THE 1970 AND 1971 AUTUMN HAWK COUNTS AT BAKE OVEN KNOB, PENNSYLVANIA

DONALD S. HEINTZELMAN AND ROBERT MACCLAY

INTRODUCTION

The 1970 and 1971 autumn hawk counts at Bake Oven Knob, Lehigh County, Pennsylvania, were the most complete yet achieved at this lookout since systematic counts began in 1961 (Heintzelman, 1969, 1970). For 98 days from 9 August through 6 December 1970, and for 100 days from 1 August through 5 December 1971, a group of volunteer observers manned either the South Lookout or the North Lookout (Point), depending upon wind direction, and counted migrating hawks and other birds. Table one summarizes the autumn hawk counts made at the Knob during the period 1961 through 1971, and during 1957; Tables two through 11 present the daily hawk counts for the 1970 and 1971 seasons.

In general, 1970 was about average for some species and a little above average for others. In considering the record numbers of some hawk species tabulated during 1970, consider that we had 25 more days of observation than the previous most complete season, 1969. However, some of these additional days occurred late in November and early December when relatively few hawks are still migrating. Nevertheless, 1970 was an above average year for hawks migrating past Bake Oven Knob in terms of numbers of birds counted.

The 1971 season, on the other hand, was very disappointing in terms of the Broad-winged Hawk migrations, but spectacularly exciting in terms of the Red-tailed Hawk, Rough-legged Hawk and Osprey flights.

VULTURES

Although observers at many hawk lookouts do not count Turkey Vultures or include them in the seasonal summaries for their stations, we consider this exclusion ill advised. Although we have heard some hawk authorities talk about population crashes of vultures, particularly Turkey Vultures, little or no evidence is available to substantiate such claims. Indeed, at least one species, the Black Vulture, is now established as a breeding bird in south-central Pennsylvania (Heintzelman, 1969), and appeared during autumn for the first time at Hawk Mountain in 1969 (Nagy, 1970). This species has yet to appear at Bake Oven Knob.

In any event, Turkey Vulture counts are routinely included in our Bake Oven Knob seasonal totals as they have been throughout our decade of raptor work at the Knob. Our method of counting vultures is simple. Throughout each day we make a series of "maximum simultaneous counts" of these birds, generally once each hour, then use the highest simultaneous count as the day's total of vultures. Considered daily, this technique doubtless results in some duplication of local birds, but it remains for banding studies to demonstrate that an imperceptably slow migration, or shift of population, of Turkey

TABLE 1

AUTUMN HAWK COUNTS
BAKE OVEN KNOB, PENNSYLVANIA

Species	1957	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Turkey Vulture	——	26	47	146	106	113	130	210	182	229	317	241
Goshawk	0	3	13	7	9	37	38	24	67	59	79	31
Sharp-shinned Hawk	228	71	280	207	429	1719	1475	1954	1987	2603	2517	2824
Cooper's Hawk	23	2	18	8	8	58	60	56	65	48	116	65
Red-tailed Hawk	135	129	733	881	938	1276	1165	1020	2149	2831	3191	3572
Red-shouldered Hawk	3	26	31	44	78	142	325	158	341	226	242	243
Broad-winged Hawk	355	236	2606	5132	5940	7491	6082	6278	11476	7211	7729	4306
Rough-legged Hawk	0	3	0	5	8	9	2	2	2	5	10	37
Golden Eagle	0	2	4	11	13	21	15	17	16	29	34	31
Bald Eagle	0	2	3	10	6	25	30	19	21	16	22	23
Marsh Hawk	10	15	47	56	100	140	126	136	282	211	369	299
Osprey	6	10	110	59	219	379	355	265	297	421	398	444
Peregrine Falcon	0	0	5	4	13	10	13	13	6	16	15	17
Pigeon Hawk	0	0	3	4	2	13	17	10	8	14	9	7
Sparrow Hawk	2	16	69	35	89	199	257	226	241	240	314	239
Unidentified Hawks	13	23	60	67	85	170	129	173	97	98	141	93
Unidentified Eagles	0	0	0	0	0	1	0	0	0	0	0	0
TOTALS	775	564	4029	6676	8043	11803	10219	10561	17237	14257	15503	12473*
No. of observation days	14	9	20	32	39	54	55	58	56	73	98	100

*Includes one SWAINSON'S HAWK.

Vultures does not occur throughout the autumn with some local birds remaining in our area for much of the autumn season and others drifting southward while being replaced in our region by birds which have drifted southward into our area from further north. Certainly the great variation in the daily counts of Turkey Vultures presented in Tables two through 10 suggests that the so-called stable local population of non-migratory birds is, in fact, a mixture of resident and migratory birds slowly drifting through our area over a period of days and weeks. Although it is true that vultures cover many miles each day in their searches for food, our maximum simultaneous counts should fluctuate far less in numbers than they do. Moreover, if all of the Turkey Vultures in the Bake Oven Knob area are local non-migratory residents, they should be relatively easy to count because they are large conspicuous birds which are easily detected. One would expect considerably less fluctuation in our daily counts than in fact occur. Therefore, we tentatively conclude that a portion of our vulture population is migratory throughout the early season, but that such migrations are not dramatic and as easily detected as are those of other raptors. However, during late October and early November, clear-cut Turkey Vulture migrations sometimes are seen.

ACCIPITERS

The three hawks of the genus *Accipiter* which regularly pass Bake Oven Knob did so in good to record numbers during 1970 and 1971 although few Goshawks appeared in 1971. Our nearly complete daily coverage during peak migratory periods doubtless accounts for some of the "extra" birds tabulated.

TABLE 2

BAKE OVEN KNOB HAWK COUNT

AUGUST 1970

AUG	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Coop-er's Hawk	Red-tailed Hawk	Red-shoul-dered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Pere-grine Falcon	Pigeon Hawk	Spar-row Hawk	Unid. Hawks	TOTALS
1	No coverage																	
2	No coverage																	
3	No coverage																	
4	No coverage																	
5	No coverage																	
6	No coverage																	
7	No coverage																	
8	No coverage																	
9	Var. 0-15	7		2		3		16								3		31
10	SE 2-8	4		1		3		3										11
11	No coverage																	
12	No coverage																	
13	No coverage																	
14	No coverage																	
15	No coverage																	
16	SW 0-7	2				3	1	2								1		9
17	W 2-8	1		1		1		1										4
18	No coverage																	
19	ENE-S 6-10		1					1					2					4
20	Var. 0-9	6										1						7
21	NW 10-20	3				1		1					1			6	1	13
22	S 0-8	6				4												10
23	No coverage																	
24	NW 3-10	8				2		15			2	1	3			2	1	34
25	NNW 1-5	7				1		1										9
26	WSW 0-7																	0
27	No coverage																	
28	No coverage																	
29	WNW 2-15	5						15			2	1	2			8		33
30	Var. 0-4	2	1			2		2										7
31	NW 8-20	5		1		2		7			4					7		26
	TOTALS	56	2	5	0	22	1	64	0	0	8	3	8	0	0	27	2	198

TABLE 3

BAKE OVEN KNOB HAWK COUNT

SEPTEMBER 1970

SEPT	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Coop-er's Hawk	Red-tailed Hawk	Red-shoul-dered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Pere-grine Falcon	Pigeon Hawk	Spar-row Hawk	Unid. Hawks	TOTALS
1	WNW 5-10	4		1		1		9			2		4			1	2	24
2	NW 5-10			3				15			1						1	20
3	No coverage																	
4	No coverage																	
5	NW 4-15	3		3		13		69			2	5	11			10	5	121
6	NW 5-20	4	1	7	2	16		92			3		9			34		168
7	NW 0-10	9	1	6	1	8		62				7	7			8	1	110
8	SSE 0-15	5		3	1	1		60				6	2			1	1	80
9	No coverage																	
10	Var. 0-7	4		1				1					1					7
11	NW 0-20	4		6	1	1		201			2	1	5			14	1	236
12	E 0-12	20	1	3	2	13		153				2	1			5	3	203
13	SW 0-7	10		7		2		98				6	12				4	139
14	E 0-10			1				1				2						4
15	SSE 1-3	3		1				15										19
16	SW 0-12	4		5		2		43				1	8			6	5	74
17	SE 0-10	15		6		4		569			1	5	32			3	4	639
18	RAIN																	
19	W 2-20	5	1	15	1	13		435			1	4	27			31	4	537
20	SE 0-8	9		67	1	8		3636				24	30			2	2	3779
21	SW 0-5	6		86	1	1		449		1		15	12				1	572
22	W 0-10			60		2		851				5	5			7	1	931
23	No coverage																	
24	SE 0-15	11		88	1	2		375				14	12	1		18	1	523
25	Var. 0-5	2		58		1		278				5	17			11	3	375
26	Var. 0-15	6	1	96	7	8	1	74			1	23	51	1		8		277
27	No coverage																	
28	Var. 0-10	12		91	1	4		65				1	9			3	1	187
29	NNW 10-20	3		60	1	10		24					5			10	2	115
30	SE 0-5			22				4				2	1					29
	TOTALS	139	5	696	20	110	1	7579	0	1	13	128	261	2	0	172	42	9169

TABLE 4

BAKE OVEN KNOB HAWK COUNT

OCTOBER 1970

OCT	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Cooper's Hawk	Red-tailed Hawk	Red-shouldered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Pere-grine Falcon	Pigeon Hawk	Spar-row Hawk	Unid. Hawks	TOTALS
1	W 2-16	13		28	2	6	1	10				1	7			2	2	72
2	S 3-18	4		154		3		7				13	15	3		1	2	202
3	Var. 0-20	3	1	132	2	9		15				14	15	4		4	5	204
4	NW 5-20	4	3	395	14	14		9				6	19			49	3	516
5	W 0-10	4	1	169	14	43	2	3				9	6			7	3	261
6	SSE 1-5	6		129	2	17		14				24	14			8		214
7	Var. 0-5	8		232	12	18	1	12				18	10			2	11	324
8	Var. 0-6	4		81	1	12	7	11				9	6	1				132
9	E 3-20	16	1	57	6	47		2				19	8	1		2	4	163
10	ESE 2-8	7		8	1	11		2				8	3		2	3	4	49
11	ESE 5-12	3		15		3	1					3	3	1	1	1		31
12	FOG																	
13	SSE 3-6	4		57		5		1				6	7			1		81
14	S 5-10	1		31								1	3		2		2	40
15	RAIN																	
16	NW 10-20	2	9	52	9	272	1					1	4	1	1	12	2	366
17	NW 8-25	4	3	62	5	431	5			1		4	2			9	4	530
18	W 5-15	7		66	4	146	11					9	2	1	2	5	2	255
19	Var. 0-10	6	2	24	2	52	5			1		1	1					94
20	E 5-15	4	3	48	1	70	33			6		7					1	173
21	FOG & RAIN																	
22	RAIN																	
23	NW 8-18			1		6	3					1			1		1	13
24	NW 3-10	3		17	5	175	19			2		10	1				1	233
25	E 4-12	1		12		17	10					7				1	1	49
26	E 2-16	5		1	1	26	1					1				1		36
27	No coverage																	
28	E 2-12	1	1	2		13	3					2	1				4	27
29	Var. 3-15	2		6	3	60	18					10	1			2	12	114
30	ESE 3-15			7	1	190	5					7					2	212
31	E 5-15			2		68	6		2			14				1		93
	TOTALS	112	24	1788	85	1714	132	86	2	10	0	205	128	12	9	111	66	4484

TABLE 5

BAKE OVEN KNOB HAWK COUNT

NOVEMBER 1970

NOV	WEATHER Wind	Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Cooper's Hawk	Red-tailed Hawk	Red-shouldered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Peregrine Falcon	Pigeon Hawk	Sparrow Hawk	Unid. Hawks	TOTALS
1	ENE	0-4	4	1	8		64	35		1			2					8	123
2	NE	8-15				1	6							1					8
3	E	6-15		2			16	4					1						23
4	NE	3-10					13	7					1						21
5	NW	8-25		3	1	1	255	10			1		8				1	2	282
6	No coverage																		
7	SE	0-10	4		6		94	10			1		9					9	133
8	E	2-10	2	1	1	1	45	13		1	1		3		1		1		70
9	E	8-20		1	1	1	40	5			2		4						54
10	RAIN																		
11	FOG & RAIN																		
12	RAIN																		
13	RAIN																	1	16
14	NW	0-15		1			12	1			1								
15	RAIN																	2	426
16	NW	10-20		9	1	2	400	5		1	6								46
17	WNW	1-5		6	1	1	35	1			2							3	40
18	SE	5-10		2	4		27	3			1								
19	No coverage																		
20	RAIN																	2	48
21	W	0-16		7	1	1	31	3		1			2					1	73
22	Var.	6-25			1		66	2		2			1					1	61
23	WNW	10-20		1	2		55				1	1					1		69
24	WNW	15-25		4		3	57	1			2		1					1	14
25	NW	0-7		1			11	1											56
26	S	0-10		3			47	5		1									
27	No coverage																		
28	No coverage																		11
29	E	10-20		1			7	1			1		1					1	63
30	NNW	5-25		5	1		50	1		1	4								
	TOTALS		10	48	28	11	1331	108	0	8	23	1	33	1	1	0	3	31	1637

For Table 6, see p. 13

TABLE 7

BAKE OVEN KNOB HAWK COUNT

AUGUST 1971

AUG	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Cooper's Hawk	Red-tailed Hawk	Red-shouldered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Peregrine Falcon	Pigeon Hawk	Sparrow Hawk	Unid. Hawks	TOTALS
1	SW 15															1		1
2	No coverage																	
3	No coverage																	
4	No coverage																	
5	No coverage																	
6	No coverage																	
7	No coverage																	
8	No coverage																	
9	No coverage																	
10	No coverage																	
11	No coverage																	
12	No coverage																	
13	No coverage																	
14	Var. 0-10	2				1		1										4
15	NW 5-20	4		1		2		16								11		34
16	NW 3-10	2				1		26				1				2	1	33
17	No coverage																	
18	SW 6-8	4						3										7
19	No coverage																	
20	NE 5-10	3																3
21	W 0-7	6															2	8
22	WNW-WSW 6-9										1							1
23	NW 5-20	4		2		3		20			2					5		36
24	W 4-12	2																2
25	S-SW 0-10	8			1	6		19					2					36
26	No coverage																	
27	RAIN																	
28	W-WSW 12					2										1		3
29	NW 2-15	2		1		3		3			2		4				1	16
30	W 0-15	5				7		13			3		6			12	2	48
31	SE 3-15	4		1		4		20					2			5		36
	TOTALS	46	0	5	1	29	0	121	0	0	8	1	14	0	0	37	6	268

TABLE 8

BAKE OVEN KNOB HAWK COUNT

SEPTEMBER 1971

SEPT	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Coop-er's Hawk	Red-tailed Hawk	Red-shoul-dered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Pere-grine Falcon	Pigeon Hawk	Spar-row Hawk	Unid. Hawks	TOTALS
1	S-SE 2-5	3				2		51				2	5					63
2	No coverage																	
3	SE 0-3	4																4
4	SW 0-8	2				4		49			1	8	18			2		84
5	NW-SW 0-3	5				7		49			3	1	7			9	1	82
6	Var. 0-5	2		2		9		89			3	6	7			6	2	126
7	S-SSW 10-20	3				7		18								7		35
8	No coverage																	
9	NW 0-7	7				1		42								2		52
10	E 5-15	3		3			1	16				5	18			1		47
11	S-SE 6-12	1		1		2		15				4	9				1	33
12	S-E 0-20	3		1		1		14				5	31			13	1	69
13	SE (FOG) 5-15																	0
14	W 3-10	2		2		1		5				5	2			9		26
15	NW 0-10	5		3		4		296				2	11			14	2	337
16	E-SE 0-8	9		13	1	3		377				5	8			2	3	421
17	E 3-10	7						491				9	11			1	3	522
18	NW 3-20	1		38	1	7		1147			3	4	85	1		45		1332
19	E 3-22			13				196				2	6				1	218
20	E-SE 3-22	8		33		7		704				10	18	1		5	1	788*
21	NW 10-20			25	3	12	1	572			1		14			11		639
22	No coverage																	
23	No coverage																	
24	N 0-15	13		1	1											1	2	18
25	WNW 0-8			16	1			13				1	5			3		39
26	RAIN																	
27	RAIN																	
28	RAIN																	
29	SE 4-15	10		114	2	2	1	29				4	24				2	188
30	E 0-10	3		81		7		5				13	21	1		6	3	140
	TOTALS	91	0	346	9	76	3	4178	0	0	11	86	300	3	0	137	22	5263*

* Includes one SWAINSON'S HAWK at 2:04 p.m., EST.

TABLE 9

BAKE OVEN KNOB HAWK COUNT

OCTOBER 1971

OCT	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Coop-er's Hawk	Red-tailed Hawk	Red-shoul-dered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Pere-grine Falcon	Pigeon Hawk	Spar-row Hawk	Unid. Hawks	TOTALS
1	No coverage																	
2	RAIN																	
3	E 2-15	8		93	6	12		2		1		4	19	3		10	1	159
4	E-ESE 5-20	9		12		2						7	8	2			1	41
5	S-W 0-5	4		43		1						6	8	3	2			67
6	NW 8-30	2		180	1	2						5	3	1		13		207
7	No coverage																	
8	NW 3-10	3		67	4	3	2	2				4	1					86
9	Var. 2-10	2		398	4	5	2	1	1			17	24	2	1	4	4	465
10	RAIN																	
11	W 3-15	16	1	440	6	10							7	1	1	4	4	490
12	W 3-15	2	3	473	8	18	4					5	8		1	19	2	543
13	E 5-20	3	3	188	2	15	3	1				17	7	1	2	1	1	244
14	SE 0-10	7		166	2	16	2			1		20	9				1	224
15	W 0-8	7		54	1	12	8					1	5			1	1	90
16	E 0-10	7		51	4	9	18			1		5	13			2	7	117
17	SE 5-15	7		46	1	36	16			1		7	5			3	9	131
18	Var. 0-14	5		9	1	16	7					4	1			5	1	49
19	SE 10-20	1		7		9	1					5				2		25
20	E 5-12																	0
21	Var. 0-3	3		19		23	8			1		5	2				9	70
22	SE-SW 1-5	2		14		3	1					4						24
23	E 0-5			14		8	1						1				3	27
24	RAIN																	
25	RAIN																	
26	NW 15-30	2		10	2	24	2					1		1			1	43
27	E-SE 0-8	1		15		2	1					5						24
28	W 2-5			37	1	29	12					3	2					84
29	NW 0-5			23	3	26	10					4	1				2	69
30	Var. 0-7	2		25		68	7					11	2				2	117
31	FOG & RAIN																	
	TOTALS	93	7	2384	46	349	105	6	1	5	0	140	126	14	7	64	49	3396

TABLE 10

BAKE OVEN KNOB HAWK COUNT

NOVEMBER 1971

NOV	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Coop-er's Hawk	Red-tailed Hawk	Red-shoul-dered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Pere-grine Falcon	Pigeon Hawk	Spar-row Hawk	Unid. Hawks	TOTALS
1	RAIN																	
2	SW 0-7	4		1		2						3						10
3	NW 0-15		1	4	1	4	1		1	1		18				1	1	33
4	W 10-20		1	31	3	506	8			7	1	5						562
5	SE-SW 2-10	2	2	9		256	22		1			2	1				1	296
6	SE 5-20	2	1	17		343	34		2	3		24	2				1	429
7	NW 5-30	2	2	9	1	394	11		1	4		2	1				6	433
8	NW 5-20		1	7		409	18			2		3						440
9	WSW 5		1			62	4		7			1						75
10	No coverage																	
11	NW 2-20		3	2	1	328	10		4			2					2	352
12	SE-SW 0-7				1	26			1	1								29
13	Var. 0-10			1		20	2					1						24
14	SE 0-15	1	4	2	1	204	11			1		2						226
15	RAIN																	
16	NW 10-15		2			165	1			2								170
17	No coverage																	
18	SE-W 1-10			4		38		1	2									45
19	FOG & RAIN																	
20	W-S 0-10					32	1			1		1					1	36
21	W-NW 5-20					27	1		1								1	30
22	NNW 5-45		2		1	156	2		2	3		4					3	173
23	N-NW 5-20					20	4			1								25
24	NE 5-15					43	1		3			1						48
25	RAIN & SNOW																	
26	NW 0-15		1	1		20	2											24
27	RAIN																	
28	NW 0-20		1	1		57	2		7			2						70
29	RAIN & SNOW																	
30	No coverage																	
	TOTALS	11	22	89	9	3112	135	1	32	26	1	71	4	0	0	1	16	3530

TABLE 6

BAKE OVEN KNOB HAWK COUNT

DECEMBER 1970

DEC	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Cooper's Hawk	Red-tailed Hawk	Red-shouldered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Peregrine Falcon	Pigeon Hawk	Sparrow Hawk	Unid. Hawks	TOTALS
1	ESE 5-10					1										1		2
2	No coverage																	
3	No coverage																	
4	No coverage																	
5	W 0-5																	0
6	NW 15-30					13												13
	TOTALS	0	0	0	0	14	0	0	0	0	0	0	0	0	0	1	0	15

TABLE 11

BAKE OVEN KNOB HAWK COUNT

DECEMBER 1971

DEC	WEATHER Wind Speed	Turkey Vulture	Gos-hawk	Sharp-shinned Hawk	Cooper's Hawk	Red-tailed Hawk	Red-shouldered Hawk	Broad-winged Hawk	Rough-legged Hawk	Golden Eagle	Bald Eagle	Marsh Hawk	Osprey	Peregrine Falcon	Pigeon Hawk	Sparrow Hawk	Unid. Hawks	TOTALS
1	No coverage																	
2	No coverage																	
3	No coverage																	
4	NW 2-15					5			3		3	1						12
5	NE-SE 5-25		2			1			1									4
	TOTALS	0	2	0	0	6	0	0	4	0	3	1	0	0	0	0	0	16

GOSHAWK (ACCIPITER GENTILIS)

Although the 79 Goshawks counted at the Knob during 1970 is our highest seasonal count on record, there is little doubt that our increased observational coverage accounts for this new record. During a true Goshawk invasion year many more birds would have been counted. Nevertheless, 16th October and 16th November, each with nine birds, were excellent days. In contrast, 1971 was a very poor Goshawk year. Only 31 were counted suggesting that the species may have experienced a population crash in the northeast. There were no outstanding Goshawk flights on any day throughout the season, four counted on 14 November being the largest number seen on any single day.

SHARP-SHINNED HAWK (ACCIPITER STRIATUS)

Our 1970 count of 2,517 Sharp-shinned Hawks is the third highest count on record for Bake Oven Knob, exceeded only by the 2,824 Sharpies counted during 1971, and the 2,603 counted during the autumn of 1969. On a relative basis, these comparative statistics demonstrate that somewhat fewer Sharpies passed the Knob during 1970, when 98 observation days were logged, than during 1969 with 73 observation days. Doubtless, the slight 1970 decrease merely represents a normal yearly fluctuation.

October of 1970 produced two exceptional Sharpie flights, each with more than 200 birds. The 4th of October was particularly notable with a flight of 395 Sharp-shins counted. Prior to 1971, this was the largest single flight of Sharp-shinned Hawks on record for Bake Oven Knob, the previous high record being 293 counted on 10 October 1965. Sunday, the 4th of October, was a clear day with moderate cloud cover, cool air temperatures, and northwest winds at 5 to 20 miles per hour. It was, in short, one of those superb October days which hawk watchers dream about but seldom experience.

The second exceptional Sharpie flight of the 1970 season occurred on the 7th of October when 232 birds were counted. Fred Tilly, the observer, noted that many hawks were at tree-top level, all generally low and nearly all to the south of the ridge—many at marginal ranges. This would be expected on a day with very light and variable winds.

During the autumn of 1971, Sharp-shinned Hawk flights were spectacular and our count of 2,824 is the highest yet recorded. In addition, we enjoyed three days when all previous daily records were exceeded. On 9 October, for example, 398 Sharpies were counted by Fred Mears and others. This was a day of light, variable winds swinging from the east to the south to the southwest and never exceeding ten miles per hour. There was a 100 percent cloud cover, fairly cool air temperatures, and limited visibility. Observations were made from the South Lookout. Exciting as this day was, even more spectacular Sharpie flights were yet to appear.

The 11th of October was a day of fairly good visibility, variable cloud cover, moderate west winds and slightly cool air temperatures. The Sharpie flight continued throughout the day resulting in a final count of 440 individuals—the largest daily flight on record up to that date. The record didn't stand for long. On the 12th of October, Ray Hendrick, the MacClays, and

Bob, Jeff and Rich Moser were stationed on the North Lookout (Point). Moderate westerly winds prevailed along with little cloud cover, excellent visibility and cool air temperatures. The day was perfect and 473 Sharp-shinned Hawks were counted—the largest daily Sharpie flight on record for the Knob. It is perhaps significant that an impressive flight of Canada Geese also passed Bake Oven Knob on 12 October; 51 flocks were counted for a combined total of 3,256 geese. One flock contained a Snow Goose, another two Snow Geese, and a third contained a bird which may have been a White-fronted Goose. The latter is highly questionable but nevertheless of interest.

COOPER'S HAWK (ACCIPITER COOPERII)

The 116 Cooper's Hawks counted at the Knob in 1970 also represents a new high seasonal total, doubtless resulting in part from our increased observational coverage. Despite this factor, the 1970 Cooper's Hawk count, more than double the 1969 count and nearly double the 1971 count, was higher than would be expected for this species which never appears in large numbers along the Kittatinny Ridge. During 1969, for example, when 25 fewer observation days were made at the Knob as compared with 1970, only 48 of these accipiters were counted. It is quite impossible, however, to attach any particular significance to the increased 1970 count, at least at this time. In 1971, 65 Cooper's Hawks were counted.

BUTEOS

The four soaring hawks representing the genus *Buteo* account for the bulk of the raptors counted during autumn migration at Bake Oven Knob. Good numbers of most of these birds were counted during 1970 and 1971, as described in more detail below.

RED-TAILED HAWK (BUTEO JAMAICENSIS)

Among the soaring hawks, the Red-tail is second only to the Broad-winged Hawk in terms of abundance as an autumn migrant. Once again, the fact that the 3,191 Red-tails which passed the Knob during 1970 represent our second highest seasonal count for this species reflects the increased number of observation days. However, the count is not too much higher than the 1969 seasonal total. Thus 1970 was neither an exceptionally good nor an exceptionally poor year for Red-tails migrating past the Knob. The Red-tail season was, however, somewhat above average.

On a daily basis, there were some remarkable flights recorded, two of which set new high records for this species for the Knob. Our second largest Red-tail flight on record occurred on 17 October 1970, when an astonishing flight of 431 of these fine soaring hawks passed the Knob! In addition, 5,511+ Canada Geese crossed our skies that day! The second exceptional 1970 Red-tail flight occurred on 16 November when 400 Red-tails passed along with six adult Golden Eagles and 177 loons! Both of these outstanding days had brisk northwest winds and cold air temperatures following the passage of cold fronts across our region.

Spectacular as were some of the 1970 Red-tail flights, the 1971 flights were extraordinary. Nobody who witnessed them will long forget them. Indeed, the 3,572 Red-tails tabulated during 1971 is the largest seasonal total yet recorded for Bake Oven Knob.

The period 4 November through 11 November was particularly outstanding. Brisk westerly winds at ten to 20 miles per hour prevailed on 4 November and 562 hawks appeared of which 506 were Red-tails. Seven Golden Eagles also were seen from the Knob that day. On 5 November the wind shifted from the west to the southeast at two to ten miles per hour and another 256 Red-tails were counted. Southeast winds at five to 20 miles per hour prevailed on 6 November and observers on the South Lookout, including field trip members from the Academy of Natural Sciences of Philadelphia, enjoyed 429 hawks including 343 Red-tails, three Golden Eagles and an excellent variety of other species. On 7 November the wind again swung around to the northwest at five to 30 miles per hour and another exciting flight of 394 Red-tails occurred. The wind held from the northwest on 8 November and 409 more Red-tails passed the Knob. On 9 November, however, a light west-southwest wind occurred and only 62 Red-tails were seen. There was no coverage on the Knob the next day, but on 11 November a northwest wind again brought another 328 Red-tails. The total of Red-tailed Hawks seen during this eight-day period is 2,298 individuals or about 65 percent of the entire season's Red-tail total.

RED-SHOULDERED HAWK (BUTEO LINEATUS)

The 1970 count of 242 Red-shouldered Hawks was about average. We never record large numbers of this species at the Knob during autumn which has always been somewhat of a puzzle to me. Probably there are far fewer areas of swampy woodland, the habitat in which Red-shouldered Hawks nest, scattered in the northeast than there are dry forested areas more suitable for the smaller, and more abundant, Broad-winged Hawk. Both species, nevertheless, are classified as woodland buteos. They merely occupy similar ecological niches in slightly different forest habitats. Habitat, therefore, seems to be the limiting factor controlling the numbers of each species. The 1971 Red-shouldered Hawk count (243) also was average.

BROAD-WINGED HAWK (BUTES PLATYPTERUS)

The Broad-wing season in mid-September is keenly anticipated by all hawk watchers, and the 1970 Broad-wing migration at Bake Oven Knob was the second best season on record for this station. It was topped only by the spectacular migrations which occurred during September of 1968. Surprisingly, only one day during 1970 produced a count exceeding 1,000 birds whereas other lookouts in the New York State-New Jersey-Pennsylvania area had several days with Broad-wing counts exceeding 1,000 birds. Our peak day was 20 September when 3,636 Broad-winged Hawks were counted. Southeast winds prevailed during most of the day, with wind speeds ranging from zero to five miles per hour, then increasing sharply to 20 to 45 miles per hour at 1400 hours. Air temperatures were below normal reaching a high of about 70° F. at 1300 hours. The percent cloud cover was, at no

time, more than 45 percent. Heintzelman recorded the following observations in his notes: "We arrived at the South Lookout at about 0800 hours, EST, and at once began seeing Broad-wings rising on thermals from the forested slopes below the South Lookout. Most of the early morning flight was at a moderate elevation along the south slope of the ridge and directly over our lookout, but at noon birds began appearing in glides out of thermals along the north slope of the ridge as well. At about 1400 hours, EST, the cloud cover increased from 5 percent to about 20 percent, and we began seeing hundreds of Broad-winged Hawks rising on thermals in front of our lookout half a mile or a mile away and then gliding toward us in seemingly endless strings of birds spread out across the northeastern sky. Huge numbers of Broad-wings also were using thermals developing over the valley immediately north of the ridge, and as these birds broke out of thermals and began their downward glide they were far out over the north valley, often at eye-level with us. No doubt we may have missed many birds, but we nevertheless counted 2,019+ Broad-wings between 1400 and 1500 hours, EST.

"As I watched the birds and their style of flight, it became obvious that the increased cloud cover began reducing the amount of thermal activity developing, and the birds were being forced to fly lower and lower — a pattern which continued throughout the remaining hours of today's flight. Often hundreds of Broad-wings were flying within a few feet of us as we stood watching them from the South Lookout."

Once again, this illustrates the complex migratory movements of Broad-winged Hawks caused primarily by the unusual dependency which these small woodland buteos have upon thermal bubbles. It is this use of thermals which permits the hawks to make broad, cross-country migrations coupled with *limited* use of prominent topographic features as leading lines. The marked yearly fluctuations in autumn counts of Broad-wings passing Bake Oven Knob, Hawk Mountain, and other hawk lookouts in the northeast directly reflect this complicated situation. This is one of the primary reasons why the use of Broad-wing counts from any single hawk lookout can not be used as an index to trends in their populations in the northeast.

In vivid support of this fact is the 1971 Broad-winged Hawk count from Bake Oven Knob. Miserable weather prevailed throughout the entire Broad-wing season and visibility from the lookouts often was restricted to a mile or two as haze and fog hung over the ridge. There may have been thousands of birds moving through the area but we were unable to see them and our seasonal total of 4,306 Broad-wings is one of the lowest on record. Only one day, 18 September, exceeded one thousand birds as 1,147 Broad-wings were counted. A single Broad-wing observed by Raymond Hendrick on 18 November 1971 is our latest record for this species for Bake Oven Knob.

SWAINSON'S HAWK (BUTEO SWAINSONI)

The outstanding hawk of the 1971 season, indeed of our entire hawk watching effort at Bake Oven Knob, was the appearance of a Swainson's Hawk at the South Lookout on 20 September 1971. The bird was observed critically,

in comparison with passing Broad-winged Hawks, and was independently identified by Maurice Broun, Edward Graham, Clifford Jones and Robert MacClay. Full details of this important record are presented by Edward Graham in a note elsewhere in this issue of *Cassinia.*

ROUGH-LEGGED HAWK (BUTEO LAGOPUS)

The ten Rough-legged Hawks counted at the Knob during 1970 represent our second highest seasonal count, although nine were counted during the autumn of 1965, and eight appeared during 1964. The species is, at best, a straggler from the arctic and sub-arctic and never occurs in large numbers along the hawk ridges of eastern Pennsylvania. Of the 10 birds counted during 1970, five were light phase birds and five were in the dark phase.

Normally, the Rough-legged Hawk is a very rare bird at Bake Oven Knob, yet unprecedented numbers appeared during the autumn of 1971 — evidently the result of a low in the population cycle of lemmings in the arctic. An incredible 37 of these interesting hawks migrated past the Knob, giving observers unexpected thrills. We have information on the color of 35 of these birds, 16 being in the dark phase and 19 being light phase birds.

EAGLES

The two eagle species which regularly migrate past Bake Oven Knob during autumn, the Golden and the Bald, have considerable environmental significance since they appear to be important biological indicators reflecting the seriousness of DDT pesticide pollution in the environment. That the Bald Eagle has taken on this role is common knowledge. The exact role of the Golden Eagle is, at present, less clear and some of the data for this species appear to be contradictory.

GOLDEN EAGLE (AQUILA CHRYSAETOS)

The 1970 Bake Oven Knob count of 34 Golden Eagles was the highest on record for this station. In 1971, 31 Golden Eagles passed the Knob. Curiously, daily observations at nearby Hawk Mountain Sanctuary produced a 1970 seasonal count of only 25 Golden Eagles. Unquestionably, there are more eagles (Golden and Bald) crossing eastern Pennsylvania in autumn than are counted at any single lookout.

This places some doubt on the validity of Spofford's (1971: 3-7) analysis of Hawk Mountain eagle counts which purportedly demonstrates that a decline has occurred in the numbers of Golden Eagles in the northeast. Spofford claims that DDT is causing the thin eggshell syndrome in Golden Eagles nesting in the Appalachians, thereby markedly lowering the breeding success of these birds, and that this lowering of breeding success is reflected in five year averages of Golden Eagles counted passing Hawk Mountain. If this were true, one would expect a marked drop in the number of sub-adult and immature Golden Eagles seen during autumn at Bake Oven Knob (and Hawk Mountain). Precisely this type of change in the ratio of adults to immatures has occurred in the Bald Eagle population which is affected by the DDT-caused thin eggshell syndrome and is reflected in the count of Bald Eagles passing Hawk Mountain and Bake Oven Knob. However, the age

ratios of Golden Eagles passing Bake Oven Knob (Table 12) has not dropped markedly during the past decade.

TABLE 12

Age Ratios of
Golden Eagles Passing Bake Oven Knob

Year	No. Adults	Percent	No. Sub-adults or Immatures	Percent
1961	1	50.0	1	50.0
1962	2	50.0	2	50.0
1963	7	63.5	4	36.5
1964	7	53.8	6	46.2
1965	15	71.5	6	28.5
1966	12	80.0	3	20.0
1967	12	70.6	5	29.4
1968	8	50.0	8	50.0
1969	21	72.5	8	27.5
1970	24	70.6	10	29.4
1971	13	41.9	18	58.1
TOTALS	122	63.2	71	36.8

The preceding data show that 36.8 percent of the Golden Eagles counted at Bake Oven Knob during autumn were sub-adults or immatures. However, the first four years of observation (particularly 1961 and 1962) are based upon limited days of field study and could be biased. Nevertheless, when the data are analyzed collectively on a five or six year basis, the variation in the percentage of sub-adults and immatures does not vary too greatly from the average for the entire decade. During the period 1961 through 1965, for example, about 37.2 percent of the birds seen at the Knob were sub-adults or immatures, whereas during the period 1966 through 1971 about 36.6 percent of the Golden Eagles were sub-adults or immatures.

On the other hand, Spofford's five year averages of the Golden Eagle data from Hawk Mountain do show a marked drop in the number of eagles seen at this station. This would *seem* to indicate a decline in the population of Golden Eagles in the Appalachians. In fact, this may be little more than an artifact of the method of analyzing the Hawk Mountain data or a reflection of local differences in Golden Eagle migration routes from year to year.

Of course, the full significance of the above discussion is not clear, but the next five years could prove crucial in detecting a marked shift in the age composition of the Golden Eagles seen at Bake Oven Knob if Spofford's thesis should be correct. Thus a continuing program of monitoring the age composition of migrating eagles is essential at both Bake Oven Knob and Hawk Mountain. A pesticide caused breeding failure of Golden Eagles nesting in the Appalachians presumably would cause a marked shift in the age composition of the population of these birds just as it has in the Bald Eagle population. Autumn counts of migrating Golden Eagles passing Bake Oven Knob and Hawk Mountain presumably would reflect this shift more readily than a change in the actual population level of the species.

BALD EAGLE (HALIAEETUS LEUCOCEPHALUS)

A total of 22 Bald Eagles, 16 adults and six immatures, was counted at Bake Oven Knob during the 1970 season. Immatures accounted for 27.3 percent of the sample — a proportion higher than would be expected now (Table 13). At Hawk Mountain, Nagy (1971) reported 28 Bald Eagles for 1970 of which six (21.4 percent) were immatures. During the 1971 season at Bake Oven Knob, 23 Bald Eagles were counted, 19 adults and four immatures. Thus a mere 17.4 percent of the Bald Eagles seen during 1971 were immatures.

This species is now endangered as a result of widespread nesting failures caused by DDT pollution in the environment. Compared with the age ratio figures for the Golden Eagle (Table 12), the figures for the Bald Eagle presented in Table 13 provide a vivid contrast. Only 18.6 percent of the Bald Eagles passing Bake Oven Knob during the past 11 years were immatures, whereas 36.8 percent of the Golden Eagles passing the Knob during this same period were sub-adults or immatures.

TABLE 13

Age Ratios of
Bald Eagles Passing Bake Oven Knob

Year	No. Adults	Percent	No. of Immatures	Percent
1961	2	100.0	0	0.0
1962	2	66.7	1	33.3
1963	9	90.0	1	10.0
1964	5	83.3	1	16.7
1965	18	72.0	7	28.0
1966	25	83.3	5	16.7
1967	17	89.4	2	10.6
1968	17	80.9	4	19.1
1969	14	87.5	2	12.5
1970	16	72.7	6	27.3
1971	19	82.6	4	17.4
TOTALS	144	81.4	33	18.6

During the first five years of the decade, 1961 through 1965, immatures accounted for 21.7 percent of the Bald Eagles seen, whereas during the next six years, 1966 through 1971, only 17.5 percent of the Bald Eagles observed passing Bake Oven Knob were immatures. These low percentages of immatures clearly indicate a population of birds whose reproductive success is failing rapidly, as nesting studies are commonly showing for the Bald Eagle. As with the Golden Eagle, however, a continuous program of monitoring the age ratios of these birds at the various hawk lookouts, Bake Oven Knob included, will be essential during the next five years or longer. Such information will not only be valuable in evaluating the survival potential for the Bald Eagle — but also will be essential to continue to evaluate Spofford's thesis that Golden Eagle counts made during the autumn migration reflect the population level of the species in the northeast.

MARSH HAWK (CIRCUS CYANEUS)

The 1970 count of 369 Marsh Hawks passing Bake Oven Knob also was the highest seasonal count on record, our second highest count being 299 tabulated during 1971. It is difficult to account for the unusually large numbers of these birds which appeared during 1970, although Nagy (1971) also reported the highest Marsh Hawk count on record for Hawk Mountain, 495 birds. However, in view of the erratic flight pattern of this species, it is not too surprising to note the considerable differences between the counts from the two locations. Doubtless, many birds drifted onto, or away from, the Kittatinny Ridge between these two stations.

On a daily basis, the 1970 season produced three days of particular note. On 20 September, 24 Marsh Hawks were counted passing the Knob — the highest count for a single day on record. This count was equalled on the 6th of October. Earlier, on the 26th of September, 23 Marsh Hawks were seen passing Bake Oven Knob. On 6 November 1971, 24 Marsh Hawks again passed the Knob — the highest daily count for the 1971 season. These four days represent the highest daily Marsh Hawk counts to date.

OSPREY (PANDION HALIAETUS

Ospreys continue to present extremely puzzling problems for hawk researchers. For example, our 1970 Osprey count at Bake Oven Knob was 398 birds — our third highest count on record. At Hawk Mountain, Nagy (1971) reported 600 Ospreys for the 1970 season — their highest count on record. Even more fantastic, the 1971 Bake Oven Knob hawk count produced 444 Ospreys — our highest count ever. Our second highest count, 421 birds, occurred during 1969. Clearly, enormous numbers of these birds are appearing along the hawk ridges of eastern Pennsylvania during autumn at the very time that this species is experiencing disastrous reproductive failures on the breeding grounds in the eastern United States. There must be some logical explanation to this seemingly inconsistent situation. Heintzelman (1970b) presented speculation about one possible cause which might account for the sharp increase in migrating Ospreys passing Hawk Mountain and Bake Oven Knob during recent years, but it remains for laboratory investigators to confirm or refute the hypothesis. At the moment, the facts are still far from clear, and a continued monitoring program during autumn is essential until this situation is adequately understood.

FALCONS

Of the three species of falcons which migrate past Bake Oven Knob during autumn, only the Peregrine Falcon has to date exhibited a disastrous population crash. It is officially considered as endangered and unquestionably will become extinct unless the remaining adult birds can again establish successful breeding populations in the northeast. On the other hand, there is considerable room for concern regarding the remaining two species — the Pigeon Hawk and the Sparrow Hawk. Recent investigations have shown that both are not only susceptible to the effects of DDT pollution (Fox, 1971; Porter and

Wiemeyer, 1969), the intermediate trophic level species, the Pigeon Hawk, actually is showing the typical thin eggshell syndrome in the wild which preceded the population crash of the Peregrine Falcon (Fox, 1971).

PEREGRINE FALCON (FALCO PEREGRINUS)

The counts of migrating Peregrine Falcons along the Kittatinny Ridge are relatively meaningless since this is not an important falcon flyway. Nevertheless, 15 Peregrines were counted at Bake Oven Knob during 1970. This is one less than was counted during 1969, but a few more than have appeared during some recent years. We made an intensive effort to try to age all Peregrines observed during 1970, but this was possible for only ten of the 15 birds seen. Of these ten birds, two (20.0 percent) were immatures.

During 1971, 17 Peregrine Falcons were counted passing Bake Oven Knob. This is our highest Peregrine count to date. We are unable to determine age on five of these birds. Of the remaining 12, only one (8.3 percent) was immature. It is unfortunate that the geographic origin of the Peregrines seen along the Kittatinny Ridge during autumn is unknown. It seems likely that they represent the geographic race *Falco peregrinus anatum,* however.

PIGEON HAWK (FALCO COLUMBARIUS)

The nine Pigeon Hawks tabulated during our 1970 hawk watch was a 35.8 percent decrease from the 1969 count, but these figures are relatively meaningless since few Pigeon Hawks ever use the Kittatinny Ridge as a migration route. The Atlantic coastline is much more important as a falcon flyway. During 1971 only seven Pigeon Hawks were counted at the Knob.

SPARROW HAWK (FALCO SPARVERIUS)

Our count of 314 Sparrow Hawks for 1970 represents our highest seasonal count on record although the increased observational coverage during 1970 doubtless is partly responsible for the high count. Only 240 Sparrow Hawks were counted during 1969, and our second highest seasonal count, 257 birds, occurred in 1966. However, 1970 saw us establish a new daily high count for the Sparrow Hawk. On 4 October a total of 49 Sparrow Hawks passed the Knob. Although only 239 Sparrow Hawks were counted during the 1971 season, our second largest daily flight on record (45 birds) occurred on 18 September 1971.

ACKNOWLEDGMENTS

The outstanding success of the 1970 and 1971 Bake Oven Knob hawk counts was directly related to the excellent cooperation which we received from a number of observers who responded to our appeals for assistance in helping to make the daily counts. "Official" observers who participated in the 1970 and/or 1971 counts include Arthur H. Bergey, Alan Brady, Herb Douglas, Tom Fitzpatrick, Edward W. Graham, Robert L. Haines, Raymond R. Hendrick, Benjamin C. Hiatt, Joseph A. Jacobs, Anne MacClay, Fred Mears, Ivan Morrin, August A. Sexauer, Doris and Gerry Steffey, Fred Tilly, Jane Tobias, Charles E. Wonderly and Ken Zindle. Dozens of other people also visited the Knob from time to time and assisted in the hawk counts. To

all of these people we express our most sincere appreciation for this invaluable assistance.

At the same time, we make a special plea for more assistance on future hawk counts. Our goal is daily coverage throughout the period September through November, and this can only be achieved by having a number of observers agreeing to take the count on assigned days. We urge you to volunteer for a few days of assigned coverage each season and thereby assure the complete success of this increasingly valuable project.

LITERATURE CITED

Fox, G. A.
1971 Recent Changes in the Reproductive Success of the Pigeon Hawk. *J. Wildlife Management,* 35: 122-128.

Heintzelman, D. S.
1969a Autumn Birds of Bake Oven Knob. *Cassinia,* 51: 11-32.
1969b The Black Vulture in Pennsylvania. *Pa. Game News,* 40 (5): 17-19.
1970a Bake Oven Knob Autumn Hawk Migration Observations (1957 and 1969). *Cassinia,* 52: 37.
1970b Speculation on DDT and Altered Osprey Migrations. *Raptor Research News,* 4: 120-124.

Nagy, A. C.
1970 Curator's Report. News Letter to Members No. 42. Hawk Mt. Sanctuary Assn., Kempton, Pa.
1971 1970 Curator's Report (and Tables on pages 14-19). News Letter to Members No. 43. Hawk Mt. Sanctuary Assn., Kempton, Pa.

Porter, R. D. and S. N. Wiemeyer
1969 Dieldin and DDT: Effects on Sparrow Hawk Eggshells and Reproduction. *Science,* 165 (July 11): 199-200.

Spofford, W. A.
1971 The Breeding Status of the Golden Eagle in the Appalachians. *American Birds,* 25: 3-7.

Bureau of Science
New Jersey Museum, Trenton, New Jersey 08625
and 625 Schuylkill Street,
Cressona, Pennsylvania 17929