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C. Stuart Houston

Dan Zazelenchuk

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Swainson's Hawk Productivity in Saskatchewan, 1944 - 2004

C. Stuart Houston
863 University Drive, Saskatoon
Saskatchewan S7N 0J8
houstons@duke.usask.ca

Dan Zazelenchuk
Box 39
Kyle, Saskatchewan S0L 1T0
danzaz@sasktel.net

ABSTRACT

The number of nestlings banded was recorded at 2,427 successful Swainson's Hawk (*Buteo swainsoni*) nests in Saskatchewan between 1944 and 2004. A sudden and prolonged drop in ground squirrel numbers appeared to explain decreased Swainson's Hawk productivity in grassland regions over ten consecutive years, 1987 - 1996.

INTRODUCTION

The world's first specimens of the Swainson's Hawk (*Buteo swainsoni*) and its main prey - Richardson's ground squirrel (*Spermophilus richardsonii*) - were collected at Carlton, Saskatchewan, in 1827 and 1820, respectively (Houston 1990). In Saskatchewan, long-term banding efforts have contributed to our knowledge of Swainson's Hawk productivity and of its annual 20,000 km migration to and from Argentina (Schmutz et al. 1996, Houston and Fung 1999).

The senior author (CSH) began incidental banding of Swainson's Hawks in 1944 but did not begin intensive studies of productivity until 1967. This 38-year program has benefitted from extensive assistance in nest-finding and banding from the junior author (DZ) for the past 16 years, including the contribution of the 71 nestlings banded under DZ's master banding permit in 2004. This paper

adds the final nine years to reproductive results reported in Schmutz et al. (2001). Altogether, we have followed this species through a sudden crash in its main prey item and a very gradual, patchy and incomplete recovery in numbers of Richardson's ground squirrel in grassland areas over 16 subsequent years.

METHODS

Since 1969, CSH concentrated much of his Swainson's Hawk banding on and near large Prairie Farm Rehabilitation Administration (PFRA) pastures near Kindersley in west-central Saskatchewan. These pastures host beef cattle without feed lots. Incubating Swainson's Hawk pairs were located during Ferruginous Hawk (*Buteo regalis*) banding in June, and were revisited for banding in the latter half of July, when the nestlings were between 10 days and six weeks old. In 1972, Jean Harris began finding nests for us, in crop land interspersed with small pastures near Kindersley; during a period of 33 years, she found 898 nests (about 28% of our total) of which 635 were successful and from which 1,132 young were banded. From 1985 to 1995, Dean Francis found 228 nests along the Saskatchewan-Alberta boundary south of Alsask, of which 150 were successful and from which 288 young were banded. The study area was not searched completely and had no well-defined boundaries.

Time and effort expended in these grassland areas were moderately consistent between years. In the parkland within the Saskatoon Bird Area (Houston 2002), dairy farms are concentrated near the city where both Martin Gerard (1987 - 1994) and Marten Stoffel (1997 - 2004) searched for nests, but with appreciably varied effort between years. The very different habitat of the Saskatoon area contributed 7.7% of the total nests found. For eight years, 1988 through 1995, in addition to the regular issue of aluminum bands, 684 anodized aluminum, alphanumeric color bands were applied to nestling Swainson's Hawks between 51° and 52° N latitude and between 108° and 110° W longitude (the Kindersley map sheet), but the color band on the leg opposite the aluminum band failed to increase the reporting rate as we had hoped (Houston 2005, in press).

We divided the overall study into three time periods: 1944 - 1987, with large numbers of Richardson's ground squirrels; 1988 -1996, with ground squirrel numbers less than 10% of the numbers of previous years; and 1997 - 2004, with slowly increasing numbers of ground squirrels with a patchy distribution. Years were defined as "good" if overall productivity of Swainson's Hawk was > 2.40 young/nest; "poor" years were those with productivity < 1.60 young/nest.

Records of ground squirrel numbers in western Canada are scarce. Our visual, somewhat anecdotal, observations of ground squirrel abundance and their inverse relation with fox and coyote numbers are given in Schmutz et al. (2001). More recently, 1-acre (0.405 ha) plots surveyed by Cameron Wilk (pers. comm.), pesticide specialist with Saskatchewan Agriculture, found the maximum number of ground squirrels dropped from 79 individuals/ha in 2003 to 15/ha in 2004, 10 km south of Vibank, Saskatchewan, without pesticides. Near Moose Jaw, the maximum of 111/ha in 2003 dropped to zero in 2004, but retrospective information revealed that the farmer had applied \$1100 of strychnine bait the second year.

A map of the main banding area, showing percentage of natural grassland remaining in plots, has been published as Figure 1 in Schmutz et al. (2001).

RESULTS

Three periods were evident from the overall results (Table 1): For the period 1967 - 1987, Richardson's ground squirrels were abundant and Swainson's Hawks raised an average of 2.1 young per successful nest. During the period 1988 -1996, ground squirrels were strikingly uncommon on grasslands and the average nest success for Swainson's Hawks dropped to 1.6 young/nest. For the period 1997 - 2004, ground squirrel numbers slowly and irregularly increased in grassland regions throughout the Kindersley map sheet area to reach roughly half of their initial numbers in grasslands by 2004, and hawks raised an average of 1.9 young/nest. The year of peak Swainson's Hawk productivity (since 1972) was 1997, the year when voles (*Microtus* sp.) were unexpectedly abundant and supplanted ground squirrels as the most numerous prey item found in nests during the banding visit.

The low year for hawk productivity was 1993, when more than 61% of nests failed and just 1.3 young were raised per successful nest. The second lowest was 1999, when at least 54% of nests failed to produce any young. The highest productivity since 1972 occurred in 1997, the year with exceptionally high vole numbers; that year 2.4 young were raised per successful nest, reminiscent of the early years.

There was, however, some variation in trends between subregions. A separate analysis of subsets tended to confirm our anecdotal observations that ground squirrel numbers dropped first near Kindersley, and then (five years later) near Alsask, 80 km to the west. In 1987, in the Jean Harris study area near Kindersley, Swainson's Hawk productivity was 1.6 young/nest, whereas near Alsask, productivity was 2.6 young/nest, the highest measure encountered during Dean Francis's 11 years. Near Alsask, productivity dropped to 1.7 young/nest in 1992 and to 1.0 young/nest in 1993, and nest success plunged to 30% in 1994. Near Saskatoon, the ground squirrel decrease was mild and brief between 1988 and 1992; subsequently, from 1993 to 1997 inclusive, 50 Swainson's Hawk nestlings were banded in 18 nests for an average of 2.8 young/nest (Houston

2002), the highest measure of productivity reported to our knowledge in North America. The Saskatoon area, for the periods 1964 - 1992 and 1998 - 2004, had an average of 2.1 young Swainson's Hawks per successful nest.

Overall, the commonest brood size noted at the banding visit was two young ($n = 934$ nests), almost equally common were broods of one ($n = 917$; see Table 2). A single nest which fledged five uniformly healthy young was so unusual as to merit separate publication (Houston 1998). For all three periods of this study, close to 40% of nests raised two young. Marked differences occurred in the percent of nests rearing one young (28% in 1972 - 1986, increasing to 52% in 1987 -1996, and dropping back to 38% in 1997 - 2004); the opposite pattern was evident in the percent of nests with three young (30%, falling to 11% and increasing to 20%, respectively).

An unexpected finding in 2004, was the death of both banded birds in a nest that had been photographed once a week to record growth rate of the nestlings. One week after the 19 Jul banding, both nestlings were dead. Both were necropsied. Both died from West Nile virus.

DISCUSSION

Our results support Ian Newton's (1979) oft-quoted statement that "almost every aspect of the natural population ecology of a given raptor species can be explained in terms of food."

Early experience with nest desertions following visits during the egg stage (during "good years") caused us, in subsequent years, to avoid flushing a female from her nest at that stage (Houston 1974); nests were not climbed until July. For these reasons, we have no data on clutch size and we underestimate the nest failure rate, since an unknown number of nest failures occurred each year prior to our first visit. Numerous examples of brood reduction were encountered, especially in years of low ground squirrel numbers, and especially among late nests where the nestlings were too small to hold a band at the first visit. Occasional instances of siblicide ("cannibalism") were encountered by chance during our visit to a

nest and were more common when prey was less abundant.

Food availability had a decided effect on productivity. From food items found in the nests at the banding visit (Schmutz et al. 2001), it is obvious that the preferred food of the Swainson's Hawk is the Richardson's ground squirrel. The hawk raises more young to banding age when either large numbers of ground squirrels or large numbers of voles and mice are present. Voles, the second choice numerically (Schmutz et al. 2001) are more frequent around dairy farms than on open beef cattle range without feedlots. Throughout all four geographic sectors, the mean number of nestlings per nest was highest in 1997, the year of a sudden increase in the vole population.

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Swainson's Hawk by George West

Table 1. Swainson's Hawks Banded in Saskatchewan by C. S. Houston, 1944-2004

Year	Nests Under Scrutiny	Min. Nests Failed	Successful Nests					Total Success Nests	Young Banded	Young/ Successful Nest
			1 Yg.	2 Yg.	3 Yg.	4 Yg.	5 Yg.			
1944-48			0	2	2	0		4	10	2.50
1953-58			0	7	1	0		8	17	2.13
1964-66			2	3	5	0		10	23	2.30
1967			1	3	4	0		8	19	2.38
1968			1	3	5	0		9	22	2.44
1969			1	9	11	3		24	64	2.67
1970			2	6	6	2		16	40	2.50
1971			6	5	7	0		18	37	2.06
1972			7	23	27	3		60	146	2.43
1973	50	23	9	11	7	0		27	52	1.93
1974	43	9	2	19	10	3		34	82	2.41
1975	42	19	7	11	5	0		23	44	1.91
1976	13	5	1	3	4	0		8	19	2.38
1977	56	16	9	18	13	0		40	84	2.10
1978	52	9	9	14	16	4		43	101	2.35
1979	53	10	8	16	19	0		43	97	2.26
1980	70	20	12	25	13	0		50	101	2.02
1981	82	14	15	32	20	1		68	143	2.10
1982	80	18	22	28	11	1		62	115	1.85
1983	109	25	26	32	22	4		84	172	2.05
1984	86	25	24	29	8	0		61	106	1.74
1985	86	20	20	24	21	1		66	135	2.05
1986	122	18	26	48	27	3		104	215	2.07
1987	143	28	61	19	28	7		115	211	1.83
1988	154	57	47	35	14	1		97	163	1.68
1989	132	57	37	30	8	0		75	121	1.61
1990	155	42	52	44	16	1		113	192	1.70
1991	124	38	47	32	7	0		86	132	1.53
1992	144	53	45	38	8	0		91	145	1.59
1993	116	71	37	4	4	0		45	57	1.27
1994	119	24	38	37	18	2		95	174	1.83
1995	101	20	45	33	2	1		81	121	1.49
1996	93	45	32	12	6	0		50	74	1.48
1997	121	23	12	41	37	7	1	98	238	2.43
1998	106	27	44	24	11	0		79	125	1.58
1999	87	47	25	13	2	0		40	57	1.43
2000	116	25	25	42	22	2		91	183	2.01
2001	148	29	49	47	20	3		119	215	1.81
2002	119	32	41	33	14	0		88	149	1.69
2003	117	21	28	40	24	4		96	196	2.04
2004	143	45	42	39	13	4		98	175	1.79
Total Nests	3182	915	917	934	518	57	1	2427	4572	1.88
			38%	38%	21%	2%	0%			
Total Young			917	1868	1554	228	5			
			20%	41%	34%	5%	0%			

Note: bold face indicates "poor years" (>1.60 young/nest)

Italics show "good years" (<2.40 young/nest)

Table 2. Summary of Swainson's Hawk Productivity for Successful Nests in Saskatchewan.

Period	Nests Under Scrutiny	Minimum Nests Failed	Successful					Total Nests	Young Banded	Young/ Nest
			1 yg.	2 yg.	3 yg.	4 yg.	5 yg.			
1944-1987	1087	259(24%)	271 28%	390 40%	292 30%	32 3%	-	985	2055	2.09
1988-1996	1138	407(36%)	380 52%	265 36%	83 11%	5 1%	-	733	1179	1.61
1997-2004	957	249(26%)	266 38%	279 39%	143 20%	20 3%	1 0%	709	1338	1.89
Total	3182	915(29%)	917 38%	934 38%	518 21%	57 2%	1 0%	2427	4572	1.89
Total Nestlings Banded			917	1868	1554	228	5			

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A Net Pole for the Masses

Christopher G. Sims

School of Mathematics and Natural Sciences

University of Arkansas at Monticello

PO BOX 3480

Monticello, AR 71656

simsc@uamont.edu

ABSTRACT

Methods utilized to deploy mist nets have changed little throughout the history of mist netting. Attempts to make net poles lightweight while maintaining portability have been successful; however, the cost (especially to students) of stackable aluminum poles is often prohibitive. In this paper I describe the construction and the unique attributes of an inexpensive and easy-to-use net pole design using a telescoping paint roller pole.

INTRODUCTION

Over the years several methods have been used by ornithologists and others in the deployment of mist nets. Stackable aluminum poles have been preferred due to their lightweight portability. Steel conduit poles have been the cheap and durable method for long-term or permanent netting situations. While many have attempted to make the steel poles smaller and more portable, few have achieved that goal successfully. While a graduate student, I saw that an inexpensive, portable, and lightweight pole was needed. Working in northern Mississippi, I also found that the pole's tip needed to penetrate hard clay soil during the dry summer months. An obvious starting point for this design was a telescoping paint roller