THE STATUS AND DISTRIBUTION OF THE COMMON LOON IN WISCONSIN

by

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ABSTRACT

An investigation to determine the status and distribution of the common loon (*Gavia immer*) in Wisconsin was conducted during the summers of 1976 and 1977. Aerial survey methods were 90 percent accurate in assessing loon populations. Audio stimulation was used to attract loons for census purposes. The estimated Wisconsin loon population is 1300 adults and 258 juveniles. Loon distributions were primarily restricted to the northern one-third of Wisconsin. Average size of 195 broods was 1.41 young per brood. Three broods, consisting of three young were observed. Forty percent of the observed adult loons were successful breeders. Loon populations appear stationary in Wisconsin, but continued human disturbance could lead to a future decline. The desertion of three loon nests was linked to human disturbance. Direct human disturbance (harassment and boating activities) is more detrimental to successful breeding than human presence. The number of dwellings per acre of water area of lakes with loon populations was significantly lower ($P<0.05$) than lakes without loons. While loons showed preferences for certain habitat types (large lakes, deep water, and a neutral pH), they do tolerate different types of water areas.

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INTRODUCTION

The common loon is a popular wildlife species because of its interesting habits, calls and unique relationship with the waterways of the undisturbed north (Olson and Marshall 1952). Breckenridge (1949) stated that the loon "expresses the essence of unrestrained wildness and seems to put the stamp of genuineness on a North Country setting like 'Sterling' does on silver".

Concern has been expressed over the decline in loon populations in some areas. The breeding distribution of the common loon is relegated mainly to the northern parts of the Northern Hemisphere, and chiefly North America (Olson and Marshall 1952). Bent (1919) reported loon breeding south to a line running west from New England through northern Ohio, Iowa and northeastern California. Loon populations in Michigan, Minnesota and New Hampshire have declined, with breeding birds found chiefly in less developed sections (Manville 1952, Roberts 1932, McIntyre 1976). Roberts (1932) attributed the early decline of loons in Minnesota to heavy hunting. Spring shooting of loons occurred in Massachusetts from mid-April to the first of June in the early 1900's (Forbush 1912). Pesticides, predators, diseases and human disturbance influences loon productivity in present populations (McIntyre 1975). Management may need to be implemented to maintain current loon populations (McIntyre 1976). Expanded research efforts are needed to provide information for effective loon management.

Little information was available on the status of the common loon in Wisconsin. The Endangered Species Committee within the Wisconsin Department of Natural Resources placed the common loon in a "Status Undetermined" category in 1971. Students, from the University of

Wisconsin - Stevens Point, compiled summer breeding observations of the common loon (Wisdom et al. 1975). A limited study by Kohel (1972), using mail surveys, reported a few loon nesting records and possible migration patterns for Wisconsin loons in 1970. Additional information was needed to determine the current status of loon populations in Wisconsin.

Field surveys were conducted from 15 May through 15 August in 1976 and 1977. Munro (1945) found this period to be the normal occupancy period for loon pairs in British Columbia, Canada. The surveys were restricted to the northern one-third of Wisconsin because of the relatively few reports of nesting loons in the southern two-thirds of the state (Wisdom et al. 1975). Twenty northern Wisconsin counties were surveyed. Surveys were conducted in the northeastern counties in 1976 (Florence, Forest, Lincoln, Langlade, Marinette, Oconto, Oneida and Vilas) and the northwestern counties in 1977 (Ashland, Barron, Bayfield, Burnett, Douglas, Iron, Polk, Price, Rusk, Sawyer, Taylor and Washburn) (Fig. 1).

The objectives of this study were to: (1) determine the breeding status and distribution of the common loon in Wisconsin; (2) determine common loon population trends in Wisconsin; (3) evaluate the use of aerial surveys and audio stimulation as common loon census techniques; (4) determine the effect of human disturbance on loon populations; and (5) determine habitat preferences of the common loon populations.

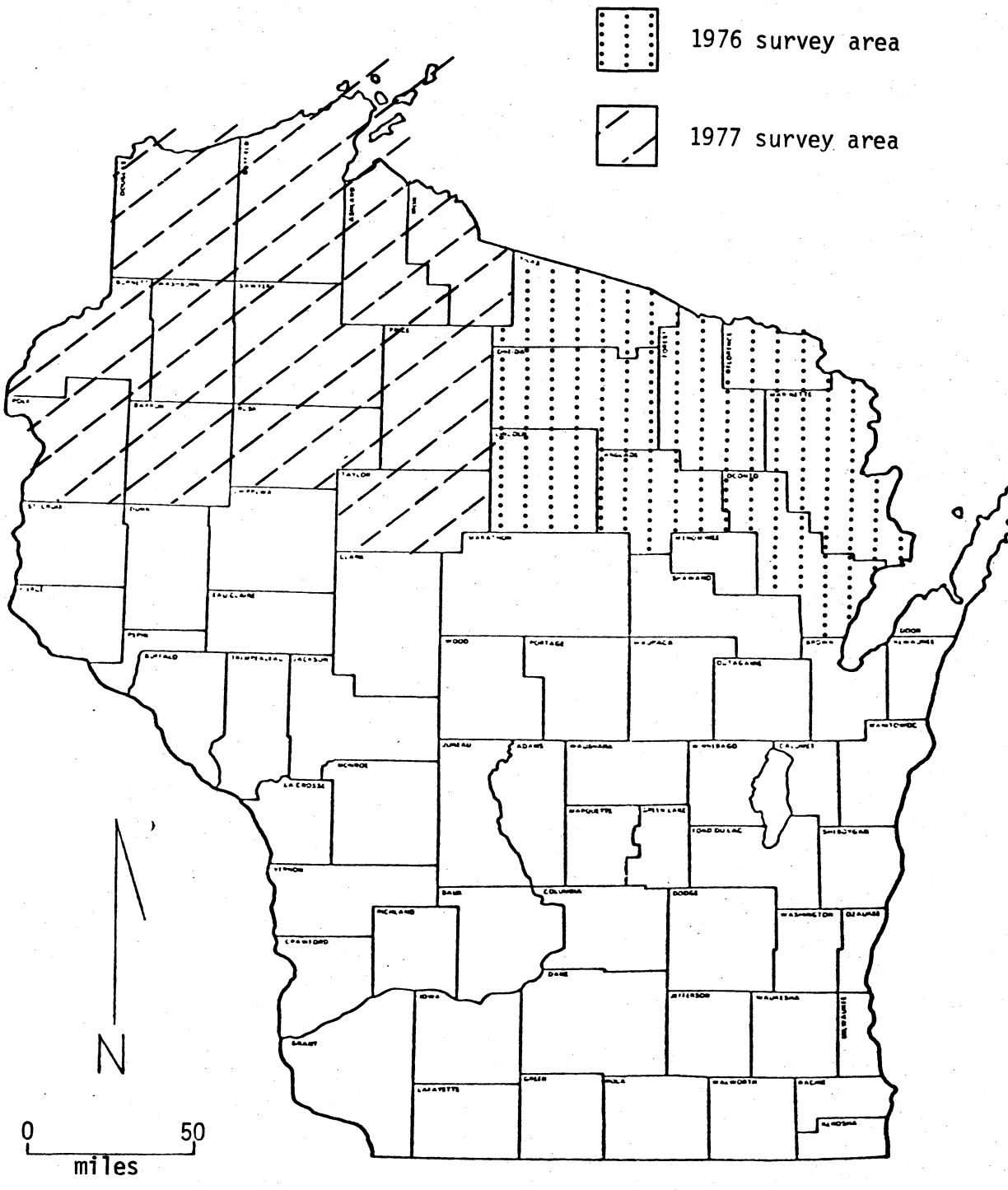

Fig. 1. Field survey area for common loon study in Wisconsin, 1976-1977.

METHODS

Historical data on the common loon in Wisconsin were located. These included the Wisconsin Society for Ornithology (W.S.O.) field notes, Wisconsin Breeding Bird Surveys (B.B.S.), Cornell Nest Records (C.N.R.), Wisconsin Department of Natural Resources (D.N.R.) observations and banding records from the Bird Banding Laboratory, Laurel, Maryland. These records were pertinent because loon pairs use the same lakes year after year (Bent 1919, Munro 1945). Data from a loon survey conducted in 1976 in the Nicolet National Forest by the United States Forest Service (U.S.F.S.) were also obtained. A survey of the Crex Meadows Wildlife Area in 1976 provided information on loon populations in that area (Lombard 1976, unpublished data, University of Wisconsin Center, Rice Lake, Wisconsin).

Mail questionnaires, seeking information on loon distributions (Appendix A), were distributed in 1976 and 1977 to D.N.R. and U.S.F.S. personnel throughout the state. Questionnaires were sent to W.S.O. members and were also distributed at their annual conferences. Postpaid, return envelopes were provided for replies. A news release,requesting information from the general public (Appendix B), was distributed to all newspapers in Wisconsin. Local radio stations in northern Wisconsin broadcasted a request for information throughout the summer months of 1976 and 1977. Residents of northern Wisconsin lakes were personally interviewed. All lakes, larger than 30 acres, were surveyed from the ground or air. Sjolander and Agren (1972) and McIntyre (1975) reported that lakes smaller than 30 acres were seldom occupied by loons. Observations were still requested from lakes of all sizes. A sample of lakes, smaller than 30 acres, was surveyed from

the ground. Wisconsin Lake Survey Reports were used to determine lake size and location. Most lakes were surveyed only once.

Censuses were conducted from vantage points adjacent to the lakes with 7x binoculars and a 20x spotting scope. A 10-minute observation was conducted at each vantage point. Lakes with many bays or islands, which could not be accurately censused from the shoreline, were surveyed from a canoe. Nests were found by walking shorelines of small lakes and islands. Nest searches on large water areas were conducted by canoeing within 20 feet of the shoreline. Olson and Marshall (1952) found that loons nest close to the water's edge.

Loon observations were conducted from ½-hour before sunrise till ½-hour after sunset. Surveys were not conducted when winds were greater than 15 mph.

A tape recording of the tremalo call of a loon (Olson and Marshall 1952) was broadcast with a Panasonic portable tape recorder and 6 inch oval amplifier to elicit responses. Calls were broadcast for 10-seconds, with 10 - 20 second listening intervals between calls. The calling-listening periods were continued for 5 minutes or until loons were observed. Bent (1919) stated that loons will even answer calls made by humans. Responses to audio stimulation were noted and recorded.

Aerial surveys were conducted during July and August in 1977 on large (greater than 1000 acres) and inaccessible water areas that could not be efficiently surveyed from the ground. Lake Superior was surveyed from the air within 0.5-mile of the Wisconsin shoreline with fixed winged aircraft, flying at an altitude of 300 feet. Aerial surveys were flown only when winds were less than 5 mph. Transects were flown at 0.25-mile intervals on the large water areas. When a loon was sighted, the area was circled for 3 minutes to detect other

submerged loons. Palmer (1949) reported the duration of loon dives to be 8.5-60 seconds.

Ninety lakes in Burnett and Washburn counties were surveyed from the air and the ground to determine aerial census accuracy. These surveys were conducted within a 3 day period.

Population trends were determined from surveys conducted for 2 consecutive years (1976 and 1977) on a 236-lake study area (Fig. 2).

The number of dwellings, resorts, public access sites, and boats was recorded for each water area to assess the human disturbance factor. Only dwellings and resorts directly adjacent to the shoreline were included in the survey; docked boats were not included. Wisconsin Surface Water Resources Bulletins provided human development information for lakes that were surveyed from the air. Loon reactions to human disturbance were also recorded.

Habitat characteristics for water areas in 17 of the 20 counties in the field survey area were obtained from Wisconsin Surface Water Resource Bulletins; data on water areas in Lincoln, Price and Washburn counties were not available. Six physical (acreage, water depth, length of shoreline, shoreline development factor, length of public frontage and percent of shoreline composed of wetlands) and four chemical (pH, alkalinity, specific conductance and water color) factors from each water area were analyzed to determine loon habitat preferences. A Seechi disc was used to determine water color (Ruttner 1952).

Data are presented using the English numerical system because all lake information and past records were reported in the English system.

All human disturbance and lake characteristic data were summarized and mean, variance, and standard deviation were calculated. Data were evaluated by t-test with paired samples (Steel and Torrie 1960). The minimum level of significance accepted was $P<0.05$.

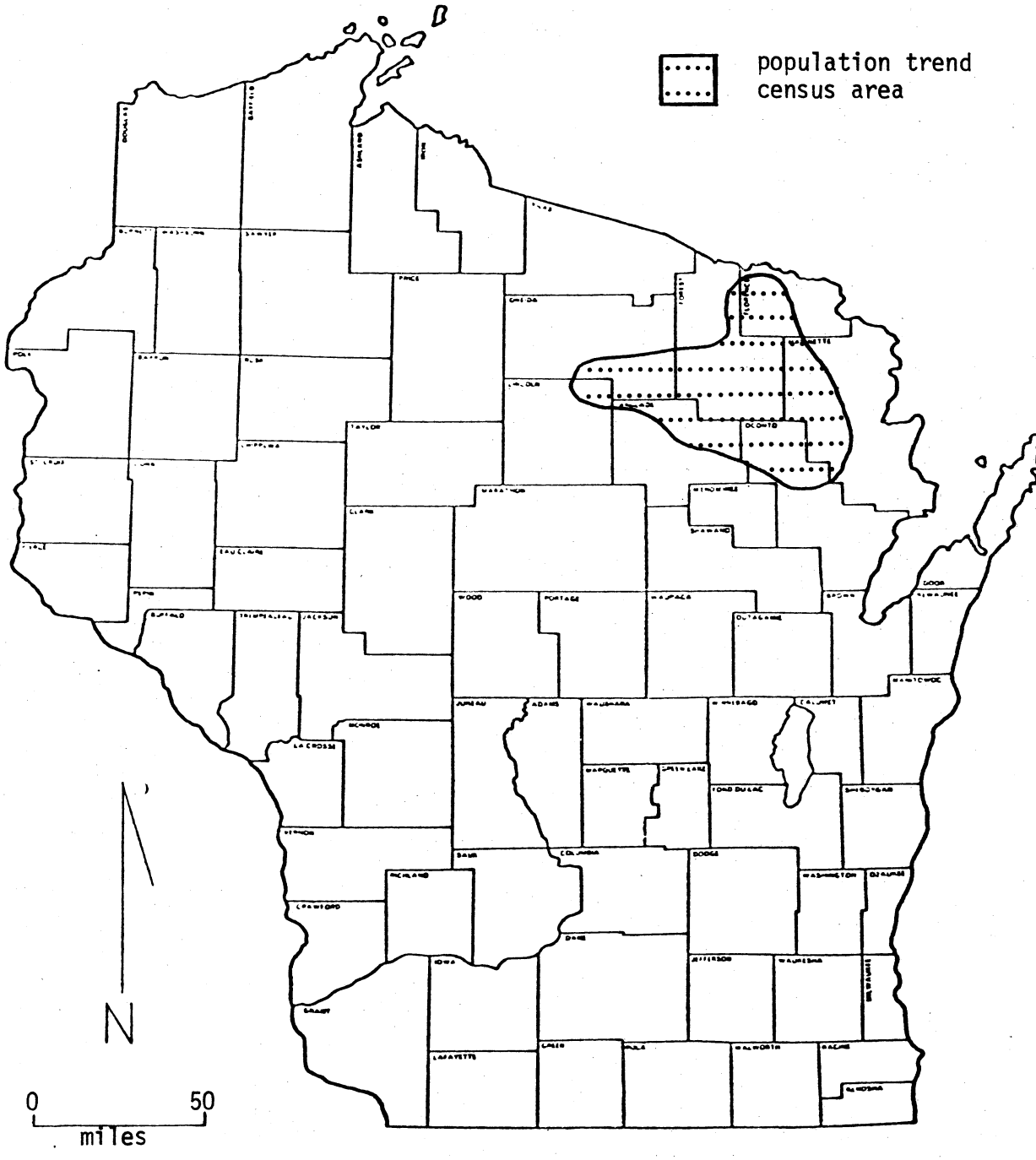

Fig. 2. Location of 236 lakes which were censused in 1976 and 1977 to determine population trends of loons in Wisconsin.

RESULTS AND DISCUSSION

Breeding Status and Distribution

The estimated Wisconsin loon population is 1300 adults and 258 juveniles. Loon population data for individual water areas is presented in Appendix D. A total of 976 adult and 222 juvenile loons were actually observed on lakes larger than 30 acres (Table 1). Five hundred thirty-eight (26.6 percent) of these 2,019 water areas contained loons. Five (3.5 percent) of 143 lakes less than 30 acres held loon populations (9 adult, 1 juvenile). Sjolander and Agren (1972), and McIntyre (1975) also report few loons on small water areas. The results of the small lake survey were extrapolated to all of the 5005 lakes which are less than 30 acres in the northern one-third of the state (Table 2), and added to those actually observed to arrive at a total estimated population of 1300 adult and 258 juveniles.

Most resident loon populations were located in the northern one-third of the state (Fig. 3). Two hundred forty-one (24.7 percent) of the 976 adult loons in the state were observed in Vilas County (Table 1). Adjacent Oneida County had the second largest adult loon population (138 adults). These counties also have the largest number of lakes in Wisconsin (over 1100 lakes in each). However, loons do not inhabit all lakes. Munro (1945) reports that, in British Columbia, loons occupy the same lakes each year, and avoid other lakes, which appear to have similar nesting habitat and food resources.

Details of the four largest loon concentrations in Wisconsin (Chippewa Flowage in Sawyer County, Crex Meadows Wildlife Area in Burnett County, Lake Superior - Wisconsin shoreline and the Turtle-Flambeau Flowage in Iron County) are presented in Table 3. Three of

Table 1. Distribution, by county, of the Wisconsin loon population on lakes larger than 30 acres (1976-1977). (Percentages in parentheses.)

County	Loon		Nests	Water areas with loons	Number of water areas surveyed
	Adult	Young			
Ashland	25(2.6)	7(3.2)	7(3.6)	11(2.0)	40(2.0)
Barron	9(0.9)	2(0.9)	1(0.5)	7(1.3)	62(3.1)
Bayfield	66(6.8)	14(6.3)	11(5.6)	36(6.7)	130(6.4)
Burnett	62(6.4)	23(10.4)	17(8.6)	29(5.4)	144(7.1)
Douglas	32(3.3)	9(4.1)	6(3.0)	18(3.3)	77(3.8)
Florence	22(2.3)	9(4.1)	7(3.6)	13(2.4)	48(2.4)
Forest	62(6.4)	6(2.7)	7(3.6)	38(7.1)	88(4.4)
Iron	70(7.2)	14(6.3)	12(6.1)	33(6.1)	92(4.6)
Langlade	11(1.1)	2(0.9)	2(1.0)	7(1.3)	52(2.6)
Lincoln	10(1.0)	2(0.9)	3(1.5)	7(1.3)	43(2.1)
Marinette	9(0.9)	2(0.9)	1(0.5)	6(1.1)	54(2.7)
Oconto	20(2.0)	7(3.2)	4(2.0)	10(1.9)	70(3.5)
Oneida	138(14.1)	31(14.0)	26(13.2)	80(14.9)	266(13.2)
Polk	12(1.3)	2(0.9)	2(1.0)	6(1.1)	105(5.2)
Price	21(2.2)	3(1.4)	3(1.5)	15(2.8)	67(3.3)
Rusk	6(0.6)	2(0.9)	2(1.0)	4(0.7)	35(1.7)
Sawyer	56(5.7)	12(5.4)	9(4.6)	27(5.0)	116(5.7)
Taylor	2(0.2)	0(0.0)	0(0.0)	2(0.4)	27(1.3)
Vilas	241(24.7)	60(27.0)	63(32.0)	130(24.2)	340(16.8)
Washburn	80(8.2)	14(6.3)	13(6.6)	45(8.4)	163(8.1)
Others	22(2.2)	1(0.4)	1(0.5)	14(2.6)	-
Total	976	222	197	538	2019

Table 2. Loon population in Wisconsin as calculated from field surveys and estimates from lakes less than 30 acres (1976-1977).

Survey type	Number of adults	Number of young	Number of water areas with loons
Direct observation (Lakes ≥ 30 acres)	976	222	538
Direct observation (Lakes < 30 acres)	9	1	5
Estimates (Lakes < 30 acres)	315	35	175
Total Population	1300	258	718

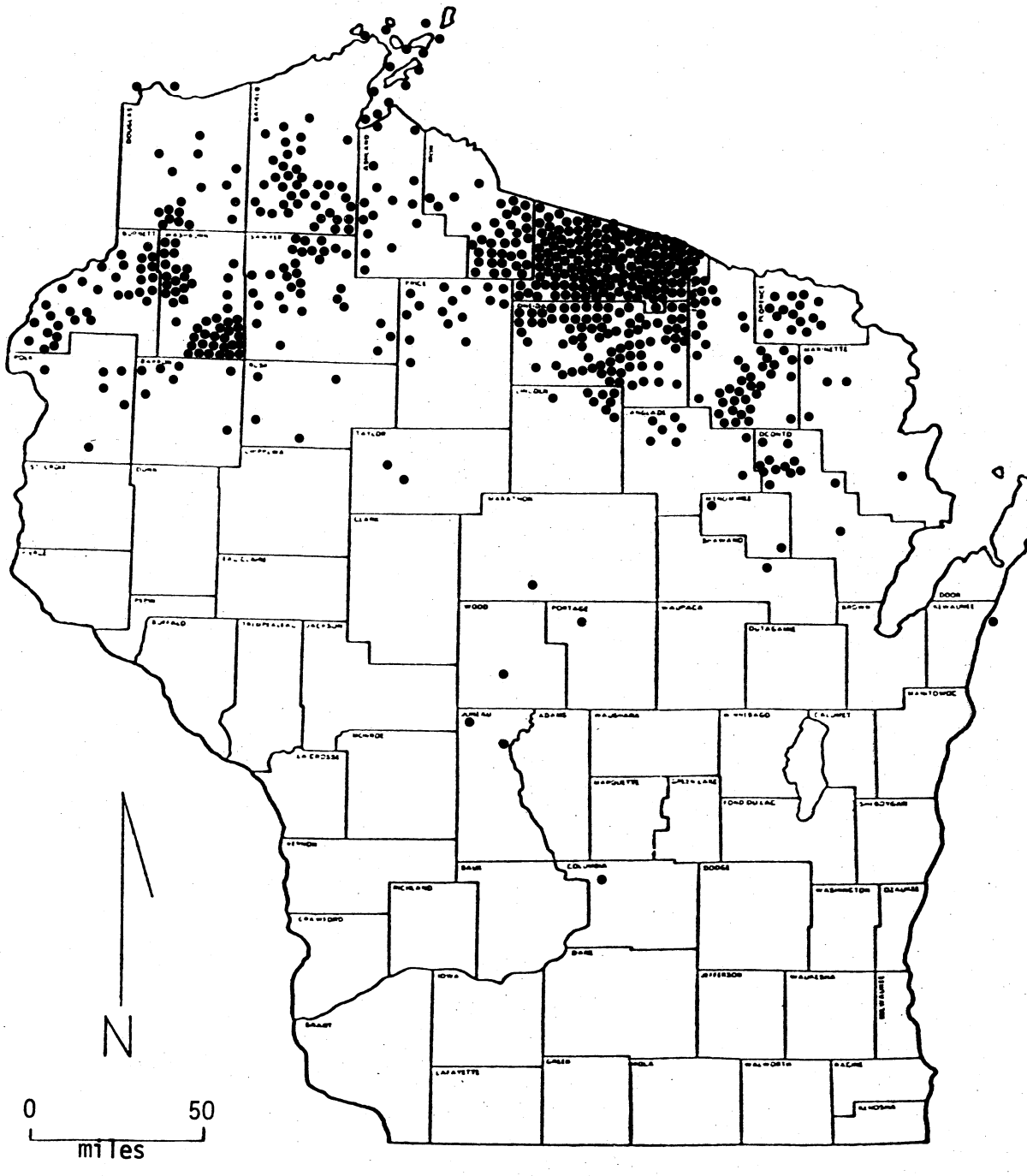

Fig. 3. Distribution of resident loon populations in Wisconsin, 1976-1977.

Table 3. Four largest Wisconsin loon concentrations (1976-1977).

Water area	County	Loon population		
		Adults	Young	Nests
Lake Superior (Wisconsin shoreline)	Ashland Bayfield Douglas	24	4	3
Crex Meadows Wildlife Area[a]	Burnett	17	11	7
Turtle-Flambeau Flowage	Iron	17	8	5
Chippewa Flowage	Sawyer	9	3	3

[a]Survey reported by Lombard (unpublished data).

the water areas (Chippewa Flowage, Crex Meadows and the Turtle-Flambeau Flowage) are man-made impoundments. Ten percent of the juvenile loons, located during this study, were produced on these water areas.

Resident loons were reported in 9 counties (Columbia, Door, Juneau, Kewaunee, Marathon, Menominee, Portage, Shawano and Wood) south of the field survey area (Fig. 3). However, loon populations were reported only on 10 water areas in these 9 counties. Six of these water areas (Swan Lake in Columbia County, Meadow Valley Wildlife Area and Pettinwell Flowage in Juneau County, Mead Wildlife Area in Marathon County, Lake Dubay in Portage County and Sandhill Wildlife Area in Wood County) are located within 20 miles of the Wisconsin River suggesting an association with this major river system. Jahn and Hunt (1964) report the Wisconsin River as being the main artery for diving duck migrations in Wisconsin. I have observed more than 60 loons in one group on the Wisconsin River near Stevens Point during the spring migrations of 1977 and 1978. These concentrations remained for 3 days (9-11 April 1977, 10-12 April 1978); some of them may have dispersed and remained for the summer months. McIntyre (1975) noted a similar pattern along the Mississippi River in Central Minnesota.

Forty percent of the adult loons were successful breeders. A nest was considered successful if one or more of the eggs hatched. Non-breeders and unsuccessful nesting pairs comprised the remaining 60 percent of the adult population. Twenty-eight percent of the adult population were single loons. Loons do not breed until 3 years of age; this may account for many of the non-breeders in the population (Taverner 1929, Roberts 1932). Twenty-eight of 35 nests observed throughout the nesting period were successful. An unknown predator destroyed two nests; three nests, on lakes with constant human

activity, were deserted.

There were 198 nests present on the study area (Fig. 4). The 63 nests in Vilas County comprised 32.0 percent of the total nests in the entire state (Table 1). Only one nest was located in the southern two-thirds of Wisconsin (Meadow Valley Wildlife Area in Juneau County).

Hatching, during both years of the study, began during the third week of June. Assuming a 29-day incubation period (Bent 1919, Olson and Marshall 1952), incubation began in mid-May. Human disturbance has been reported to cause adverse effects on loons (olson and Marshall 1952, Barr 1973). The Memorial Day Weekend, with the associated increase in human activities on water areas during the last week in May, could be an important nesting success factor (Olson and Marshall 1952). Human disturbance during this stage of incubation could lead to desertion of nests.

Brood size averaged 1.41 young per successful loon pair. A pair was determined to be successful if one or more young hatched. One hundred eighteen (60.5 percent) of 195 broods observed had only one chick (Table 4). Broods of three young were observed in Oneida (2) and Vilas (1) counties. Broods of three young have not been reported in other studies. McIntyre (1975) reported an average brood size of 1.4 for loon populations in Minnesota.

Population Trends

Loon distribution is currently restricted to the northern one-third of Wisconsin; loons are observed infrequently in the south (Fig. 3). Since the early 1900's, loons have abandoned previous nest sites in Southern Wisconsin. Human disturbance may be responsible for

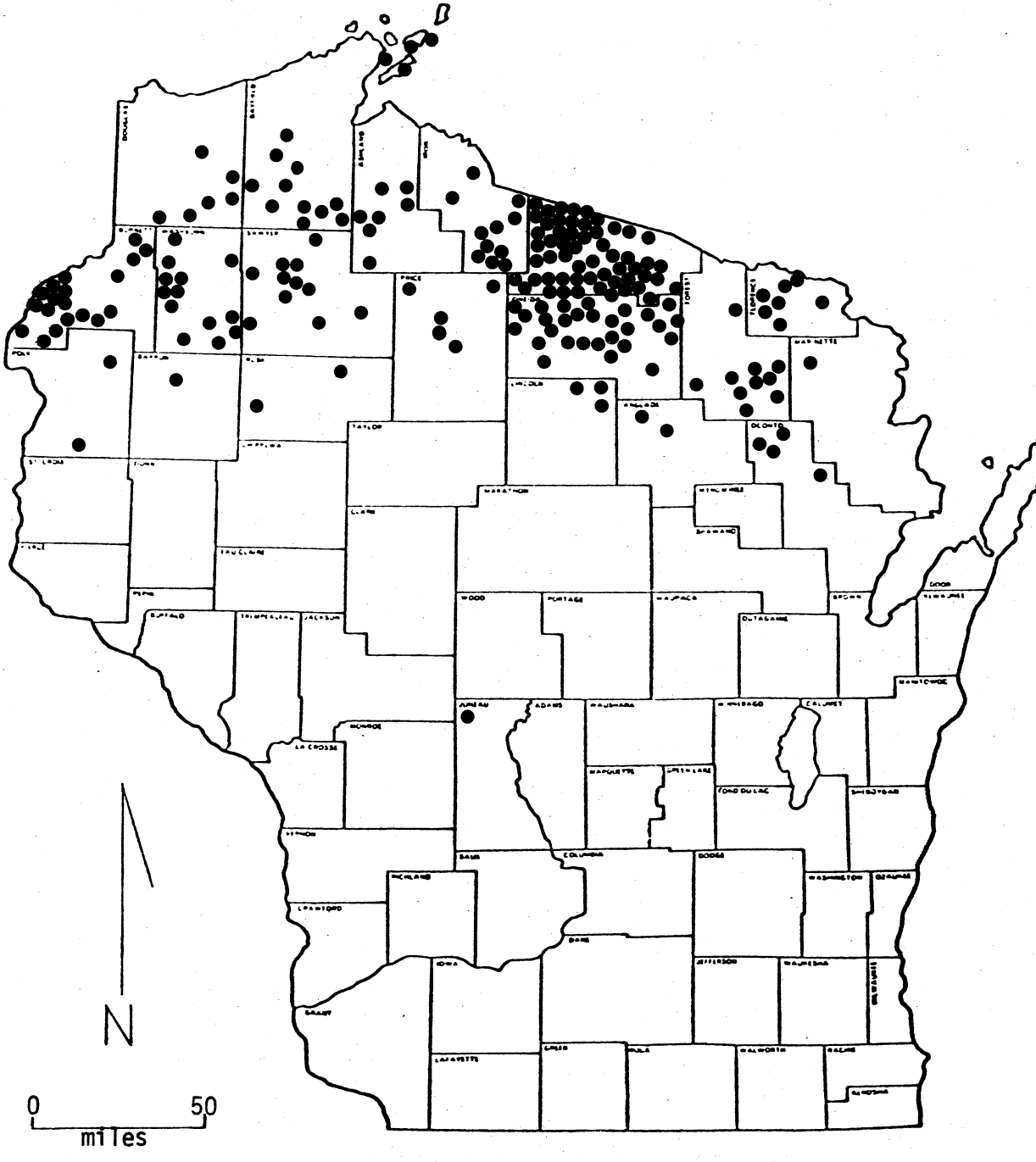

Fig. 4. Distribution of loon nests in Wisconsin, 1976-1977.

Table 4. Brood sizes of Wisconsin loons in 1976 and 1977. (Percentages in parentheses.)

Year	Brood size		
	One chick	Two chick	Three chick
1976	53(59.5)	35(39.3)	1(1.1)
1977	65(61.3)	39(36.8)	2(1.9)
Total	118(60.5)	74(37.9)	3(1.5)

this movement (Olson and Marshall 1952). Bent (1919) included the entire state as breeding range of the loon, with records of loon nesting in Waukesha County. W.S.O. field notes from 1946-1953 include reports of resident loons in Fond du Lac, Waupaca and Waushara counties. Wisdom et al. (1975) compiled records from W.S.O. members since 1954 which included observations of resident loons in Brown, Green Lake, Sheboygan and St. Croix counties. The remainder of the observations were reported from the northern one-third of the state. Kohel (1972) reported a few loon nesting records for northern Wisconsin in 1970.

There was a 5.7 percent decrease in the adult loon population between 1976 (105 adults) and 1977 (99 adults) on the 236-lake study area (Fig. 2). Type-E botulism killed at least 592 common loons in Lake Michigan during the fall of 1976 (Locke 1976, unpublished data, U.S. Fish and Wildlife Service, Madison, Wisconsin); this may account for a portion of the decrease in the adult loon populations in 1977. Adult loon populations remained unchanged on 84.7 percent of the water areas (Table 5). Reports from residents of northern Wisconsin indicate that there has been little change in loon populations over the last 15 years. Robbins (1977) reported no significant changes in loon populations from 1966 through 1975. Loon populations appear to be stationary in Wisconsin at this time but increased human disturbance could cause a decline in the future. The effect of continued disturbance may not be seen for many years because loons live for 30 to 40 years (McIntyre 1976).

Census Techniques

Aerial survey methods were 90 percent accurate in assessing loon populations. Fifty-two of 58 loons which were present on 90 lakes were detected from the air. All 6 young loons (100 percent

Table 5. Adult loon population fluctuations for lakes monitored for 2 consecutive years in northeastern Wisconsin (1976-1977). (Percentages in parentheses.)

Population status - 1977	Number of lakes
Increase	16(6.8)
Decrease	20(8.5)
No change	200(84.7)
Total	236

accuracy) and 46 of the 52 adults (88 percent accuracy) present were detected from the air. Aerial surveys were most accurate when conducted when winds were less than 5 mph and visibility was over 1 mile, and at an altitude of 300 feet above water level. They should be conducted after 1 July. Adult loons are on nests in May and June and would be difficult to detect from the air at that time. Young loon are approximately 2 weeks old by 1 July and can easily be observed from the air. The aerial surveys were faster than ground surveys; 15.0 lakes per hour were surveyed from the air compared with 3.0 lakes per hour from the ground. The cost of the aerial survey was $2.33 per lake. Aerial surveys are the only practical method for censusing large (greater than 1 thousand acres) water areas. Large water areas have been accurately censused by boat in other studies (McIntyre 1975, Olson and Marshall 1952, Vermeer 1973), but these surveys required many hours of observation.

The approaching airplaine caused some loons to dive. This required circling the area to accurately assess loon numbers. The 3-minute circling period was adequate as loons surfaced within 20 seconds after diving. Young loons dove repeatedly; adult loons with young swam in a small circle around the diving young. This behavior continued throughout the 3-minute survey period. The circling behavior was not noted in adults without young.

Tape-recorded calls stimulated a vocal response at 39 (83.0 percent) of 47 lakes where loons were present. No response was obtained at three lakes where loons were known to be on nests. Five single adults, which were with young loons on five other lakes, also did not respond vocally; these adults swam directly away from the source of the audio

stimulation. Loon pairs with young responded by one adult approaching the speaker while the other adult accompanied the young to the opposite side of the lake. Two adult loons were attracted from lakes 0.5 mile away, calling as they flew. The tremalo call, used in this study, was reported by Olson and Marshall (1952) to be uttered when a pair's territory was being invaded. This accounts for the aggressive behavior noted in adult loons and the protective behavior provided the young. Response to the call lasted for up to 9 minutes if stimulation was continued. The audio stimulation was effective on small lakes (less than 200 acres), here the call could be heard over the entire lake by human ear. Weather conditions influenced the range of sound. Winds greater than 15 mph hindered both the range over which the loon call could be heard and the range loon responses were received. Loons responded to the calls at all times of the day.

Human Disturbance

Loon populations in Wisconsin are affected by human disturbance. The desertion of three loon nests in this study was linked to human disturbance. The presence of fisherman for lengthy periods (3-4 hours) near two of the nests prevented the return of the incubating adults. A third nest, located on a 1.2-acre island, was abandoned after the island was used as a campsite for 1 week in early June 1976. Olson and Marshall (1952) reported that 6 of 10 known cases of nest desertion were traceable to human disturbance. McIntyre (1977a) found that human activity increases the chances of predation. Loons, when disturbed, leave their nest and thus alert avian predators to the nest location and also increase the chances for mammalian predation of the unattended nest.