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Isle Royale Beaver Studies 1990

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Isle Royale Beaver Studies -- October 1990

Introduction

Beaver studies were conducted by Philip C. Shelton and Douglas W. Smith from 15-24 October 1990. The major focus of this work and the subject of this report was an aerial survey of active beaver colonies conducted by both workers October 16 and 19. Shelton also visited, on foot or by boat, 26 sites active in the fall of 1990, and live-trapped seven beavers at two colonies. None of the 28 animals marked in 1988 were recaptured, and no abnormal physical characteristics were noted.

Adverse weather and schedule limitations hampered the 1990 aerial survey. Total flying time was nine (9) hours five (5) minutes, compared to the 12 to 16 hours normally flown. Extrapolation from the partial count and comparison with previous counts enabled a reasonable estimate of the beaver population in fall 1990. A total of about 176 colonies is estimated, compared with 200 in 1988, indicating a decrease of about 12 percent for this period (Table 1).

The decrease most likely resulted from continued wolf predation coupled with decreasing availability of preferred beaver foods. Although the number of wolves on the island during this period was only 12-15 (Rolf O. Peterson, annual report, 1989-90), the number of potential beaver-hunting units, each consisting of one or two wolves, may have been as high as during times when there were two or three times as many wolves, but the wolves were in larger packs that spent more of their time hunting moose.

Methods

The 1990 aerial survey was flown by Joe McHenry of the Ely unit, Superior National Forest, in a DeHaviland DHC-2 "Beaver." Shelton observed from the right front seat, with Smith immediately behind on the same side. Communication by headsets with voice-activated microphones facilitated coordination. Shelton chose the flight pattern, following procedures established on previous counts. On the first day, Shelton and Smith communicated information on observations, but on the second day no communication took place between observers in an attempt to maintain independence for comparison. McHenry, who had had extensive experience spotting beaver colonies from aircraft in Alaska, occasionally shared information with both observers, although Smith may have been disadvantaged by a poorer quality headset. Altitudes ranged from about 200 to 500 m above ground level, with 300 m being optimum. On the first flight of October 16, airspeed was about 125 kph. On request from Shelton, the plane was slowed to about 110 kph for the second flight on that day. McHenry was reluctant to fly at the slower speed, and on October 19 the speed used was again about 125 kph.

We flew four (4) hours 15 minutes October 16, but observing conditions were poor: many leaves were still on the trees and there was bright sun, making extreme contrast between sunlight and shadows, which made beaver food caches difficult to see except in the 1936 burn. On the first flight (1:36), in which the area north of the Greenstone Ridge and northeast of McCargoe Cove and Chickenbone Lake were covered, speed was also a factor, as mentioned above. The second flight (2:38) covered the area north of the Greenstone Ridge from McCargoe Cove and Chickenbone Lake, to the southwest end of Lake Desor, then moved to the 1936 burn area between Chippewa Harbor and Moskey Basin.

High winds and rain precluded flight on the 17th. Rain turned to snow late in the afternoon of the 17th, and by morning of the 18th, 0.2 m of snow lay on uplands away from the warming influence of Lake Superior, with 0.12 to 0.15 m close to the lake. High winds again prevented flying on the 18th. The 19th brought light winds and a high, thin overcast. Light was ideal for beaver counting (bright sun on this snow would have made it impossible to get any useful data), but snow covered many food piles and houses, and some ponds were completely frozen, making observation difficult. Only a few houses had fresh black mud on the snow-covered houses. No appreciable melting occurred before we flew on the 19th.

We were able to fly four (4) hours 50 minutes on the 19th, first recounting the area south of Moskey Basin, but extending the count lines both northeast and southwest to cover the entire area northeast of Siskiwit Lake and south of the Greenstone Ridge, then covering the area north of the Greenstone Ridge from 5 km southwest of Lake Desor to the southwest end of the island, all of Grace Creek, and then all the area from the southwest end of Siskiwit Bay to the northeast end of Siskiwit Lake on the south side of the Greenstone Ridge.

The area not counted was a block of about 20 km² southwest of Lake Desor and north of the Greenstone Ridge, and the entire south corner of the island, south of Grace Creek and southwest of Siskiwit Bay, an area of about 120 km² (see map). Although these 140 km² comprise a quarter of the island, only 22 active colonies, 11 percent of the total, occurred there in 1988. These areas characteristically have low beaver densities, and were deleted in favor of the better beaver habitats where more colonies could be found in a shorter time. Both days provided conditions leading to undercounting, and the estimate of beaver numbers had to account for both the area missed and the poor counting conditions.

This was the first time two observers worked simultaneously. Shelton, following procedures used in the past, marked colonies on a map which had been prepared by marking active sites from the most recent previous count, made in October 1988. Smith, by

contrast, used a blank map. But Shelton's advantage of having made several previous counts on Isle Royale may have been offset or matched by Smith's more recent extensive ground work on the island. Also, it is possible that Shelton's use of the premarked map caused him to miss foodpiles because of looking too intensively at sites active in 1988, rather scanning nearby sites where a cache was visible. Smith would not have been prejudiced to look at the old site and may have found the new one more quickly.

On October 19 only, when no discussion took place between observers, Smith saw 64 food caches and Shelton saw 67. We identified 37 food caches at identical sites, and another eight (8) were judged to be the same although we marked them up to 0.5 km apart.

Shelton missed 19 (30%) of the caches Smith saw, although he saw a fresh house or dam at three of these and questioned whether there was fresh activity at another. Thus he saw nothing at 15 (23%) of sites where Smith saw caches. Smith missed 22 (33%) of the caches Shelton saw, but Smith saw a fresh house at two of these, fresh cutting at one, and questioned a fourth, leaving 18 (27%) of Shelton's caches where Smith saw nothing. It is unfortunate that this opportunity to compare observers came when observing conditions were the poorest of any count done on the island. General conclusions probably should not be drawn from the comparison.

Correlation between the two observers for the total count was close: 112 colonies with food piles for Shelton, 110 for Smith. In 16 instances both recorded food caches within a half mile or less, and the sites were assumed to be the same. In addition, 22 sites missed by Shelton were seen by Smith, and 24 sites missed by Smith were seen by Shelton in locations where it was unlikely that the difference was merely one of location. Shelton saw fresh mud on the house or dam at four of the sites where Smith saw food caches, and Smith saw fresh mud on three houses, fresh cutting at two sites, and questioned a third site where Shelton saw a food cache.

Results

Adding the total figures from both observers (112 + 22 and 110 + 24), the number of food caches seen by one or the other observer was 134. This is a minimum figure for the count, and if accurate, would indicate a drastic drop from 1988, when 200 food caches were counted. But poor conditions on both -- leaves and bright sun on the 16th, snow and ice on the 19th, and too high flying speed on part of the first and all of the second day -- make direct comparison of this count with previous counts unrealistic.

Estimates of the total number of colonies with food caches actually on the island were done by:

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|--|----------------|
| 1. correcting only for area covered: | estimate = 151 |
| 2. correcting for flying time: | estimate = 174 |
| 3. comparing air and ground work: | estimate = 181 |
| 4. comparing 1988 and 1990 results from harbors and lakes: | estimate = 171 |
| 5. comparing ground work only, 1988 and 1990: | estimate = 177 |

The four calculated corrections that give total estimated number of active colonies (2, 3, 4 and 5) fall between 171 and 181, with a mean of 176, which is considered to be the best estimate for 1990. The higher estimate (181) may be more nearly accurate, but the median is considered to be more nearly comparable with previous counts. This represents a decrease of 24 (12%) from the 1988 count of 200.

If the average number of beavers per colony with a food cache is still about 6.4, and the sites with fresh sign but no food cache represent about two beavers, the total number beavers on the island in fall 1990 should be:

$$176 \times 6.4 + 33 \times 2 = 1192, \text{ or roughly } 1200 \text{ animals.}$$

Details of these calculations follow:

1. Correcting only for area covered gave a figure of 151 as the estimate for the number of colonies that would have been found if the count had been completed under the conditions encountered. This correction was calculated by adding to the partial 1990 count the appropriate fraction of colonies found in 1988 in the area not counted in 1990, based on the ratios of 1990: 1988 in the area counted both years:

Number to be added if 1990 count had been completed under same conditions	$= \frac{\text{No. counted in 1990}}{\text{No. counted in 1988 in same area counted in 1990}}$	$\times \frac{\text{No counted in 1988 in area not counted in 1990}}{\text{No counted in 1988 in area not counted in 1990}}$
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Solving this equation for the combined total:

$$134 / (199 - 22) \times 22 = 17$$

$$134 + 17 = 151$$

This figure corrects only for difference in area covered, not for the poor observing conditions.

2. A second series of estimates, based on flying time required in other years compared with 1990, gave figures ranging from 149 to 199 with a median figure of 174, which is thought to be close to the actual number present in 1990. Previous counts required a low of 12 hours (1980) and a maximum of 16 hours (1986), with a mean of 14 hours flying time. By using nine hours (actually 9:05) for 1990, the following estimates can be made, using only Shelton's figures in order to retain comparability to his previous counts:

Low estimate: $12/9 \times 112 = 149.$

Median estimate: $14/9 \times 112 = 174$

High estimate: $16/9 \times 112 = 199$

Estimate based only on comparison with 1988:

$$15.25/9 \times 112 = 190.$$

The high estimate and the estimate based on 1988 are certainly too high because the areas which in the past have the sparsest concentration of colonies and thus yield fewest colonies per unit time were deleted in 1990.

3. The third estimate was based on the ratio of colonies found by Shelton on foot or by boat October 20-24 to those found from the air in the same area. During ground work on the northeast end of the island after the aerial survey, Shelton found 23 fresh food caches and another which was a few weeks old and would not have shown up well from the air. Shelton had seen 16 of these from the air, and Smith had seen 14, missing three seen by Shelton, and seeing one that Shelton missed. Together they saw 17 of the 23 food caches.

Estimate based on Shelton's work: $= 23/16 \times 112 = 161.$

Based only on Smith's work: $= 23/14 \times 110 = 181.$

Based on combined observations: $= 23/17 \times 134 = 181.$

Interestingly, Joe McHenry, who has had extensive experience spotting beaver colonies from the air, mostly in Alaska, ventured that the usual undercount is about 25 percent. Using his figure would give an estimate for 1990 of 179 colonies ($134/0.75 = 179$).

4. Yet another estimate was based on comparison of lake and harbor colonies found in 1990 and in 1988 in the area counted in 1990. These colonies were least affected by the adverse conditions -- leaves and bright sun on the 16th, and snow cover on the 19th. Leaves still on trees would not affect visibility

of food caches, bright sun would only affect food caches on the south side of lakes and harbors where they would be in the deep shadows of overhanging trees, and the water of harbors and all but the smallest lakes were warm enough to melt the snow from food caches. Thus, an estimate for 1990 can be made by assuming that the lake and harbor count in 1990 was nearly complete and that the actual ratio of colonies on streams, lakes, and harbors did not change drastically from 1988 to 1990.

Pertinent figures are as follows:

Number of colonies in the area counted in 1990 (Shelton figures only)

Year	Harbor	Lake	Total
1988	6	29	35
1990	2	27	29

Total number of colonies estimated for 1990 = $\frac{\text{No. lake and harbor total colonies in 1990} \times 1988}{\text{No. lake colonies in 1988 in area counted in 1990}}$

$$= \frac{29 \times 200}{35}$$

$$= 166$$

Adding the single lake colony Smith saw which Shelton missed modified the figure upward slightly:

$$\frac{30 \times 200}{35} = 171$$

5. Comparison of ground work all on the northeast end of the island, between the two years 1988 and 1990 also provides an estimate of the change between the two years. In the areas that were covered by foot or boat both years, 26 food caches were found in 1988 and 23 in 1990.

$$23/26 = 0.885; \quad 0.885 \times 200 = 177 \text{ colonies.}$$

Food cache sizes

Beginning 1984, Shelton recorded sizes of food caches using a system of visual categorization based on the apparent size of

the food cache relative to the size of an average beaver house as seen from the air (Table 2):

Extra Large (LL) = more than twice the size of a house.

Large (L) = 1 to 2 times the size of a house.

Medium (M) = 0.5 to 1 times the size of a house.

Small (S) = <0.5 times the size of a house.

Very Small (VS) = a few sticks visible (not used in 1984).

Perusal of these figures reveals no striking changes in ratios of sizes of food caches. There may be a slight decline in the larger sizes, but it would be inadvisable to attach much significance to this. The figures are presented in hopes that they may prove useful if similar data are obtained in years to come as beavers continue to deplete their food resources.

Table 1. Aerial counts of beaver colonies, Isle Royale National Park, 1962-1990

Colonies with food caches

<u>Year</u>	<u>Total</u>	<u>Number (%) by habitat*</u>				<u>Sites with fresh house, dam, or cutting</u>	<u>Total active sites</u>
		<u>Stream</u>	<u>Lake</u>	<u>Harbor</u>	<u>1936 burn</u>		
1962	125	84(67)	26(21)	15(12)	43(34)	-	-
1974	286	251(88)	24(08)	11(04)	102(36)	30	316
1978	129	99(77)	19(15)	11(08)	48(37)	27	156
1980	83	58(70)	17(20)	8(22)	13(22)	39	122
1982	125	93(74)	24(19)	8(06)	31(25)	28	153
1984	151	129(85)	17(11)	5(03)	53(35)	53	204
1986	204	167(82)	26(13)	11(05)	75(37)	36	240
1988	200	164(82)	30(15)	6(03)	81(40)	40	240
1990	a)112	83(74)	27(24)	2(02)	48(43)	25	137
	b)110	85(77)	23(21)	2(02)	46(42)	10	120
	c)134	104(78)	28(21)	2(01)	57(42)	26	160
	d)176	146(83)	28(16)	2(01)	74(42)	33	209

a) Shelton only; b) Smith only; c) Combined total;
d) Best estimate. See text for calculations.

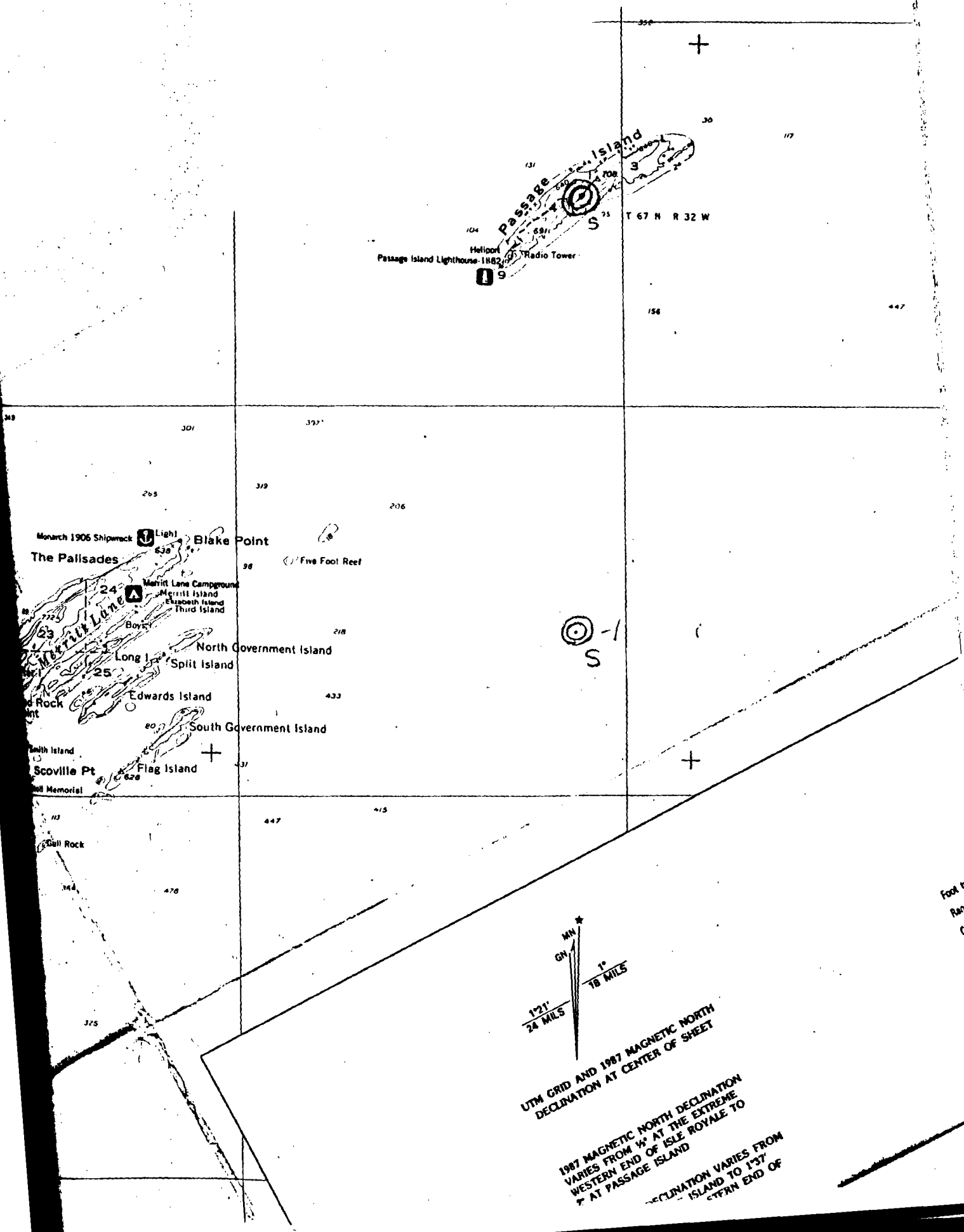
*Stream, lake, and harbor sites add to 100%.

Table 2. Food Cache sizes, percent of total, 1984, n=107:
1986, n=199; 1988, n=192; 1990, n= 111.

Size Class and year		Stream	Habitat		Harbor	Totals				
			Lake							
		Non- burn	1936 burn	Non- burn	1936 burn	Non- burn	1936 burn	Non- burn	1936 burn	Tot.
LL	84	3	1	0	2	0	0	3	3	6
	86	0	1	1	0	0	0	1	1	2
	88	1	2	0	1	0	0	1	2	3
	90	0	1	0	0	0	0	0	1	1
L	84	19	14	4	3	1	1	23	18	41
	86	9	5	5	2	1	0	13	7	20
	88	18	16	5	3	0	0	22	19	41
	90	7	5	5	3	0	0	12	8	20
M	84	12	11	1	0	2	0	15	11	26
	86	22	15	3	1	2	0	26	16	41
	88	17	10	3	2	1	0	21	11	32
	90	23	15	6	3	0	0	30	18	48
S	84	17	7	3	1	0	0	20	7	27
	86	15	13	1	0	3	0	19	13	32
	88	10	7	2	1	1	1	13	8	21
	90	12	9	4	4	2	0	17	13	30
VS	84	-	-	-	-	-	-	-	-	-
	86	3	1	1	1	1	0	5	2	6
	88	2	1	0	0	0	0	2	1	3
	90	1	0	1	0	0	0	2	0	2
Tot.	84	50	33	7	6	3	1	61	39	100
	86	47	34	10	4	6	0	62	38	100
	88	47	35	9	6	2	1	58	42	100
	90	43	31	15	9	2	0	60	40	100

Legend for 1990 map:

⊙	site with food cache, seen by both observers	= 71
⊗	sites with food cache, close enough to assume identity.	= 16
⊙	site with food cache, seen by Shelton only	= 19
⊗	site with food cache, seen by Smith only	= 13
⊙H	Shelton saw food cache, Smith saw fresh house	= 3
⊙D	Shelton saw food cache, Smith saw fresh dam	= 0
⊙C	Shelton saw food cache, Smith saw fresh cutting	= 2
⊙?	Shelton saw food cache, Smith questioned	= 1
⊗H	Smith saw food cache, Shelton saw fresh house	= 2
⊗D	Smith saw food cache, Shelton saw fresh dam	= 2
⊗C	Smith saw food cache, Shelton saw fresh cutting	= 0
⊗?	Smith saw food cache, Shelton questioned	= 1
H	Fresh house, seen by either (Shelton = 16)	= 21
D	Fresh dam, seen by either (Shelton = 5)	= 5
C	Fresh cutting, seen by either	= 0
?	Questioned, by either (Shelton = 3; Smith = 1)	= 4
□	Food cache found by Shelton during ground work	= 6



R33W 1990

-12

March 1906 Shipwreck Light Blake P

The Pailades

Lock Point

Porter I

Red Rock Point

Smith Island

Scoville Pt

Stoll Memorial

Gull Rock

Bat Island

Raspberry Island

Smithwick Channel

Smithwick Island

Shaw Island

Tookers Island

Tookers Island Campground

Heron Island

Outer Hill Island

Inner Hill I

Starvation Point

Mott Island

Algoma 1825 Shipwreck

East Caribou Island

Gilberts Hole

West Caribou Island

Caribou Island Campground

Burnt Island

Lighthouse-1855

Middle Islands Passage

Bay

Point

Point

Point

Point

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FIVE FINGER BAY

DUNCAN BAY

TOBIN HARBOR

ROCK HARBOR

SMITHWICK HARBOR

SMITHWICK CHANNEL

SMITHWICK ISLAND

SHAW ISLAND

TOOKERS ISLAND

TOOKERS ISLAND CAMPGROUND

HERON ISLAND

OUTER HILL ISLAND

INNER HILL I

STARVATION POINT

FIVE FINGER BAY

DUNCAN BAY

TOBIN HARBOR

ROCK HARBOR

SMITHWICK HARBOR

SMITHWICK CHANNEL

SMITHWICK ISLAND

SHAW ISLAND

TOOKERS ISLAND

TOOKERS ISLAND CAMPGROUND

HERON ISLAND

OUTER HILL ISLAND

INNER HILL I

STARVATION POINT

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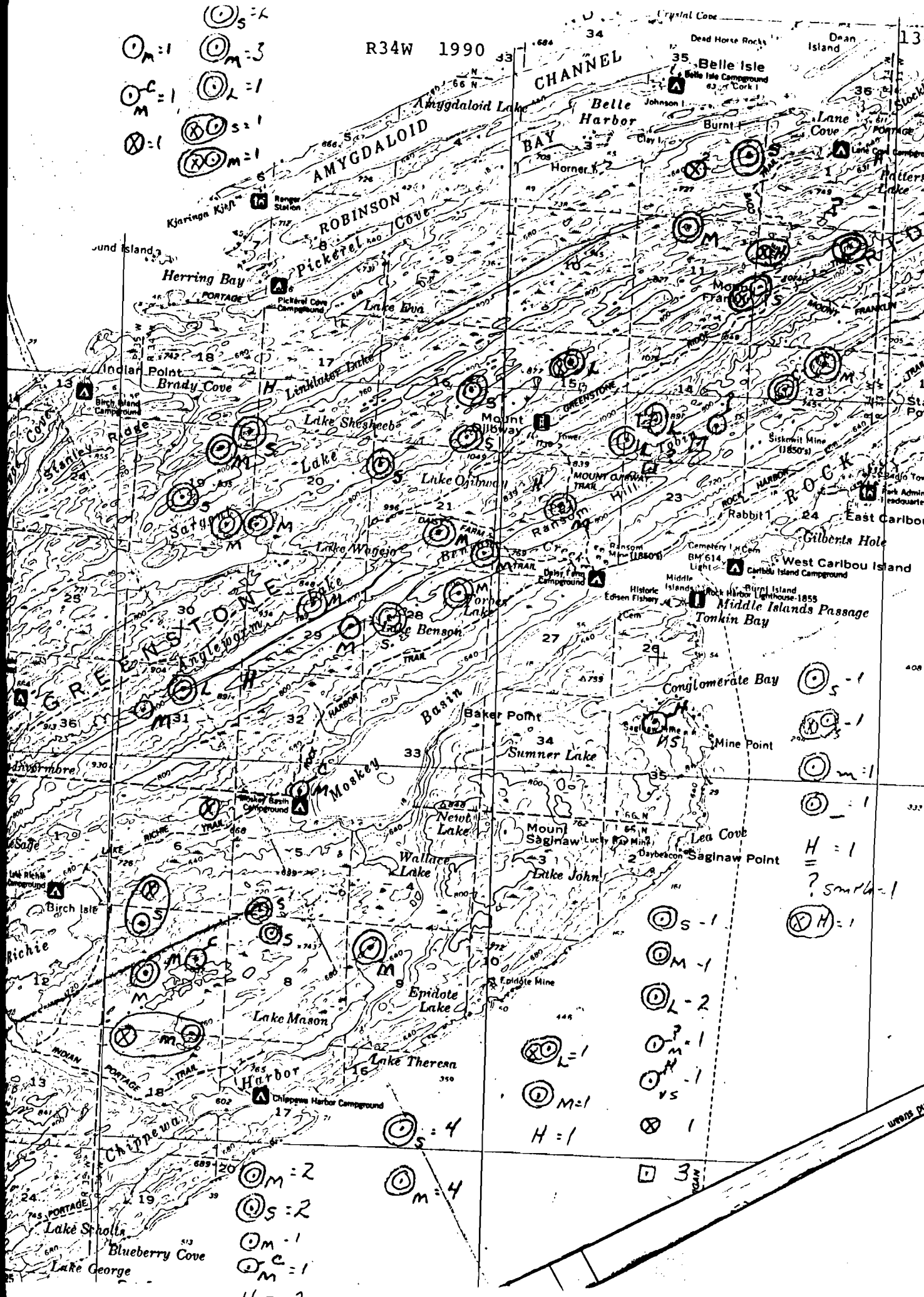
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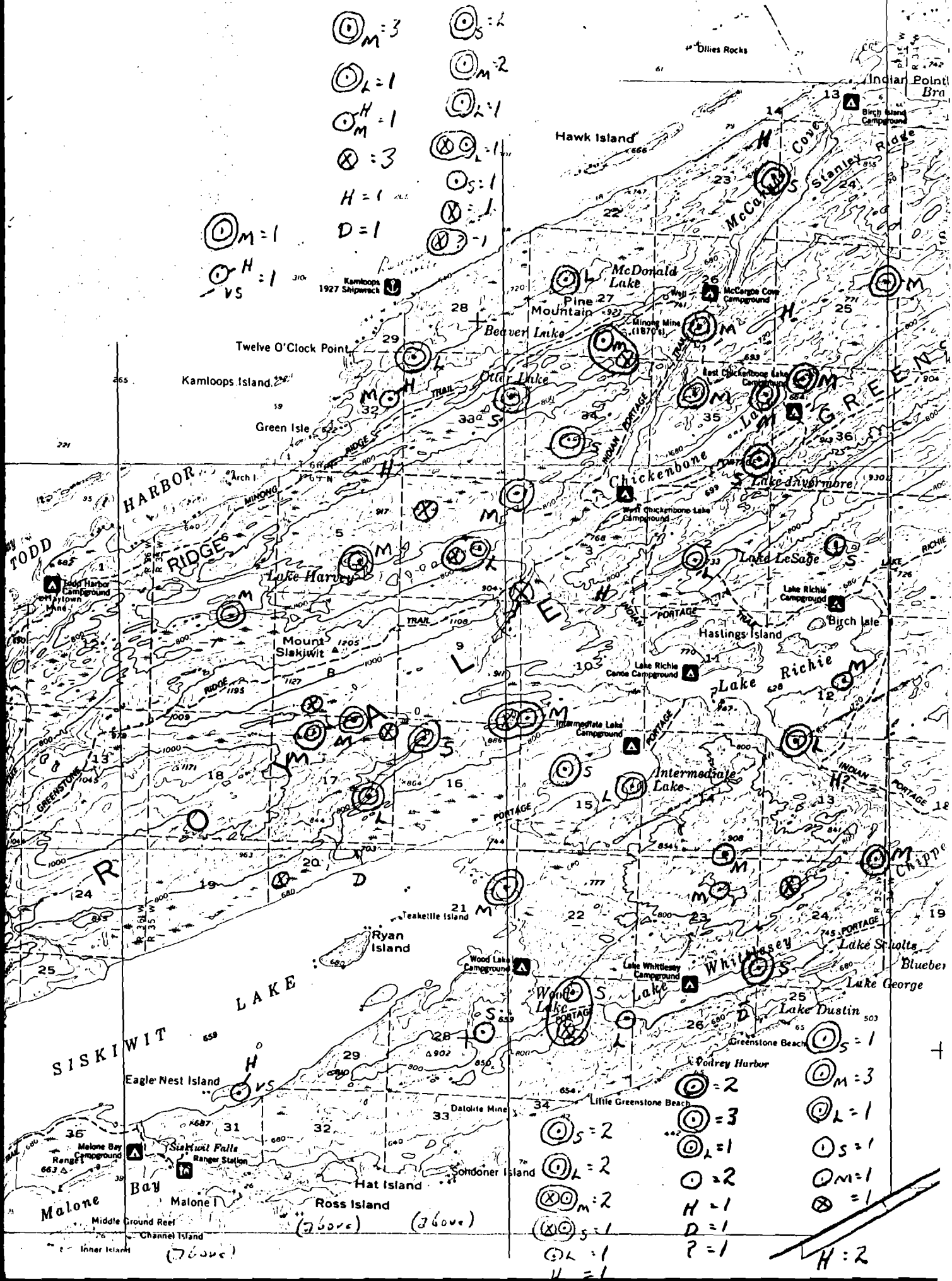
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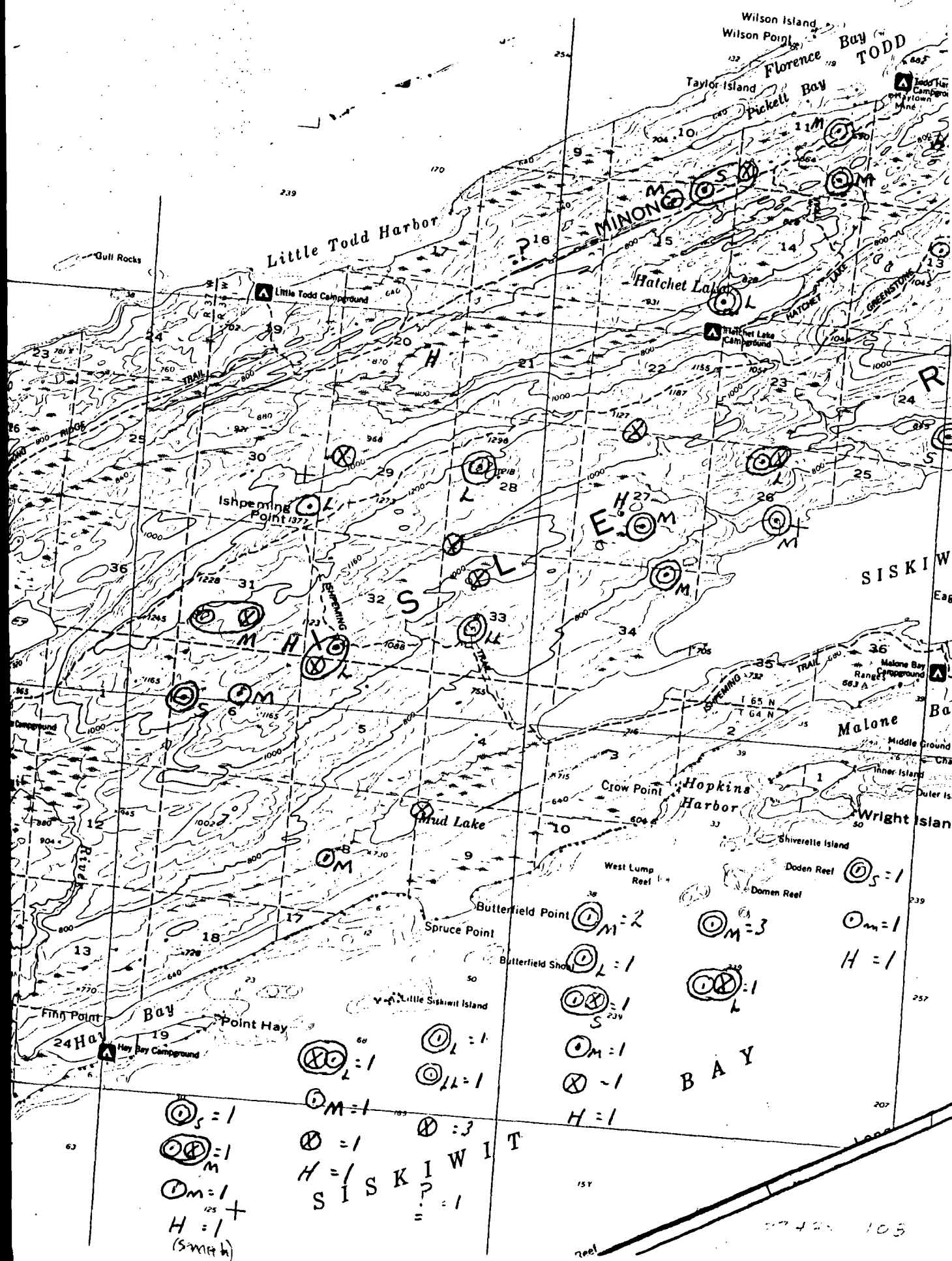
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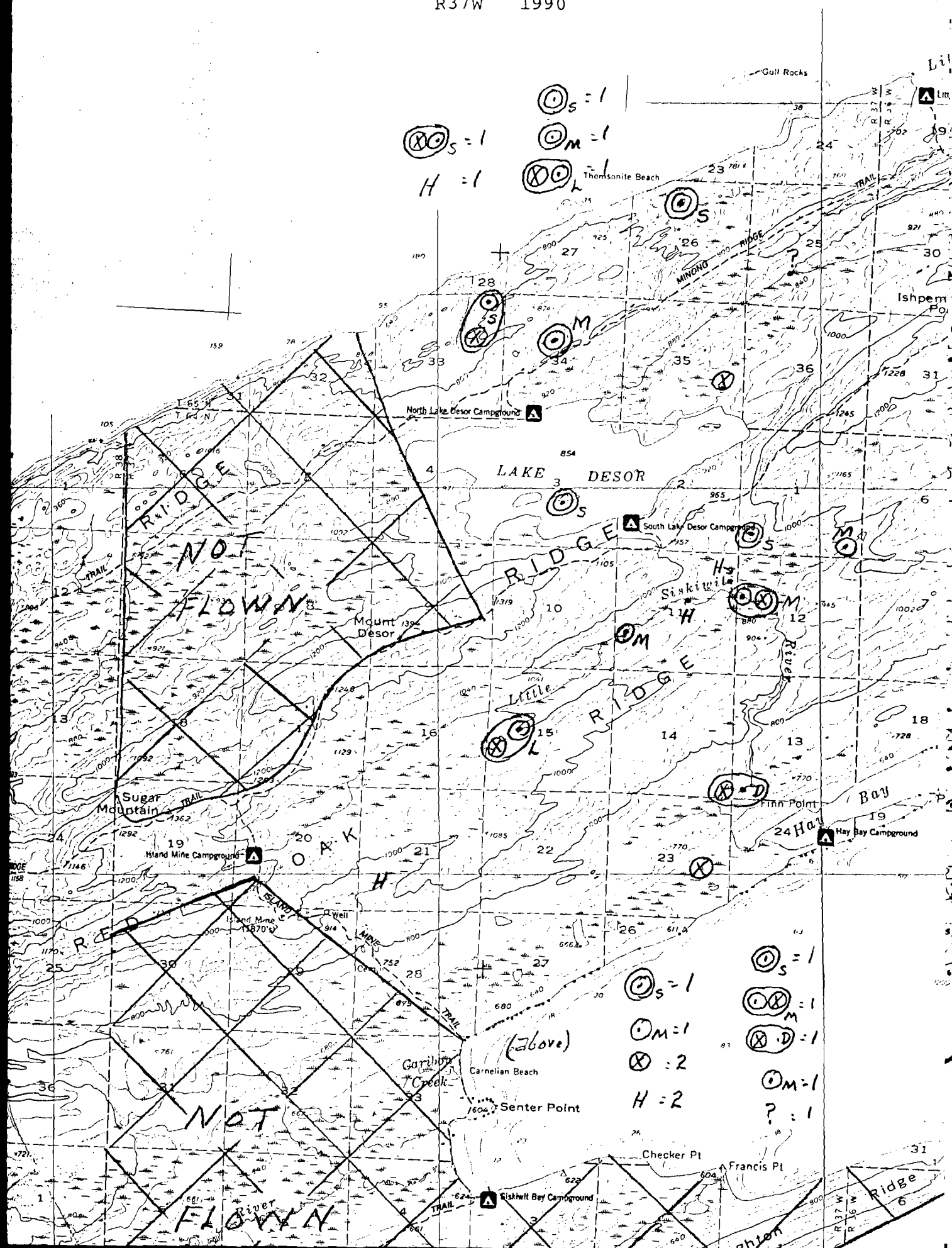
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