
Swainson's Hawk Banding in North America to 1992

C. Stuart Houston
863 University Drive
Saskatoon, Saskatchewan S7N 0J8
[address for correspondence]

Josef K. Schmutz
Department of Biology
University of Saskatchewan
112 Science Place
Saskatoon, Saskatchewan S7N 5E2

The migration of the Swainson's Hawk (*Buteo swainsoni*) to Argentina and back each year is the second longest migration of any North American raptor, exceeded only by the Peregrine Falcon (*Falco peregrinus*). From Saskatchewan this is a 22,000 km round trip that takes nearly two months in each direction. These hawks travel in flocks of up to 8,000 through Panama (Smith 1985), use thermals to save effort (Smith 1980), go without food over long but as yet undetermined distances (Smith et al. 1986; Kirkley 1991), and may arrive in Argentina so weak and starved that individuals on occasion are picked up by hand (Houston 1990). They spend just over four months on breeding grounds in North America and about four months of the austral summer on the pampas of southern South America. Recent declines in Swainson's Hawk productivity in Alberta and Saskatchewan have been associated with a drastic decline of its main prey species, the Richardson's Ground Squirrel (*Spermophilus richardsonii*) (Houston and Schmutz 1995). Equally worrisome are recent reports of a large killoff by excessive pesticide use in Argentina (Woodbridge et al. 1995). This study was undertaken to determine general patterns of mortality and movement.

METHODS

The Canadian Wildlife Service banding office supplied data for all Swainson's Hawk encounters from 1923 through mid-1992, and for all Swainson's Hawk banding between 1955 and 1992. All issues of *Bird Banding Notes* were abstracted to ascertain the number of Swainson's Hawk banded between 1923 and 1954, inclusive. For the longevity table, it was necessary to exclude situations where the hawk was released alive, and those reported by "how found" codes 50 (skeleton), 56 (band obtained), and 98 (band only)

(Tables 2, 5). From 550 encounters of 541 individuals, we deleted three records of hawks of unknown age, which were unrepresentative: one banded in Florida in Nov 1939 (before wintering Swainson's were known there) was recovered in Florida the next May; one banded in Feb in Missouri (a state with no other wintering records) was recovered 265 km north of where banded 10 days later; one banded in Sep in New Jersey was recovered in Nova Scotia the next spring (far beyond its range). One improbable record of a 600-km post-fledging northward movement in Alberta proved to be an erroneous entry of latilong coordinates due to confusion between two lakes, each named "Fox Lake," and was amended. From direct contact with band finders, we changed 33 "how found" codes from "00, found dead," to a more specific code, adding 13 to code 14, 11 to code 45, 5 to code 54, 2 to code 2, 1 to code 17 and 1 to code 50; in addition, one code was changed from 45 to 54 from information gained directly from the band finder.

RESULTS

Jurisdictions with the largest number banded were: Alberta (5383), Saskatchewan (3728), Colorado (1312), and California (1087 individuals) (Table 1). There were 547 encounters of 538 individual Swainson's Hawks, since two hawks were reported three times and another five on two occasions.

Of these, 150 were found dead, 123 shot and 122 killed on highways (Table 2); 319 were encountered in the same state or province, 99 in another state or province, 15 in Mexico, 11 in Central America, and 72 in South America, including 47 in Argentina (Table 3).

Table 1. Swainson's Hawks banded in North America, 1955-1992 (by state and province). Individual banders of more than 100 hawks are listed separately. 1992 numbers are incomplete.

State code	All State banders combined State Number banded	Individual Banders > 100	Individual number banded	Individual Encounters	Individual % Encounters	Includes	
159	New Jersey						
172	Pennsylvania						
188	Virginia						
234	Illinois						
236	Iowa						
250	Minnesota						
252	Missouri						
291	Wisconsin						
317	Colorado	1312	Andersen Ryder Craig	761 213 107	15 12 1	2.0% 5.6% 0.9%	8 in Wyo.
338	Kansas	52					
353	Montana	108					
354	Nebraska	29					
360	New Mexico	370	Bednarz	298	5	1.7%	
364	North Dakota	567	NPWRC	366	7	1.9%	
367	Oklahoma	46					
381	South Dakota	69					
383	Texas	50					
392	Wyoming	103					
406	Arizona	49					
414	California	1087	Bloom Woodbridge	764 278	25 2	3.3% 0.7%	
433	Idaho	252					
455	Nevada	16					
469	Oregon	173	Henny	119	2	1.7%	
485	Utah	358	Gessaman	146	4	2.7%	
489	Washington	384	Fitzner Brady	172 105	10 0	5.8% 0.0%	
	Total U.S.A.	5109					
604	Alberta	5383	Schmutz Fyfe Jones Lein Andrews Pletz	2158 931 880 710 355 206	73 31 28 36 18 9	3.4% 3.3% 3.2% 5.1% 5.1% 4.4%	5 in Sask. 16 in Sask.
611	Brit Columbia	2					
645	Manitoba	33					
668	Ontario	1					
679	Saskatchewan	3728	Houston Harris	2783 859	91 37	3.3% 4.3%	
	Total Canada	9147					
	TOTAL	14256			461	3.2%	
	PRE-1955	528			80	15.2%	
	ALL-TIME TOTAL	14784			541	3.7%	

Table 2. SWHA banded in North America – How Found.

How Found Code		Number	Less ** Misidentified	Less ** * Repeats	Total
0	Found Dead	153	2		151
1	Shot	124	1		123
2	Starved	2		1	2
3	Injured	25		1	24
4	In Trap	4			4
9	By Owl or Hawk	3			3
11	By Dog	2			2
14	By Car	51			51
17	Drowned	1			1
20	By Disease	1			1
21	In Building	1			1
27	By Train	2			2
28	Caught by Hand	15		1	14
29	Sight Record	3		1	2
33	Caught at Nest	16			16
36	Exhausted	2			2
45	On Highway	72		1	71
47	Band Removed*	1			1
50	Skeleton*	1			1
52	By Telescope	8		1	7
54	Electrocuted	13			13
56	Band Obtained*	5		2	3
57	In Fence	3			3
89	T&R Diff. L/L	16		1	15
97	Miscellaneous	2		1	1
98	Band Only*	15			15
99	T&R Same L/L	9			9
	TOTAL	550	3	9	538

* Not suitable for longevity determination.

** Three hawks probably misidentified.

*** Nine extra reports of 5 hawks reported twice and 2 hawks reported 3 times.

Table 3. SWHA Encounters (banded in North America). 547 Encounters of 538 Individuals.

State Banded		Country Where Encountered														TOT
Code	Name	Same State	Other State	Mexic	El Salvad	Guata mala	Pana- ma	Ecuad- or	Colum bia	Vene- zuala	Argen- tina	Brazil	Uru- guay	Chile	TOT	
291	WI		2												2	
317	CO	19	9	2		1			4		5				40	
338	KS	1	3	1											5	
353	MT	1													1	
354	NE	0	0			1									1	
360	NM	5	2					1							8	
364	ND*	8	5	1							3				17	
367	OK	3	3					1				1			8	
381	SD	4	2												6	
383	TX		1												1	
392	WY	5	11							1	1				18	
406	AZ	0	0	2											2	
414	CA	21	2	4		1		2			1				31	
421	IL	1													1	
433	ID	6	1	2											9	
469	OR	1	3					1							5	
485	UT	2	3		1							1			7	
489	WA	11													11	
604	Alberta	156	23	2	1	3		2			20	4		1	212	
645	Manitb	3	2						1						6	
679	Sask.	89	32	1	2		1		4		17		1		147	
TOTAL		336	104	15	4	6	1	7	9	1	47	6	1	1	538	

Encounter rates were high in the early years and stayed above 10% until 1955; since 1975, this rate has been consistently less than 4% (Table 4). There were 80 encounters from the first 519 Swainson's Hawk banded between 1923 and 1953, inclusive, plus one recovery from this cohort since 1953 (15.6% in total). Sixty of the first 81 hawks reported had been shot. Between 1955 and 1992, there were another 466 encounters from 14,256 Swainson's Hawk banded (3.3%). This represents a marked difference in rates ($G=109.95$, $p < 0.001$). Of hawks banded as nestlings, there were only 149 encounters more than one year post banding; numbers recovered each year tapered off rapidly, especially beyond the eighth year, though there were then one to seven encounters per year until 15 years post banding (Table 5). A single recovery at 18 years, 2 months, banded as a nestling by W. Andersen in southeastern Colorado ($38^{\circ} 20' N$, $103^{\circ} 30' W$), on 15 Jul 1973, and found dying beneath a power line 7 mi north of Dumas, Texas ($35^{\circ} 50' N$, $101^{\circ} 50' W$), on 1 Sep 1991, was the oldest known bird of this species on the computerized printout. This hawk surpassed the previous record of 15 years, 9 months and 28 days, reported by Houston and Millar (1981). More recently, another nestling banded by W. Andersen in southeastern Colorado was found dead in Argentina, part of a massive pesticide kill of Swainson's Hawks, at age 19 years, 6 months (Woodbridge et al. 1995b).

Table 4. SWHA banding and recovery totals, all North America

Year	Number Banded	Number Recovered	Quintile Encounter
1922-30	26	7	26.9%
1931-35	80	8	10.0%
1936-40	230	36	15.7%
1941-45	123	22	17.9%
1946-50	29	4	13.8%
1951-55	47	6	12.8%
1956-60	159	9	5.7%
1961-65	252	11	4.4%
1966-70	447	31	6.9%
1971-75	1861	67	3.6%
1976-80	3061	107	3.5%
1981-85	2622	88	3.5%
1986-90	4875	127	2.6%
1991	471	18	3.8%*
1992	499	8	1.6%*
1993	2	0	0.0% nil
TOTAL	14,784	549	3.7%

* incomplete.

** Listed by year of banding, not year of recovery.

NOTE: For yearly totals of SWHA banded, the fiscal is one year higher, 1922-1953.

Table 5. Swainson's Hawk Longevity. North American band encounters through 1992 (after deletion of codes 50, 56, 98 and birds released alive).

Banded As	Years After Banding																		Total	
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17		18
Nestling	261	35	28	21	14	13	7	4	7	3	6	3	4	1	1	1	0	0	1	410
Adult	11	8	10	3	2	5	4	8	4	1	1									57
Total	272	43	38	24	16	18	11	12	11	4	7	3	4	1	1	1	0	0	1	467
Additional data on hawks released alive:																				
	3	1	6	2	2	3	3	6	2	1	1	2								32
Final	275	44	44	26	18	21	14	18	13	5	8	5	4	1	1	1	0	0	1	499

Such random recoveries of hawks banded as nestlings (line 1 in Table 5) may be less than ideal for calculation of annual mortality rates, in part because of the disproportionate number (63.7%) found dead in the first year, and in part because there are such small numbers after 12 years. If one considers separately those hawks banded as adults (line 2 in Table 5), there is less skewing toward recoveries in the first year after banding (19.3%). Not eligible for the usual mortality table are the small number of hawks released alive, of which only 9.4% were reported in the first year (final line in Table 5). Planned retrappings or resightings of color bands of live adults offer additional samples near the upper end of the age scale. In Alberta, four hawks banded as nestlings were resighted at 17 years or later: Red TG, a male at 17 years; Red D3, a male at 18 years; Red DT, a female at 18 years; Red UK, a female at 19 years (JKS).

Although banding results for other raptor species banded as nestlings show high encounter rates in the first calendar year, this trend proved unusually high in this species. First-year recoveries occurred disproportionately during August and September, usually the first two months of flight. Many were killed on highways. In August, almost all were found within 30 km of their natal site, with the following exceptions: two early movements

were by Saskatchewan hawks which moved west into Alberta 50 and 65 km, respectively, by 21 and 30 Aug, when about seven and eight weeks old. An Alberta hawk went 50 km east before being found dead on 28 Aug; two others went 40 km east by 10 Aug and 85 km west by 31 Aug. In Saskatchewan, a hawk went 60 km east before it was killed on the highway on 27 Aug. The greatest northerly movement from the nest was a Wyoming hawk which went 60 km by 10 Sep. A late departure from Saskatchewan was a juvenile killed on the highway on 4 Oct. A Colorado juvenile was hit by a car on 5 Oct, 175 km south of its natal site.

When exact dates of recovery are given, related to an immediate death such as a bird shot or killed on a highway, we can better judge the progress of migration of birds-of-the-year, though none of the band encounters allow calculation of the distance travelled per day. Representative samples of the speed and progress of migration through to Central America and Argentina, of hawks banded in Saskatchewan, have already been presented (Houston 1990). The migration is spread out over about a month at each point along the route, with the first hawks passing through Texas and Central America and on to Colombia in Oct. The first banded hawk arrived in Argentina on 10 Nov.

Where are the non-breeding birds when one year old?

Although the sample size for recoveries of one-year-old hawks is surprisingly small, they suggest that non-breeding Swainson's Hawks in the first summer, and some individuals in their second and third summers, do not return to their natal areas. When one-year-old hawks were recovered between 11 May and 10 Sep, the average dispersal distance from the natal site (n=10) was 530 km. The greatest distance was a hawk banded as a nestling in Alberta in late July and killed by a car in Kansas, 1,670 km distant, on 20 Aug the following summer; however, one could speculate that it had spent part of the summer closer to its natal site, but as a non-breeding adult had begun its fall migration early. Three birds, one each in Alberta and North and South Dakota, did return to somewhere near their natal areas at one year of age and were shot at 25, 75 and 75 km from the natal site, respectively. Three others were found injured at one year of age, 40, 65, and 170 km from their natal sites.

Hawks in their second summer following hatching showed an average dispersal distance of 142 km (n=14); in the third summer, 126 km (n=12); and in the fourth summer, at or near four years of age, 44 km (n=11). Once the hawks reached five years of age, the average dispersal was 63 km (n=36), and all but one of the summer encounters were within 300 km or less of the natal site. The exception was a hawk banded in Oregon that was electrocuted in Idaho on 18 Aug, 545 km from its natal site.

Age at first breeding: In Alberta, the youngest breeding hawk trapped while defending a nest was three years old (JKS). In California, Woodbridge et al. (1995a) captured five three-year-olds as territorial breeders, two still in subadult plumage. None have yet bred at age two, as most other buteos do.

Natal Dispersal: Our most solid evidence for natal dispersal distance of adult hawks is from Alberta. Three hawks banded as nestlings in Saskatchewan were trapped at nests in Alberta, west of where they had been raised: 190 km at three years, 310 km at five years, and 200 km at six years after banding. However, a very few bred at or within 10 km of the natal site (three in the

same "latilong" and four in the adjacent latilong; JKS). Another Saskatchewan hawk was shot in Alberta 11 years later, 290 km west. Another moved 140 km west within Alberta, when killed on a highway on 8 Aug at eight years of age. P. H. Bloom has a four-year-old Swainson's Hawk, banded near Doris, California, and found injured in the Diamond Valley, Nevada, on 29 Apr 1986, possibly breeding 560 km southeast of its natal site.

DISCUSSION

Banding recoveries are not constant over time. The drastic reduction in recovery percentages since 1955 reflects in part a switch in philosophy. Early settlers on the Canadian prairies often called the Swainson's Hawk a "chicken hawk" and believed that "the only good hawk is a dead hawk." In the early years many hawks were shot. Although impossible to quantify, there also was a "curiosity factor," which is presumed to have caused a higher percentage of bands to be reported in the first thirty years. Though hawks now are rarely shot, reporting rates of most Saskatchewan and Alberta species continue to decline slowly (CSH), a matter of some concern to banders. On the other hand, there was a language and poverty barrier in Central and South America, so that the first-ever recovery from south of the Rio Grande, in 1941, was of a nestling Swainson's Hawk banded by Hartley Fredeen in Saskatchewan in 1940 (Houston 1990).

A comparatively high percentage (relative to other raptors) of banded birds was recovered in the first two months after banding. Many were road kills, related to a tendency to feed in roadside ditches on the sparsely treed plains. One or more recoveries occurred in each of the first fifteen years; one hawk is known to have survived to the age of 18 years, and a more recent hawk survived to 19½ years. Raw data presented from random finding of dead hawks, with low numbers of those more than five years old, would allow only a rough calculation of adult survival, hence no figure has been attempted.

Four color-banded hawks, sighted at 17 to 19 years of age, all of which are now presumed dead

because they were not sighted again in 1995, were not on the computer printout. Work overload at the banding office has caused a policy which discourages reporting of live retraps in subsequent years, though such records offer valuable information about survival and longevity.

Four topics cry for further answers. Little is known about the length of time that migrating hawks go without food. Numbers found in Argentina are far short of the known continental population; are there other, undiscovered 'wintering' grounds? Do all hawks return to North America in summer? We have poor figures on what percentage of hawks begin nesting at three, four, and five years of age. Not one of the 700 double-rivet, alphanumeric, anodized color bands placed on nestlings in Saskatchewan since 1978 has been sighted in subsequent years, though a hundred or more adults are seen well enough each summer to be certain that they are not wearing bands. Experiments in radio-telemetry with precise localities reported by satellite at intervals will, in future, shed some light on these problems.

SUMMARY

From 14,784 Swainson's Hawks banded in North America between 1923 and 1992, there were 547 valid encounters of 538 individuals. Of these, 72 were recovered in South America, including 47 in Argentina. Sixty of 81 encounters from birds banded prior to 1955, but only 60 of 421 since then, were reported shot; 153 were found dead and 122 were killed on highways. There was moderate site philopatry after four years of age, but Saskatchewan-hatched hawks were trapped at their nests in Alberta at distances of 190, 200 and 310 km from their natal areas.

ADDENDUM

William S. Clark assures us the Swainson's Hawk banded at Cape May, New Jersey, on 26 September 1988 was correctly identified. It was reported as found dead near Advocate Harbour, Nova Scotia, on an unspecified date in the spring of 1989.

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