35	135	120	211	886
GRAND TOTAL	841,139	992,950	687,015	444,484	897,519	528,540	727,900	1,030,849	297,375	826,058	649,762	452,414	698,000

¹ Designations used consistently for the first time in 2002.