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DISTRIBUTION AND STATUS OF THE
GREATER SANDHILL CRANE IN WISCONSIN

By

Ernest A. Gluesing

A THESIS

Submitted to the
University of Wisconsin-Stevens Point
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ABSTRACT

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The greater sandhill crane (Grus canadensis tabida) was studied from September, 1972, through November, 1973. Important nesting habitats are river marshes, lake marshes, flooded meadows, cattail marshes, sedge marshes, cranberry reservoirs, and bogs. The mean size of 143 marshes where one or more pairs of sandhill cranes were located was 339 acres. Approximately 850 sandhill cranes were present in Wisconsin during the summer of 1973. Of the 250 known pairs, nests were located for 40 pairs and 66 pairs were known to have produced 87 young. An estimated 55 additional pairs were not observed and an estimated 152 cranes were present as non-breeders. Thirty-three nests had a mean clutch size of 1.788 and 55 percent of all known nests were on land in private ownership. The densities of cranes in Wisconsin were low in relation to other North American populations indicating that the number of cranes in Wisconsin should continue to increase if their habitat is preserved. White collars were placed on 29 cranes and measurements of 36 captured cranes indicated that none could be definitely classified as belonging to the rowani subspecies.

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INTRODUCTION

The sandhill crane (Grus canadensis) is a unique and intrinsic part of Wisconsin's marshes. Their stately and photogenic qualities attract many visitors where observation has been made possible with towers or dike roads. Brochures of state wildlife areas advertise the sandhill as a nesting resident and proclaim to the sightseer the opportunity for a closer look at this unusual bird. The importance of the sandhill crane was eulogized best by Aldo Leopold (1949:102-103):

"Our ability to perceive quality in nature begins, as in art, with the pretty. It expands through successive stages of the beautiful to values as yet uncaptured by language. The quality of cranes lies, I think, in this higher gamut, as yet beyond the reach of words.

This much, though, can be said: our appreciation of the crane grows with the slow unraveling of earthy history. When we hear his call we hear no mere bird. He is the symbol of our untamable past, of that incredible sweep of millennia which underlies and conditions the daily affairs of birds and men."

During the early 1800's migratory populations of sandhill cranes nested in wetland habitats across much of the northern half of the North American continent. Their range extended south as far as northern California and Arizona, central Nebraska, southern Illinois, and central Indiana and Ohio. Sedentary populations existed in Florida, Louisiana, Mississippi, Cuba, and the Isle of Pines. Sandhill cranes have disappeared from much of their

former nesting areas as a result of excessive hunting, drainage of wetlands, and human settlement. The decline in the sandhill crane population was very rapid between 1870 and 1915 (Walkinshaw 1949). Despite recent increases in numbers due to protection from hunting and preservation of wetlands, cranes no longer nest in Ohio, Indiana, Illinois, Iowa, Nebraska, the Dakotas, Washington, Louisiana, Arizona, and much of southern Canada (Lewis, et al. 1973).

The story in Wisconsin is a miniature image of the plight of wetland habitats in much of North America. Pioneer farmers came in their covered wagons and settled on the wooded uplands surrounding the marshes. They cleared the timber and planted corn and cereal grains. To feed their livestock, they converted the marshes to pastures or hay meadows. Later, during the early 1900's, to meet the demand for more crop lands to feed a hungry industrial society, large scale drainage was initiated.

Short growing seasons, poor and acid soils, killing frosts in the summer, high drainage taxes, a drought, and a depression combined to cause many of these early farms to be abandoned during the 1930's and 1940's. Failure to pay taxes and resettlement programs reverted much of this land to government ownership.

Early records of sandhill cranes nesting in Wisconsin are few in number. One of the earliest records for Wisconsin was attributed to Aldo Leopold who reported

meeting a farmer who knew of sandhill cranes breeding since at least 1848 (Henika 1936). Other early nesting records include: Racine County in 1853 (Hoy 1853); Walworth County in 1883, Juneau County in 1896, Jefferson County in 1898, and Green Lake County in 1893-1903 (Kumlien and Hollister 1903); Oconto County in 1895 (Schoenebeck 1939); Burnett County in 1903 (Walkinshaw 1949); and Wood County in 1918 (Hamerstrom 1938). Sandhill cranes were suspected of nesting in Outagamie County before 1883 (Grundtvig 1894). Other recorded sightings of sandhill cranes in Wisconsin are listed in Appendix A.

Between the turn of the century and the 1940's, there is a conspicuous lack of recorded data of known nesting pairs or even sightings of sandhill cranes in Wisconsin. How small the crane population in Wisconsin actually became is unknown, although Henika (1936) estimated the Wisconsin population at only about 25 breeding pairs during the 1930's. The population has increased dramatically since that time, yet, except for brief reports by Hamerstrom (1938), Grange (1955), and Gregg and Hunt (1970), no intensive efforts were made to determine and report the status and distribution of sandhill cranes in Wisconsin.

The lack of knowledge on the number, distribution, and status of a rare¹ bird; its importance as an intrinsic part

1. The greater sandhill crane was removed from the U. S. Fish and Wildlife Service's list of rare and endangered species in 1973 (Office of Endangered Species and International Activities 1973).

of Wisconsin's marshes symbolizing "our untamable past"; and concern for its future indicated the need for a study.

This dissertation is a report of a study conducted from September, 1972, through November, 1973, in cooperation with the Wisconsin Department of Natural Resources. The main objectives of the study were (1) to determine the number and distribution of breeding pairs and (2) to delineate the habitat used by sandhill cranes in Wisconsin.

The Sandhill Crane

Six subspecies of the sandhill crane (Grus canadensis) have been described. The greatest differences between the subspecies are size and geographical range. The geographical distribution and migration paths for the six subspecies of sandhill cranes in North America are shown in Figure 1. Three of the subspecies, the Florida, the Mississippi, and the Cuban are non-migratory. The Florida sandhill crane (G. c. pratensis Meyer 1794) breeds only in Florida and southern Georgia (Walkinshaw 1973a). The Mississippi sandhill crane (G. c. pulla Aldrich 1972) consists of a small population of about 38-40 birds in Jackson County in southern Mississippi (Valentine and Noble 1970). The remaining non-migratory subspecies, the Cuban sandhill crane (G. c. nesiotus Bangs and Zappey 1905), is only found in Cuba and the Isle of Pines (Walkinshaw and Baker 1946, Walkinshaw 1953). The Florida and the Mississippi subspecies are listed as threatened on the U. S. Fish and

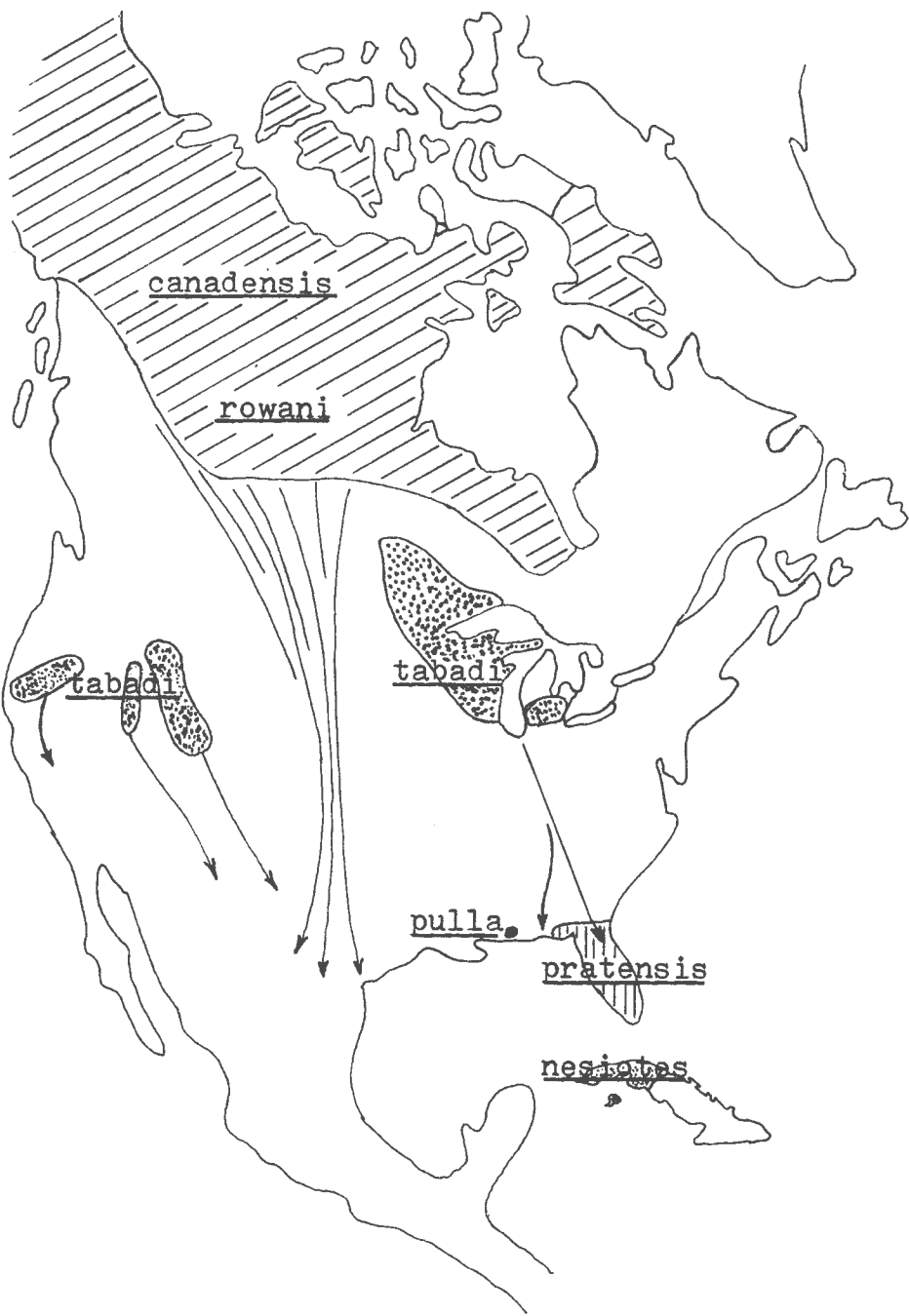


Figure 1. Distribution and migration routes of subspecies of the sandhill crane (*Grus canadensis*) in North America (Lewis, et al. 1973; Walkinshaw 1973a).

Wildlife Service list of Threatened Wildlife of the United States (Office of Endangered Species and International Activities 1973) and the Cuban subspecies is listed as rare in the Red Data Book-Aves of rare and endangered species (Vincent 1971).

The largest and smallest forms of the sandhill crane are found within the three migratory subspecies. The distribution of the smallest subspecies, the lesser sandhill crane (G. c. canadensis Linnaeus 1758), was described by Walkinshaw (1949:4) as follows:

"The Lesser Sandhill Crane breeds from northern Siberia across Alaska, Arctic Canada to the region of Baffin Island, south probably to the northern portions of the western Canadian Provinces. It winters from central California east to Texas, south into Mexico, probably as far south as Mexico City."

The Canadian sandhill crane (G. c. rowani Walkinshaw 1965a) breeds in "southern Mackenzie, Alberta, Saskatchewan, and probably central western Manitoba" (Walkinshaw 1965a:181). This subspecies winters in southern and eastern Texas. Lumsden (1971) has extended the breeding range of the Canadian sandhill crane into northern Ontario. The population of lesser and Canadian sandhill cranes is estimated at 200,000-270,000 (Lewis, et al. 1973).

Walkinshaw (1965a) described the Canadian sandhill crane on the basis of color of primary feather shafts and measurements of wing chord, tarsus, exposed culmen, bare tibia, and bill length from tip to posterior of the nostril.

The use of this criteria to differentiate subspecies of the sandhill crane has been questioned in recent years. In a study of sandhill cranes at Last Mountain Lake, Saskatchewan, Stephen, Miller, and Hatfield (1966) collected 303 specimens during spring and fall migrations from 1961 through 1963. The specimens were collected by non-selective shooting of flocks going between feeding and roosting areas. Measurements of the exposed culmen, bill length from tip to posterior margin of the nostril, and metatarsus length were recorded for each specimen and compared with those listed by Walkinshaw (1949, 1965a). The color of primary feather shafts was also recorded for 127 specimens. Frequency polygons for these data were examined to determine the probable proportions of each subspecies present. Because of significant overlap in measurements and the lack of correlation in color of shafts of primary feathers, Stephen (1967:21-22) wrote:

"It is concluded that attempts to differentiate subspecies by the criteria used are not warranted for the following reasons: the colour of shafts of primary feathers is not a reliable taxonomic character; at least 75 percent of the Last Mountain Lake sandhill crane specimens could not be assigned to one subspecies (Mayr, et al. 1953); the measurements of adult males followed a normal distribution indicating a single population;...and...there is a lack of correlation of diagnostic characters."

A more recent study of fall migrant populations of sandhill cranes in northwestern Minnesota, North Dakota, and eastern Montana tends to support the validity of the

rowani subspecies. Linear measurements of wing chord, metatarsus length, and exposed culmen were obtained from 180 sandhill cranes collected at random during the fall of 1970 and 1971. Johnson and Stewart (1973:161) concluded that a "statistical analysis employing measurements of breeding specimens representing the three migrant subspecies of Sandhill Crane (Grus canadensis canadensis, Grus c. rowani, and Grus c. tabida) provided supportive evidence that the intermediate population, rowani, is separable on the basis of wing chord, tarsus length, and exposed culmen."

The greater sandhill crane (G. c. tabida Peters 1925) estimated at 22,600-26,600 individuals exists in four populations (Lewis, et al. 1973). The Rocky Mountain population nests in river valleys, marshes, and meadows in portions of Idaho, northern Utah, southwestern Montana, western Wyoming, and northwestern Colorado. Major wintering areas are in the middle and lower Rio Grande Valley of New Mexico (Drewien 1973, Drewien in Lewis, et al. 1973).

The Colorado River Valley population nests in northeastern Nevada and possibly portions of south-central and southwestern Idaho. Wintering areas are in the Imperial and Colorado River Valleys of Arizona (Littlefield and Drewien in Lewis, et al. 1973).

The Central Valley population nests in flooded meadows and marshes of Oregon and northeastern California. One of the largest localized populations of greater sandhill

cranes is located at Malheur National Wildlife Refuge, Harney County, Oregon. The Central Valley population winters in north-central California (Littlefield and Ryder 1968, Littlefield in Lewis, et al. 1973).

The Eastern population of greater sandhill cranes nests in Michigan, Wisconsin, Minnesota, and central Manitoba (Walkinshaw 1973a, Lewis, et al. 1973). It is possible that greater sandhill cranes are also nesting in southern Ontario (Lumsden 1971, Lovett Williams personal communication). The Jasper-Pulaski Game Preserve in northeastern Indiana is the primary spring and fall staging area for the Eastern population of greater. Fall concentrations in 1973 were estimated at 8,000 cranes (Duane Shroufe personal communication). Major wintering areas are in Florida and southern Georgia (Walkinshaw 1960, Williams and Phillips 1972). A small number of cranes also winter in southern Alabama (Imhof 1969 and personal communication). Estimates of the number of sandhill cranes on the wintering grounds (Williams, Eadie, and Imhof in Lewis, et al. 1973) and counts of fall concentrations at the Jasper-Pulaski Game Preserve (Duane Shroufe personal communication) places the Eastern population of greater sandhill cranes at approximately 8,000-10,000 individuals.

METHODS

Population Survey

A mail survey of Wisconsin Department of Natural Resources Game Managers and Conservation Wardens was "conducted" in February, 1973. The survey requested information on migration numbers, date of arrival, and the number of known or suspected nesting cranes in their assigned area. Examples of questionnaires are contained in Appendix B. To determine the more concentrated nesting areas, information from this survey was compared to that of a similiar survey by Gregg and Hunt (1970). U. S. Department of Interior Geological Survey topographic maps (7.5 and 15 minute series) were purchased for those areas where there was known or suspected nesting. During the interval between the cranes initial arrival in March and incubation in April, sandhill cranes were observed with the aid of a 15-60X spotting scope and 7x35 binoculars. Walkinshaw (1950) also noticed an interval of about one month between the cranes initial arrival and incubation. Suspected nesting areas were marked on the topographic maps.

Once it was determined from observations of the crane's behavior that incubation had begun (Walkinshaw 1965d), helicopter searches for individual nests were initiated. The use of the helicopter, because of limited funds, was restricted to intensive searches in known nesting areas.

Light fixed-wing aircraft were also used to locate nests, but it was quickly determined that they were not satisfactory. Because the greater height and speed required by fixed-wing aircraft to maintain control and safety prevented low, zig-zag flight patterns, single and small groups of cranes were difficult if not impossible to detect. Valentine and Noble (1970) also found light fixed-wing aircraft unsatisfactory for locating nesting cranes during their study in Mississippi. Wisconsin crane habitat does not facilitate the use of airboats which have been used successfully by Thompson (1970) in Florida and Rod Drewien (personal communication) in Idaho.

Where possible, nests were visited on foot and data collected included the number of eggs, nest measurements, water depth at the nest site, habitat description, and photographs. Nest visits were limited to a maximum of one per week to minimize disturbing the incubating crane and reduce the possibility of human caused desertion (Littlefield and Ryder 1968).

Ground searches were conducted throughout the summer for pairs with young. Local residents and Wisconsin Department of Natural Resources personnel were contacted to discuss the past history of cranes; their location and behavior; their intrinsic value; and the extent, if any, of crane caused crop depredation. Mail surveys (see Appendix B) of Wisconsin Department of Natural Resources Game

Managers and Conservation Wardens were used again in August and October of 1973 to obtain additional information about summer residents and migrants. These procedures generally follow those outlined by Walkinshaw and Wing (1955) in their census of cranes in southern Michigan.

Capturing and Marking

In September and October of 1973, cranes were captured at the Necedah National Wildlife Refuge, Juneau County, with a recoilless rocket-projected net. Cranes were also captured at the Dike 17 Wildlife Area, Jackson County, with a cannon-projected net. Captured cranes were color-marked with numbered aluminum collars and banded with size 9 standard U. S. Fish and Wildlife Service bands above the distal joint of the left tibiotarsus. Measurements of captured cranes followed those described by Stephen, Miller, and Hatfield (1966:581-582); Stephen (1967:19); and Miller, Hochbaum, and Botkin (1972:13). The length of the bill was measured from the tip to the posterior margin of the nostril. The length of the culmen was measured from the tip of the upper mandible to the point where the culmen met the lores. The length of the tarsometatarsus was measured from the posterior edge of the tibiotarsus-tarsometatarsus joint to the anterior edge of the tarsometatarsus-phalanx joint of the mid-toe. The mid-toe was measured from the last scute of the toe to the anterior edge of the tarsometatarsus-phalanx joint.

Cranes were examined for ectoparasites and blood samples were collected from the brachical vein of eighteen cranes. Sera from these samples will be used in future serological studies. Blood smears were examined for protozoan parasites.

The $1\frac{1}{2}$ inch mesh capture nets were 40 feet wide by 60 feet long with an 18 inch skirt. Three recoilless rockets were required to launch each net. Three inch high bare aluminum collars, supplied by Rod Drewien, Idaho Cooperative Wildlife Research Unit, University of Idaho, Moscow, were painted white and individually marked with a black letter-number combination (Figure 2). The ends of the collar were not fastened together so that cranes could pull free if their bill or some other object became wedged inside the collar.

In order to avoid the problems encountered by Wheeler and Lewis (1972), dummy capture equipment was placed at feeding areas and primary roosts in early August. Dummy equipment consisted of 18 inch lengths of 2x4's wired onto standard T-type fence posts and burlap sacks placed in a row to simulate a net. Ear corn was used for bait. When sandhill cranes began using the bait pile daily, recoilless rockets and nets were placed in position (Figure 3). Recoilless rockets were attached to fence posts at a height of approximately 60 inches and at a 15-20 degree angle. Nets were originally anchored with rubber straps 2 feet in length, but after the first capture attempt, ten-foot

lengths of nylon rope were substituted for the rubber straps. Cranes were removed from the net and placed in burlap feed sacks with their legs taped together (Williams and Phillips 1972), until they could be processed. Each crane was immediately released at the capture site after being processed.



Figure 2. Juvenile sandhill crane with individually marked white aluminum collar, September 26, 1973.



Figure 3. Sandhill crane capture equipment ready for firing at the Necedah National Wildlife Refuge, Juneau County, Wisconsin, September 26, 1973.

RESULTS

Sandhill Crane Habitat

Sandhill cranes nested in river marshes, lake marshes, flooded meadows, sedge marshes, cattail marshes, cranberry reservoirs, and bogs. In addition they were suspected of nesting in shrub and wooded swamps. Visual isolation was usually afforded each pair of cranes by the surrounding wooded uplands or hills. In larger marshes visual isolation and/or physical separation was produced by shrub and tree islands, dikes, ditches, or elevated road beds. Standing water 5-60 centimeters or more in depth during the breeding season was common to all nesting habitats. Cultivated fields or cranberry bogs were adjacent to or within a mile from most of the marshes.

The relative size of 143 marshes where one or more pairs of cranes were located was determined from topographic maps based on aerial photographs. The size of these marshes varied from 10 acres to more than 3000 acres. The mean size was 339 acres with a standard deviation of 387. On a per pair basis, the mean size was reduced to 292 acres with a standard deviation of 260.

Plant species commonly found in these marshes were grasses (Gramineae), sedges (Carex spp.), rushes (Juncus spp.), sphagnum moss (Sphagnum spp.), Labrador tea (Ledum groenlandicum), leather-leaf (Chamaedaphne calyculata),

common cattail (Typha latifolia), great bulrush (Scripus validus), spike rushes (Eleocharis spp.), bur-reed (Sparganium eurycarpum), arrowhead (Sagittaria latifolia), and occasionally reed (Phragmites communis).

In the drier portions of the marsh or on surrounding uplands, common species were sweetfern (Comptonia pergrina), sheep sorrel (Rumex acetosella), steeplesh spirea (Spiraea tomentosa), Joe-Pye-weed (Eupatorium purpureum), stick tights (Bidens spp.), goldenrod (Solidago spp.), and milkweeds (Asclepias incarnata and A. syriaca).

Shrub species which provided isolation in the wetter areas of the marsh were mainly willows (Salix spp.), and to a lesser extent speckled alder (Alnus rugosa).

Tree and shrub species on the surrounding uplands included quacking aspen (Populus tremuloides), oaks (Quercus alba, Q. macrocarpa, Q. palustris, Q. rubra, and Q. ilicifolia), pines (Pinus banksiana and P. strobus), white birch (Betula papyrifera), hawthorns (Crataegus spp.), dogwoods (Cornus spp.), and raspberries (Rubus occidentalis and R. idaeus). I have attempted to provide a general description of the habitat in which sandhill cranes were known to nest or where they were suspected of nesting. A description of all marshes is beyond the scope of this study. In the following section on nests, some examples from various marshes where nests were located will indicate the variety of habitats occupied.

Nests

Nests located in river marshes are illustrated by Figures 4, 5, and 6. Figure 4 shows a nest in a flooded marsh along the Fox River. The nest consisted of a large mound of sedges measuring approximately 91 x 107 centimeters (Figure 5). The top of the nest, at its highest point, protruded 15 centimeters above the surface of the water. The depth of the water, measured at the nest, was 61 centimeters. Another nest on the Fox River (Figure 6), approximately $\frac{1}{2}$ mile upstream, illustrates the isolation produced by willows and the fact that some sandhill cranes nest in close proximity to human residential areas.

Nests in sedge marshes with varying degrees of shrub growth are illustrated by Figures 7 and 8. The nest in Figure 7 was in a large, sedge and sphagnum marsh in northwestern Wisconsin. The nearest open body of water (determined from aerial photographs) was approximately 12 meters away. Because of the height of the tussocks, attempts to reach this nest on foot were unsuccessful. A mound nest in a typical sedge and willow marsh in central Wisconsin is shown in Figure 8.

The variation in nest size and shape is further illustrated by Figures 9 and 10. The nest in Figure 9, located in a cattail, sedge, and reed marsh, was approximately 84 centimeters in diameter and extended 20 centimeters above water 56 centimeters in depth. Nests containing little

vegetative matter were also constructed by sandhill cranes. Figure 10 represents this type. Predominant vegetation in this marsh consisted of grasses, sedges, sphagnum moss, Labrador tea, great bulrush, and willows. In all cases, crane nests were constructed predominantly from dried vegetation of the most available species in the area of the nest. The use of the most predominant vegetation in the area of the nest was documented by Walkinshaw (1949, 1973b) and Littlefield and Ryder (1968).

The helicopter is the most efficient method of locating crane nests in Wisconsin. When approached by the helicopter, the incubating crane flushed from the nest facilitating its location and a determination of the number of eggs present. In contrast, an incubating crane remained on the nest in a crouched position when approached by a fixed-wing aircraft. Twenty-seven nests were located in 19.5 hours of flight time in a helicopter at a rate of 1.38 nests per hour. This rate is lower than what was normally experienced since it includes a day when only two nests were located in 5.5 hours of search time as well as refueling and ferry flights. Generally nests were located at a rate of about two per hour of actual search time over the marshes.

The effectiveness of the helicopter compared to that of a light plane in locating crane nests was demonstrated unintentionally when I searched an area initially with a helicopter and recorded the location of five nests, all of which contained eggs. The following day Dr. George Archibald, a pilot, and



Figure 4. Sandhill crane nest in a flooded marsh along the Fox River, Green Lake County, Wisconsin, April 21, 1973.



Figure 5. Nest of a sandhill crane with a rare clutch of 3 eggs, Green Lake County, Wisconsin, April 21, 1973.



Figure 6. Sandhill crane nest constructed next to willows and in close proximity to a residential area, Green Lake County, Wisconsin, April 21, 1973.

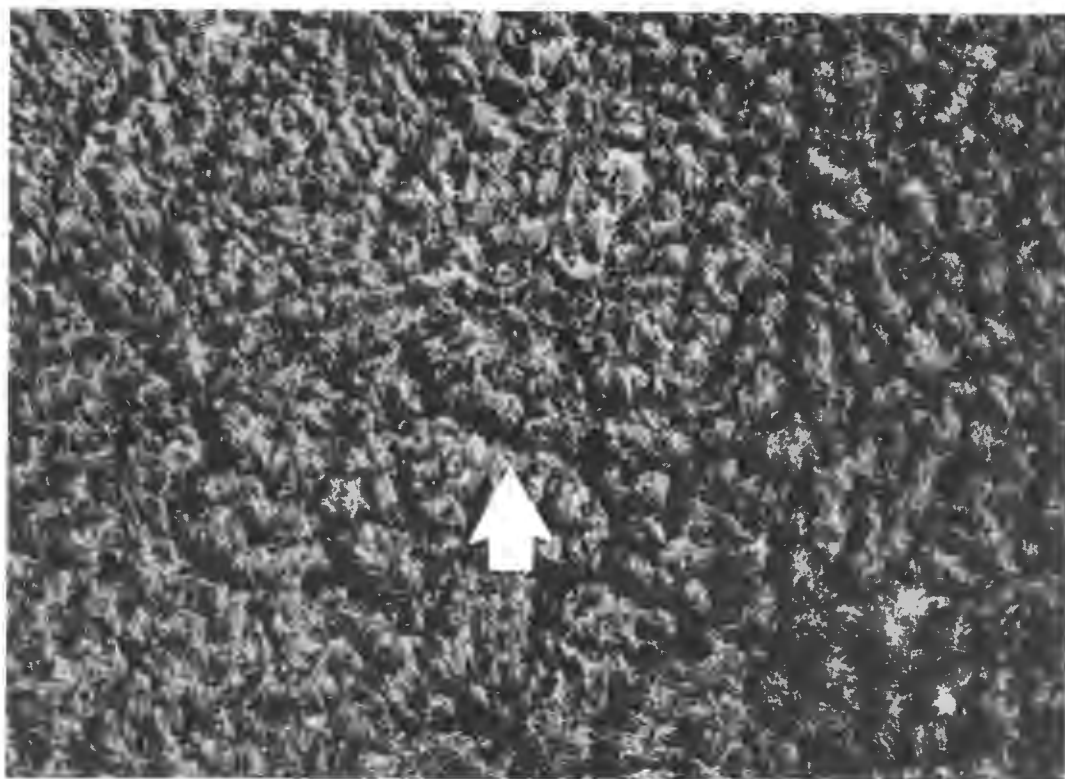


Figure 7. Nest of a sandhill crane in a large, sedge marsh, Burnett County, Wisconsin, April 23, 1973.

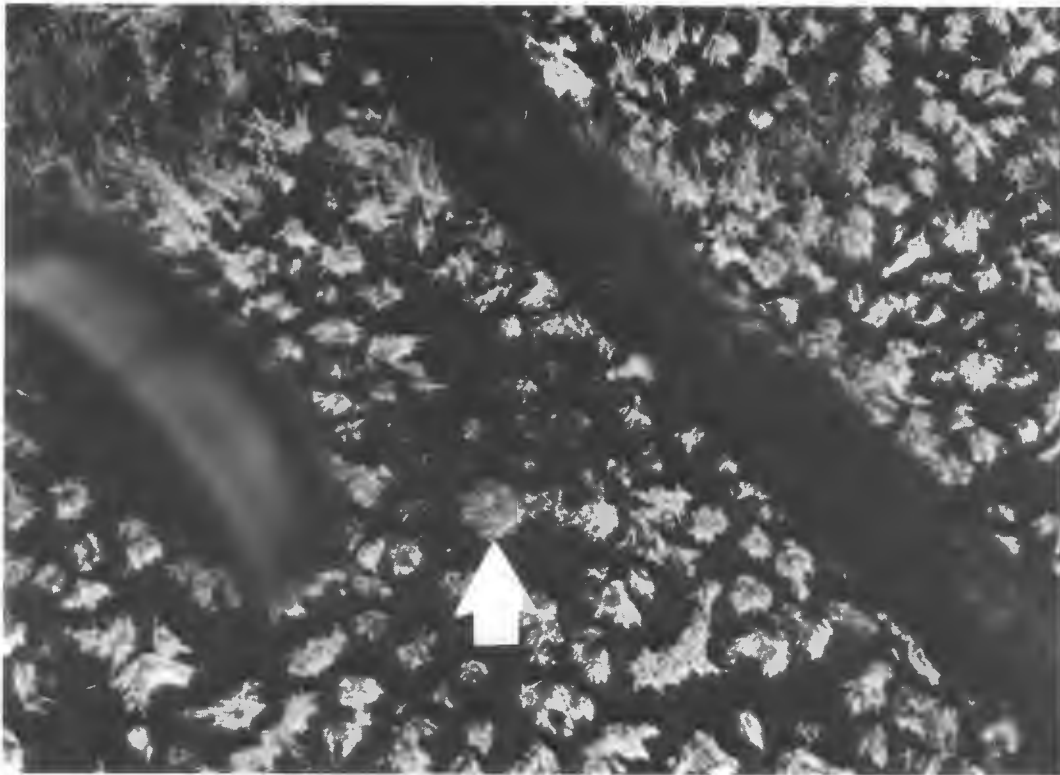


Figure 8. Sandhill crane nest in a flooded, sedge and willow marsh, Wood County, Wisconsin, May 4, 1973.



Figure 9. Construction of a large mound-type sandhill crane nest in a cattail, sedge, and reed marsh, Marquette County, Wisconsin, April 27, 1973.



Figure 10. Sandhill crane nest constructed out of very little vegetative matter, Portage County, Wisconsin, April 29, 1973.

two other observers searched the same area in a light plane and only located one of the five nests. Although a total of six nests were located during this study by light plane, specific searches for previously located active nests were unsuccessful (Dr. George Archibald personal communication). This further illustrates the ineffectiveness of light fixed-wing aircraft in locating sandhill crane nests.

Clutch Size

Clutch size was obtained for 33 nests. Twenty-four contained two eggs, 8 contained one egg, and 1 contained three eggs. The mean clutch size was 1.788 which is less than the mean clutch size of 1.962 for 126 nests in Michigan (Walkinshaw 1965b) and 1.917 for 108 nests in Oregon (Littlefield and Ryder 1968). A mean clutch size of 1.788 for sandhill cranes in Wisconsin may be misrepresentative since some of the nests were only observed once. Thompson (1970) had several observations of single-egg nests which contained two eggs when revisited.

Distribution in Wisconsin

Table 1 lists the location of 250 pairs of sandhill cranes and the number of non-breeders observed in each county during the spring and summer of 1973. Of these 250 pairs of sandhill cranes, nests of 40 pairs were located and 61 other pairs were known to have young. Figure 11 shows the distribution of sandhill cranes in Wisconsin during 1973.

The number and percent of nests, pairs with young, and pairs without known young or nests that were located on marshes in private, public, or private and public ownership are shown in Table 2. It is interesting that 55 percent of all known nests were on private land and 56 percent of the nests located with the helicopter were on private land although aerial searches were conducted primarily over public land.

Migration

It is not known how many migrating and summer resident sandhill cranes were in the state on any one day during September or October. It is known, however, that the total number of cranes using various roosting or feeding areas in the state during the 21 day period from September 25 through October 15 exceeded 1800. The largest actual count at a single roost was 413 at the White River Marsh on September 29 by John Weber. Gerald Updike estimated more than 400 cranes were at the Necedah National Wildlife Refuge during the first week in October. Other large counts were 225 on September 25 at Dike 17 (Eugene Kohlmeyer); 175 on October 7 in Sherwood Township, Clark County (Paul Kooiker); and 150 on October 14 at Crex Meadows (Norman Stone). The last large concentration of sandhill cranes to leave the state was in November. Gerald Updike reported that on November 4, 225 sandhill cranes were still at the Necedah National Wildlife Refuge, but by the afternoon of November

5, all were gone. Peak numbers of spring and fall migrating sandhill cranes during 1973 are shown in Figure 12. At the time of this writing (February 1974), no sightings of cranes banded in Wisconsin have been reported from either the Jasper-Pulaski Game Preserve in Indiana or from the wintering grounds in Florida.

Depredation

Data on the amount of crop depredation within the state were incomplete, however, depredation was reported in Green Lake, Juneau, Marathon, Marquette, Portage, and Waushara Counties.

Parasites

No protozoan parasites were found in blood smears from eighteen sandhill cranes and only one ectoparasite (Family Menoponidae) was found.

Captured Cranes

A total of thirty-six cranes were captured and banded with size 9 standard U. S. Fish and Wildlife Service aluminum bands. Numbered collars were placed on twenty-nine of the thirty-six cranes and a numbered 2½ inches square "tarsus-tag" was placed on a chick captured at the Navarino Wildlife Area. One crane died of a broken neck during capturing, one died during handling, and three escaped from under the net prior to removal for measuring and marking. Dates of capture, measurements, and location of capture are listed

in Table 3.

Dr. John Aldrich (personal communication) has grouped measurements of length of culmen of adult sandhill cranes into the following categories:

	<u>male</u>	<u>female</u>
<u>tabida</u>	96-116 mm	87-104 mm
<u>rowani</u>	67-99 mm	70-94 mm

According to these categories, fifteen of the captured cranes were male tabida, four were female tabida, seventeen could not be classified as to sex, and none could be definitely classified as belonging to the rowani subspecies.

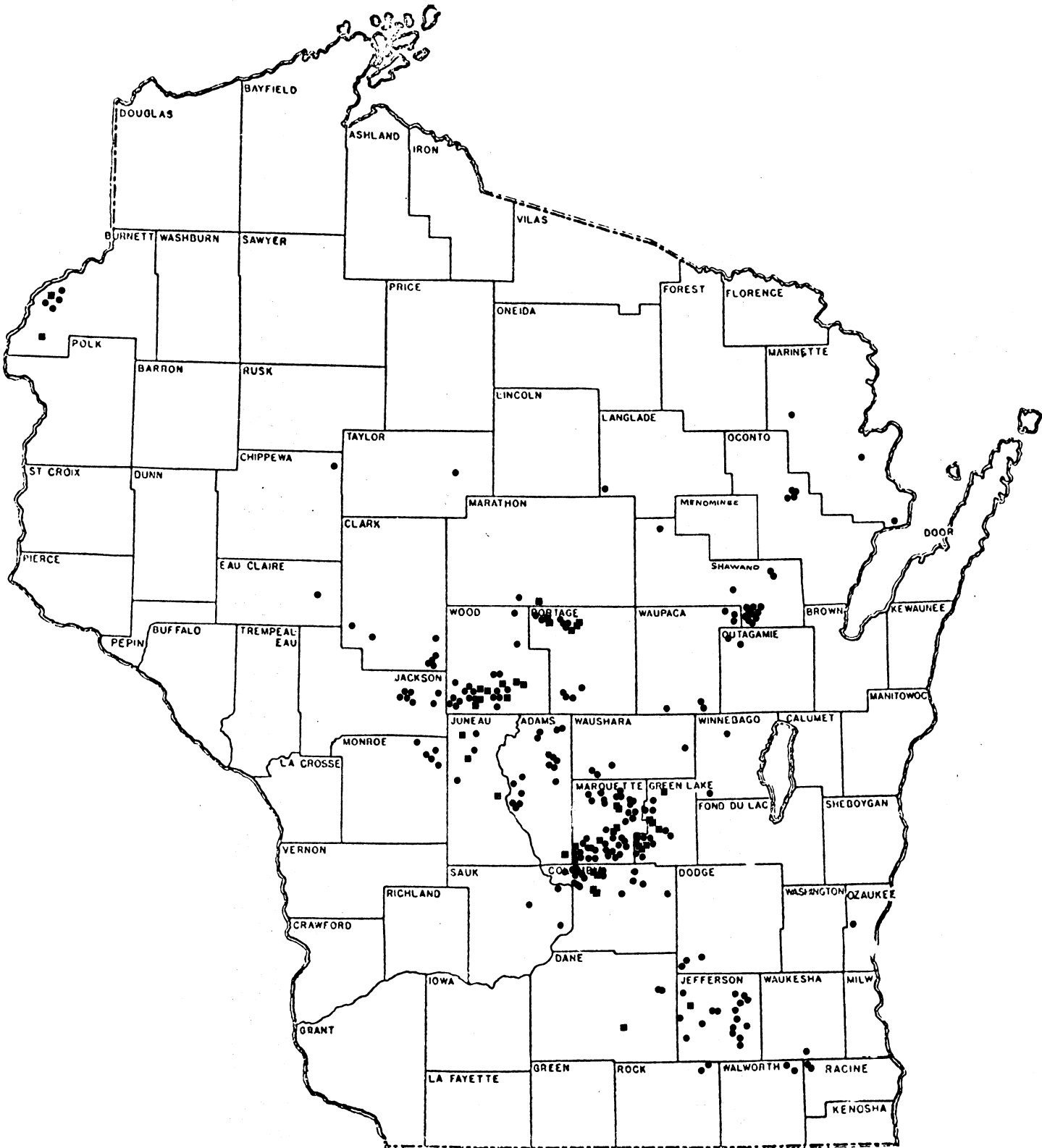


Figure 11. Distribution of sandhill crane pairs in Wisconsin during the summer of 1973. Circles represent pairs located. Squares represent nest located.

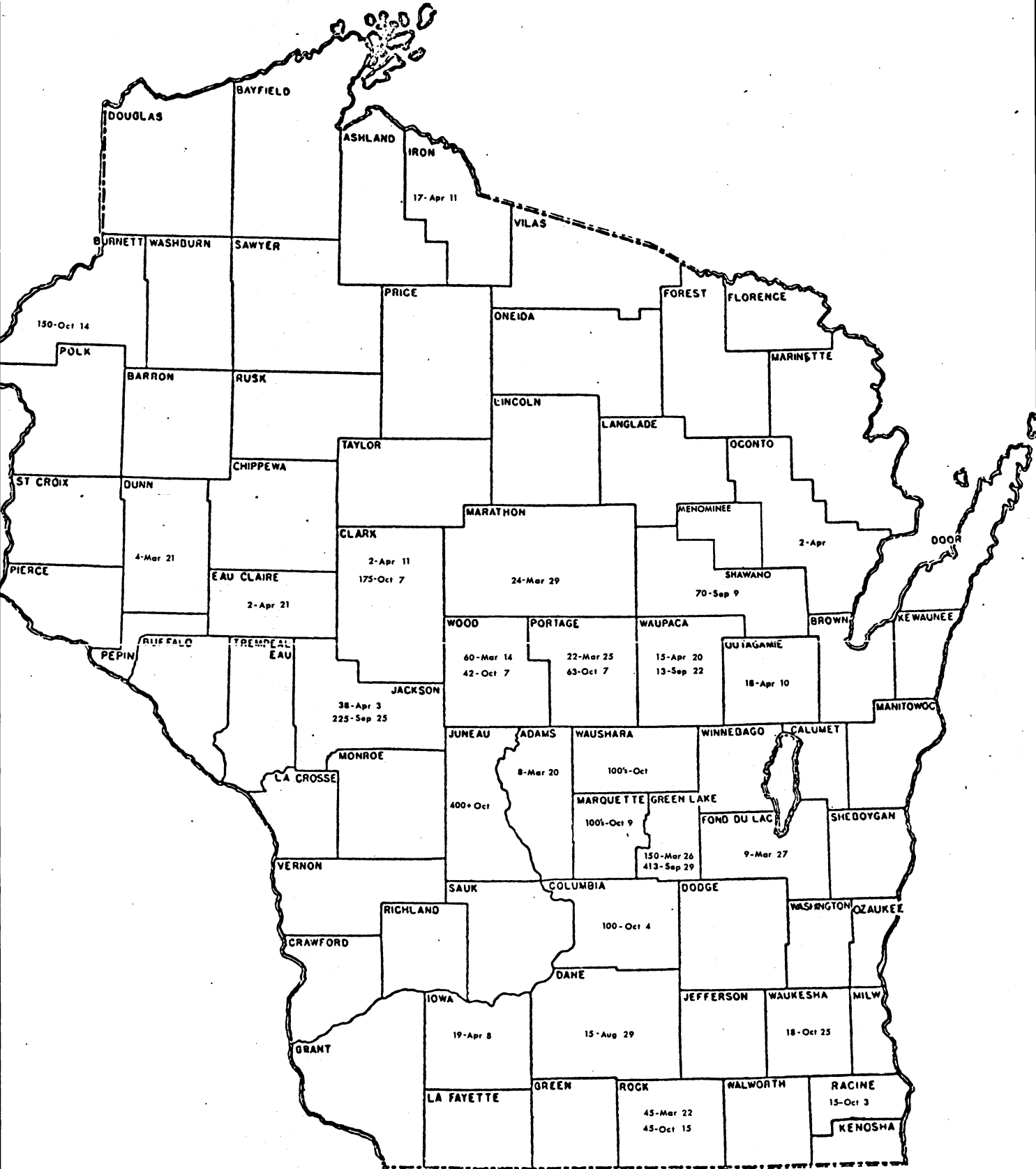


Figure 12. Peak numbers of sandhill cranes observed during the spring and fall of 1973.

Table 1. Location of sandhill crane pairs during the summer of 1973. The peak number of cranes observed in groups in each county during the summer is shown in parenthesis after the respective county name.

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>ADAMS COUNTY</u>			<u>PLAT 1970</u>		
<u>New Haven Township</u>					
T14N, R7E, Sec.23	1	1		P	G.Archibald
<u>Quincy Township</u>					
T16N, R5E, Sec.9	1			P	G.Archibald
T16N, R5E, Sec.11	1	1	2+	P	D.Christensen, G.Archibald
T16N, R5E, Sec.23	1			P	G.Archibald
T17N, R5E, Sec.17	1	1	3+	P	D.Christensen, R.Palmer
<u>Adams Township</u>					
T17N, R5E, Sec.2	1			P	E.Gluesing
T17N, R5E, Sec.26	1			P	G.Archibald
<u>Lincoln Township</u>					
T17N, R7E, Sec.4,5,8	1			P	D.Knocke
<u>Richfield Township</u>					
T18N, R7E, Sec.8,16	2			P	G.Archibald
T18N, R7E, Sec.16,23	1	2		P	D.Christensen, G.Archibald
T18N, R7E, Sec.19,20	2		15+	P	D.Grinde
<u>Big Flats Township</u>					
T19N, R6E, Sec.9,10	1*	1	7-10	P	D.Johnson
<u>Rome Township</u>					
T20N, R6E, Sec.34	1		20+	P	J.Kubisiak
<u>Leola Township</u>					
T20N, R7E, Sec.27,28, 32,33	2			P	D.Knocke, A.Gear, L.Pennington

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>BURNETT COUNTY (5)</u>				<u>1973</u>	
<u>Anderson Township</u>					
T37N, R19W, Sec.9,10	N2e		many	S	E.Gluesing, N.Stone
<u>West Marshland Township</u>					
T39N, R18W,	1	2	many	S	N.Stone, M.Zekas
T39N, R18W, Sec.9	1	1	many	S	E.Gluesing, N.Stone
T39N, R18W, Sec.18	N1e		many	S	E.Gluesing, N.Stone
T39N, R18W, Sec.21	1	2	many	S	N.Stone, M.Zekas
T39N, R18W, Sec.32	1	1	many	S	E.Gluesing, N.Stone, M.Zekas
<u>CHIPPEWA COUNTY</u>				<u>PLAT 1972</u>	
<u>Rubby Township</u>					
T31N, R5W, Sec.2,3	1		1+	PC	R.Nesbit
<u>CLARK COUNTY</u>				<u>PLAT 1970</u>	
<u>Sherwood Township</u>					
T23N, R1E, Sec.23	1		5+	P	P.Kooicker, N.Freedlund
T23N, R1E, Sec.27	1		5+	PC	P.Kooicker
T23N, R1E, Sec.33	1		5+	C	P.Kooicker
T23N, R1E, Sec.34	1		5+	PC	P.Kooicker
<u>Lynn Township</u>					
T24N, R1E, Sec.35,36	1		13+	P	D.Doberstein, V.Schier
<u>Pine Valley Township</u>					
T24N, R2W, Sec.19	1*	1	many	P	K.Church
<u>Foster Township</u>					
T25N, R4W, Sec.27	1		8-9	C	R.Nesbit

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>COLUMBIA COUNTY</u>				<u>PLAT 1972</u>	
<u>Lowville Township</u>					
T11N, R10E, Sec.16	1			P	G.Archibald
<u>Pacific Township</u>					
T12N, R9E, Sec.2,3	N			PS	G.Archibald, R.Argard, R.Rich
T12N, R9E, Sec.12	N			P	G.Archibald, R.Argard, R.Rich
<u>Wyocena Township</u>					
T12N, R10E, Sec.11	1	1	many	P	E.Babcock
<u>Springvale Township</u>					
T12N, R11E, Sec.2	1			P	E.Gluesing
<u>Lewiston Township</u>					
T13N, R7E, Sec.11	1			P	G.Archibald
T13N, R8E, Sec.3	1	1	6+	P	G.Archibald
T13N, R8E, Sec.3,9,10	2		6+	P	K.Garland
T13N, R8E, Sec.5,8	1		6+	P	E.Gluesing, G.Archibald
T13N, R8E, Sec.32-35	3		4+	P	T.Deerwester, G.Archibald
<u>Fort Winnebago Township</u>					
T13N, R9E, Sec.2,11	N2e			S	G.Archibald, R.Argard, R.Rich
T13N, R9E, Sec.11	N			S	G.Archibald, R.Argard, R.Rich
T13N, R9E, Sec.9	2		10	P	E.Gluesing, J.Millard
T13N, R9E, Sec.12	1			PS	G.Archibald
T13N, R9E, Sec.13	1			S	G.Archibald
<u>Scott Township</u>					
T13N, R11E, Sec.20	1		3+	P	E.Gluesing
T13N, R11E, Sec.32	1		many	P	E.Gluesing

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>DANE COUNTY (15)</u>				<u>PLAT 1973</u>	
<u>Dunn Township</u> T6N, R10E, Sec.29	N2e	1	7	P	T.Knaack, M.Schneider, D.Gjeston
<u>Deerfield Township</u> T7N, R12E, Sec.2,11	2+		7	P	D.Gjeston
<u>DODGE COUNTY (3)</u>				<u>PLAT 1971</u>	
<u>Portland Township</u> T9N, R13E, Sec.22	1			PS	T.Knaack
T9N, R13E, Sec.28	1			PS	T.Knaack, G.Archibald
<u>Shields Township</u> T9N, R14E, Sec.16	1			S	T.Knaack, G.Archibald
<u>EAU CLAIRE COUNTY</u>				<u>1973</u>	
<u>Bridge Creek Township</u> T26N, R6W, Sec.22	1+		8-9	S	R.Nesbit
<u>GREEN LAKE COUNTY (43)</u>				<u>PLAT 1969</u>	
<u>Kingston Township</u> T14N, R11E, Sec.8	N1e		many	S	E.Gluesing, G.Archibald
	N2e		many	S	E.Gluesing, G.Archibald
T14N, R11E, Sec.16	N2e		many	S	E.Gluesing, G.Archibald
T14N, R11E, Sec.10	N2e		many	S	E.Gluesing, G.Archibald
T14N, R11E, Sec.11	1	2	5	P	Ringhand
T14N, R11E, Sec.15	1			PS	G.Archibald

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>GREEN LAKE COUNTY (continued)</u>					
<u>Kingston Township</u>					
T14N, R11E, Sec.17	1			P	G.Archibald
<u>Marquette Township</u>					
T14N, R11E, Sec.2	1	1	5	P	Ringhand
T15N, R11E, Sec.2	N3e*		17	P	E.Gluesing, G.Archibald
T15N, R11E, Sec.2	N2e*		17	P	E.Gluesing, G.Archibald
T15N, R11E, Sec.30	1		7	P	E.Gluesing
T15N, R11E, Sec.34,35	1	2	2	P	M.Fredrick
T15N, R12E, Sec.15,22	1*	1	5	P	D.Severson
T15N, R12E, Sec.17	1	2		P	B.Long (D.Trainer)
T15N, R18E, Sec.18	N			P	G.Voss
<u>Princeton Township</u>					
T16N, R11E, Sec.34,35,36	2*		many	P	V.Anderson
<u>St. Marie Township</u>					
T16N, R12E, Sec.5,6	1*	1	20+	P	A.Rudey, D.Trainer
<u>Seneca Township</u>					
T17N, R12E, Sec.8	N			S	G.Voss
<u>JACKSON COUNTY</u>					
<u>1973</u>					
<u>Millston Township</u>					
T21N, R2W, Sec.10,11,13, 14,15	4		many	S	E.Gluesing
T21N, R2W, Sec.23,24	1	1	many	S	E.Kohlmeyer
<u>City Point Township</u>					
T21N, R1E, Sec.3	1	1		S	E.Gluesing
T22N, R1E, Sec.24	1			S	E.Gluesing

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>JEFFERSON COUNTY</u>			<u>PLAT 1972</u>		
<u>Sumner Township</u>					
T5N, R13E, Sec.10	1*		5-6	P	E.Rehbaum
<u>Palmyra Township</u>					
T5N, R16E, Sec.4,9	2		20+	P	G.Strikes
<u>Oakland Township</u>					
T6N, R13E, Sec.6	1	2	7+	P	J.Rumpf
<u>Jefferson township</u>					
T6N, R14E, Sec.20,29	1*	2	2+	P	V.Stelse
T6N, R15E, (Jefferson Marsh)	2			S	W.Seybold
<u>Sullivan Township</u>					
T6N, R16E, Sec.4	1			P	E.Gluesing
T6N, R16E, Sec.21,22	1*		3+	P	E.Gluesing
T6N, R16E, Sec.26,27	1	1		P	E.Gluesing
T6N, R16E, Sec.30,31	2		20+	P	E.Gluesing
<u>Lake Mills Township</u>					
T7N, R13E, Sec.22,26	N2e*	1	10	PS	M.Ayres
<u>Concord Township</u>					
T7N, R16E, Sec.14,23	1*	1	5	P	H.Groose, R.Hunt
T7N, R16E, Sec.19	1	1		PS	W.Seybold
T7N, R16E, Sec.25	1	1	7-10	P	R.Pogell
T7N, R16E, Sec.34	1			P	E.Gluesing
<u>Waterloo Township</u>					
T8N, R13E, Sec.32	1	2	3	PS	J.Behm

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>JUNEAU COUNTY (59)</u>				<u>PLAT 1970</u>	
<u>Germantown Township</u> T17N, R4E, Sec.27	N			P	G.Archibald
<u>Cutler Township</u> T18N, R2E, Sec.33	1		20+	P	P.Woggon
<u>Necedah Township</u> T19N, R3E	1		many	F	E.Gluesing
T19N, R3E, Sec.31	N2e		many	F	E.Gluesing
<u>Kingston Township</u> T20N, R2E, Sec.36	N1e		many	F	E.Gluesing
<u>Finley Township</u> T20N, R3E, Sec.32	1	1	many	F	E.Gluesing, D.Christensen
<u>LANGLADE COUNTY</u>				<u>1973</u>	
<u>Ackley Township</u> T31N, R9E, Sec.29,30	1	1	8+	S	C.McIlquham, G.Kloes
<u>MARATHON COUNTY (20)</u>				<u>PLAT 1968</u>	
<u>Green Valley Township</u> T26N, R5E,	1			S	E.Gluesing
<u>Bergen Township</u> T26N, R6E, Sec.34	N1e			S	E.Gluesing, L.Nauman

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>MARQUETTE COUNTY (12)</u>				<u>PLAT 1972</u>	
<u>Douglas Township</u>					
T14N, R8E, Sec.4	1*		5-7	P	E.Gluesing, G.Archibald
T14N, R8E, Sec.16,21	1	2		P	G.Archibald
T14N, R8E, Sec.17,18	N2e*	2	many	P	G.Archibald
T14N, R8E, Sec.19	1	1	many	P	G.Archibald
T14N, R8E, Sec.26,35	1	1	many	P	G.Archibald
T14N, R8E, Sec.32	N2e*		many	P	G.Archibald
T14N, R8E, Sec.33	1	2	many	P	G.Archibald
<u>Moundville Township</u>					
T14N, R8E, Sec.13	1		many	P	E.Gluesing
T14N, R8E, Sec.36	1	1	many	P	G.Archibald
T14N, R9E, Sec.16	1		many	P	G.Archibald
T14N, R9E, Sec.18	2		many	P	E.Gluesing
T14N, R9E, Sec.22	1		many	P	H.Jones
T14N, R9E, Sec.23	1		3+	P	A.Sproul
T14N, R9E, Sec.27	1*	1	3+	P	A.Sproul
<u>Buffalo Township</u>					
T14N, R9E, Sec.9	N			P	G.Archibald
T14N, R9E, Sec.25,36	1	1	10	PS	J.Millard
T14N, R10E, Sec.3	1		8	P	D.Blada
T14N, R10E, Sec.10	1		2	P	C.Metcalf, K.Kendal
T14N, R10E, Sec.14,15	1		4-5	P	E.Dixon
T14N, R10E, Sec.19	1		38	P	D.Henderson
T14N, R10E, Sec.30,31	1		10	PS	J.Millard
<u>Oxford Township</u>					
T15N, R8E, Sec.26,35,36	1	1	many	P	G.Archibald

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>MARQUETTE COUNTY (continued)</u>					
<u>Packwaukee Township</u>					
T15N, R9E, Sec.24	1	1		P	G.Archibald
T15N, R9E, Sec.33	1			P	G.Archibald
<u>Montello Township</u>					
T15N, R10E, Sec.19	N2e			P	E.Gluesing, G.Archibald
T15N, R10E, Sec.21	N2e			P	E.Gluesing, G.Archibald
<u>Mecan Township</u>					
T15N, R11E, Sec.5	1*	1	50+	P	H.Werch, H.Grams
T16N, R11E, Sec.8	1*	1	many	P	L.Schoebel
T16N, R11E, Sec.9	1*	1	many	P	L.Schoebel
T16N, R11E, Sec.30	1	1	many	P	P.Zieman
<u>Shields Township</u>					
T16N, R10E, Sec.8,8	2		5+	P	P.Whitford
T16N, R10E, Sec.10	N1e			P	E.Gluesing, G.Archibald
T16N, R10E, Sec.10,14	N2e			P	E.Gluesing, G.Archibald
T16N, R10E, Sec.26,36	2		many	P	P.Zieman
T16N, R10E, Sec.34	1	2		P	C.Holmquist
<u>Newton Township</u>					
T17N, R9E, Sec.4,5	1		5-6	PS	J.Frost
T17N, R9E, Sec.28,34	1		5+	PS	P.Whitford
<u>Crystal Lake Township</u>					
T17N, R10E, Sec.24	1*	1	many	P	L.Schoebel
T17N, R10E, Sec.30,32	1	2	5+	P	P.Whitford
T17N, R10E, Sec.35,36	2			S	E.Gluesing, G.Archibald

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>MARINETTE COUNTY</u>				<u>1973</u>	
<u>Peshtigo Township</u> T29N, R23E Peshtigo Harbor WA	1		many	S	L.Lintereur
<u>Lake Township</u> T32N, R21E Lake Noquebay WA	1			S	L.Lintereur
<u>Athelstane Township</u> T35N, R18E Phillips Marsh	1			C	L.Lintereur
<u>MONROE COUNTY (14)</u>				<u>PLAT 1965</u>	
<u>La Grange Township</u> T18N, R1W, Sec.11,12	1	1		P	J.Kincannon
T18N, R1W, Sec.13	1	1		P	J.Kincannon
<u>Byron Township</u> T18N, R1E, Sec.28	1			P	R.Kelley
<u>Lincoln Township</u> T19N, R1W, Sec.8	1			PC	J.Kincannon
<u>Scott Township</u> T19N, R1E, Sec.31	1			P	J.Kincannon
<u>OZAUKEE COUNTY</u>				<u>1973</u>	
<u>Saukville Township</u> T11N, R21E, Sec.32	1	1	8	P	P.Mathiae

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>OCONTO COUNTY</u>				<u>PLAT 1972</u>	
<u>Brazeau Township</u>					
T31N, R18E, Sec.29-32	2		5+	PC	E.Gluesing
<u>Bagley Township</u>					
T30N, R18E, Sec.3,4,5,8,9	2		5+	PSC	E.Gluesing
<u>OUTAGAMIE COUNTY</u>				<u>1973</u>	
<u>Deer Creek Township</u>					
T24N, R15E, Sec.1,2	1		10+	S	J.Kunath
<u>Maine Township</u>					
T24N, R16E, Sec.17	1	2	many	P	L.Kriese
<u>PORTAGE COUNTY (26)</u>				<u>PLAT 1972</u>	
<u>Grant Township</u>					
T21N, R7E, Sec.14,15	2			P	E.Gluesing, L.Nauman
<u>Pine Grove Township</u>					
T21N, R8E, Sec.19	1			P	E.Gluesing, L.Nauman
<u>Buena Vista Township</u>					
T22N, R8E, Sec.27	1			P	E.Gluesing
<u>Eau Pleine Township</u>					
T25N, R6E, Sec.5	1			S	E.Gluesing
T25N, R6E, Sec.13	1	1		P	Norbert
T25N, R7E, Sec.17	N2e			P	E.Gluesing, L.Nauman
T25N, R7E, Sec.17	N1e	1		P	E.Gluesing, L.Nauman

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>PORTAGE COUNTY (continued)</u>					
<u>Dewey Township</u>					
T25N, R7E, Sec.12	1			P	G.Czaplinski, B.Gruthoff
T25N, R8E, Sec.10	N1e			P	E.Gluesing, L.Nauman
T25N, R8E, Sec.15	N1e	1		P	E.Gluesing, L.Nauman
T25N, R8E, Sec.16,17,20	3			P	E.Gluesing
T25N, R8E, Sec.21	N2e	2		P	E.Gluesing, L.Nauman
<u>RACINE COUNTY</u>					
				<u>1973</u>	
<u>Waterford Township</u>					
T4N, R19E, Sec.9	1		6+	P	T.Becker
T4N, R19E, Sec.15	1		9	S	T.Becker
<u>ROCK COUNTY (4)</u>					
				<u>1973</u>	
<u>Lima Township</u>					
T4N, R14E, Sec.3	1			PS	J.Stone
T4N, R14E, Sec.20,29	1		many	S	J.Stone
<u>SAUK COUNTY</u>					
				<u>PLAT 1960</u>	
<u>Freedom Township</u>					
T11N, R5E, Sec.8	1	2	50+	P	Thies, G.Archibald
<u>Merrimac Township</u>					
T11N, R7E, Sec.27,28	1			P	G.Archibald
<u>Fairfield Township</u>					
T13N, R7E, Sec.34	1		many	P	G.Archibald, F.Gerbillcocks

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>SHAWANO COUNTY (39)</u>				<u>PLAT 1971</u>	
<u>Navarino Township</u>					
T25N, R16E, Sec.15	1	2		S	G.Kloes
T25N, R16E, Sec.10	1	1		S	G.Kloes, E.Gluesing
T25N, R16E, Sec.2,3,5,9, 10,15,16	6			S	G.Kloes, E.Gluesing
T25N, R16E, Sec.20,21	1			P	G.Kloes, S.Hendrickson
T25N, R16E, Sec.27,34	1			P	G.Kloes, J.Johnson
<u>Belle Plane Township</u>					
T26N, R15E, Sec.13,14	1			P	G.Kloes, B.Gruthoff
<u>Washington Township</u>					
T27N, R17E, Sec.22,23	2			P	G.Kloes, B.Gruthoff
<u>Hutchins Township</u>					
T29N, R12E, Sec.17	1	2		P	G.Kloes
<u>TAYLOR COUNTY</u>				<u>1973</u>	
<u>Greenwood Township</u>					
T32N, R2E, Sec.32	1	2	3+	P	E.Hedlund, J.Evrad
<u>WALWORTH COUNTY</u>				<u>1973</u>	
<u>Troy Township</u>					
T4N, R17E, Sec.2	1*			P	J.Eveland
<u>East Troy Township</u>					
T4N, R18E, Sec.23,24	1			P	E.Gluesing

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>WAUKESHA COUNTY</u>				<u>1973</u>	
<u>Vernon Township</u> T5N, R19E, Sec.35	1		6+	P	T.Becker
<u>WAUPACA COUNTY (5)</u>				<u>PLAT 1971</u>	
<u>Lind Township</u> T21N, R12E, Sec.20,29	1	1	3	P	W.Brockman
<u>Freemont Township</u> T21N, R14E, Sec.8	1		10	P	W.Smith
T21N, R14E, Sec.17	1		10	P	E.Gluesing
<u>Matteson Township</u> T25N, R15E, Sec.4	1		5	P	J.Kunath
T25N, R15E, Sec.13	1			S	E.Gluesing, G.Kloes
T25N, R15E, Sec.24	1			S	R.Bell
<u>WAUSHARA COUNTY (12)</u>				<u>PLAT 1974</u>	
<u>Richford Township</u> T18N, R9E, Sec.29,32	2	1	5-6	P	J.Frost
<u>Dakota Township</u> T18N, R10E, Sec.18	1			PS	E.Gluesing
<u>Poy Sippi Township</u> T19N, R13E, Sec.23,24	1			PS	E.Gluesing

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>WINNEBAGO COUNTY</u>				<u>PLAT 1966</u>	
<u>Nepeuskune Township</u> T17N, R14E, Sec.27,34	1			P	E.Gluesing, G.Archibald
<u>Winchester Township</u> T20N, R15E, Sec.8	1			P	E.Gluesing
<u>WOOD COUNTY (29)</u>				<u>PLAT 1970</u>	
<u>Remington Township</u>					
T21N, R2E, Sec.4	1			S	E.Gluesing
T21N, R2E, Sec.7	1			S	E.Gluesing
T21N, R2E, Sec.10	1			SC	D.Doberstein
T21N, R2E, Sec.16	1			S	E.Gluesing
T21N, R3E, Sec.5	N2e			S	E.Gluesing
T21N, R3E, Sec.6	2			S	E.Gluesing
T21N, R3E, Sec.7	N2e			S	E.Gluesing
<u>Hiles Township</u>					
T22N, R2E, Sec.16,21	1			C	E.Gluesing
T22N, R2E, Sec.25	1			PF	E.Gluesing
T22N, R2E, Sec.36	1		many	P	E.Gluesing
<u>Dexter Township</u>					
T22N, R3E, Sec.29	N2e			S	E.Gluesing, G.Archibald
T22N, R3E, Sec.31	1			S	E.Gluesing
T22N, R3E, Sec.34	N2e			S	E.Gluesing
<u>Cranmoor Township</u>					
T21N, R4E, Sec.2	N2e		many	P	E.Gluesing
T21N, R4E, Sec.4	1	1	many	P	M.Brazeau
T21N, R4E, Sec.5	1	1	many	P	M.Brazeau
T21N, R4E, Sec.15,16	1		many	P	M.Brazeau

Table 1. (continued)

County, Township, Section	Pairs	Young	Years of Crane Occupancy	Owner- ship	Authority
<u>WOOD COUNTY (continued)</u>					
<u>Cranmoor Township (continued)</u>					
T22N, R4E, Sec.22	N2e		many	P	E.Gluesing
T22N, R4E, Sec.24	N2e		many	P	E.Gluesing, L.Nauman
T22N, R4E, Sec.32	1	1	many	P	M.Brazeau
T22N, R4E, Sec.35	1	1	many	P	M.Brazeau
T22N, R5E, Sec.19	N2e		many	P	E.Gluesing, L.Nauman
<u>Seneca Township</u>					
T22N, R4E, Sec.9,10	2			P	Brockman
<u>Sherry Township</u>					
T24N, R5E, Sec.2	1		3+	P	E.Gluesing
<u>Milladore Township</u>					
T25N, R5E, Sec.3	1			C	E.Gluesing
WISCONSIN TOTALS	256	87			

N--Nest (N2e--Nest and 2 eggs).

P--Private ownership.

C--County ownership.

F--Federal ownership.

S--State ownership.

Table 2. The percent of known sandhill crane pairs found on marshes in private and/or public ownership.

	PRIVATE		PUBLIC		PRIVATE and PUBLIC	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Pairs with nest	22	55.0	16	40.0	2	5.0
Pairs with young	48	78.7	9	14.8	4	6.5
Pairs without known young or nest.	92	61.7	39	26.2	18	12.1
Total pairs.	162	64.8	64	25.6	24	9.6

Table 3. Measurements, location, and date of sandhill cranes captured in Wisconsin during 1973.

USP&WS Band no. (519-99)	Age	Bill (mm)	Culmen (mm)	Tarsometatarsus (mm)	Mid-toe (mm)
<u>Navarino WA</u>					
<u>August 16</u>					
001	J		60	208	
<u>Necedah NWR</u>					
<u>September 20</u>					
002	A	102	133	241	89
003	A	110	140	280	95
Casualty	A	114	149	280	86
<u>Dike 17 WA</u>					
<u>September 21</u>					
004	A	95	133	267	92
005	A	102	133	242	83
006	A	95	127	260	89
<u>Necedah NWR</u>					
<u>September 26</u>					
007	J	95	133	260	89
<u>Necedah NWR</u>					
<u>October 3</u>					
008	A	98	133	248	83
009	A	121	152	296	92
010	A	114	152	297	95
011	A	98	130	267	95
012	A	108	152	264	89
013	A	105	133	254	89
014	A	105	133	279	92
Casualty	A	98	127	257	89
<u>Necedah NWR</u>					
<u>October 5</u>					
015	A	105	133	270	89
016	A	102	140	276	86
017	A	102	140	263	89
018	A	111	140	257	86
019	J	95	124	267	86
020	A	89	117	264	79
021	A	95	133	260	83
022	A	102	137	264	76
023	A	105	140	283	92
<u>Necedah NWR</u>					
<u>October 9</u>					
024	A	98	133	257	89
025	A	106	143	248	83
026	A	111	143	286	95
027	A	103	131	257	86
028	A	113	149	289	86
029	A	102	149	264	86
030	A	98	137	238	76
031	A	111	152	273	92
032	J	89	121	270	89
033	A	102	133	273	84
034	J	106	143	279	95
035	A	102	137	270	89
036	J	92	121	267	83

A--Adult, J--Juvenile

DISCUSSION

Size of the Wisconsin Population

Very little published information is available on the size of territories or on the movements of sandhill cranes on the breeding grounds. This lack of knowledge presents a problem in censusing cranes, especially when trying to avoid double counting of pairs. Walkinshaw (1965c) reports a territory normally consists of three divisions; (1) the nesting area, (2) the roosting area, and (3) the feeding area. Littlefield and Ryder (1968) found that feeding flights were often made out of the territories in early spring, but once incubation had begun pairs remained on territory. At the Haehnle Sancturary, Michigan, pairs of sandhill cranes remained on territory from their arrival in February or March until late September and sometimes into October and November (Walkinshaw 1973b). In Wisconsin during 1973 some pairs of sandhill cranes were observed on their territories from March into October. Feeding and roosting areas for territories on the Haehnle Sanctuary averaged 2,190 feet (extremes of 665-3,100 feet) and 550 feet (extremes of 18-1,155 feet) respectively, from the nest site. The size of territories varied with the number of pairs present. Between 1935 and 1940 when only two pairs were present, the average territory size was 130 acres. From 1965 to 1972 when between six to seven pairs

were present, the average territory size was only 38.5 acres. This relatively small territory size is significant since it included the area where the parents raised the young. The size of eight territories on the Malheur National Wildlife Refuge were of similiar size, ranging from 3 acres to 168 acres with a mean of 62 acres (Littlefield and Ryder 1968).

During 1973 in Wisconsin, nests were usually a mile or more apart. The shortest distance between two nests with eggs was approximately $\frac{1}{2}$ mile. This occurred in four instances: two were in cranberry reservoirs; one was in a river marsh; and one was on a floating sedge bog. The size of marshes inhabited by one or more pairs of cranes varied greatly. The relative size of one hundred forty-three marshes averaged 339 acres with a standard deviation of 387. In contrast the marsh acreage for one hundred sixty-six pairs of cranes averaged 292 acres per pair with a standard deviation of 260. It is interesting to note that even though the relative size of marshes inhabited by pairs of cranes was extremely variable, the mean size on a per pair basis had a more normal distribution. The large acreage per pair of cranes in Wisconsin, when compared to the territories of breeding cranes on the Malheur National Wildlife Refuge or on the Haehnle Sanctuary, would indicate that Wisconsin has a potential for a much larger population.

Many of the marshes where cranes were located during

1973 were isolated by wooded uplands and were partially bordered by cultivated fields or pastures. Generally these marshes were no closer than a mile apart. In order to reduce the probability of double counting pairs of cranes, the following assumption was made: if a pair of cranes had been observed on two different farms bordering the same marsh, these observations were considered to be of the same pair even though the two farms were $\frac{1}{2}$ mile or more apart.

Approximately 850 sandhill cranes were present in Wisconsin during the summer of 1973. There were 250 known pairs, 87 young, and an estimated 55 pairs that were not observed. In addition an estimated 152 cranes or 25 percent of the adult population (Littlefield and Ryder 1968) were present as non-breeders. Actual counts of groups of cranes observed at various times through the summer totaled 286 (Table 1), but it is not known if they were all non-breeders.

The estimate of an additional 55 pairs was based on the number of single cranes observed during the incubation period, reports of pairs of cranes in areas that were not checked sufficiently, the number of cranes observed at roosts during late August, and knowledge from past studies (Stephens 1967, Littlefield and Ryder 1968, Valentine and Noble 1970) which indicated all the cranes in a particular area were not observed. The breakdown for each county of the estimated 55 pairs is as follows: Adams 2 pairs; Burnett 2 pairs; Clark 1 pair; Columbia 3 pairs; Dane 1 pair;

Eau Claire 1 pair; Green Lake 4 pairs; Jackson 9 pairs; Jefferson 3 pairs; Juneau and Wood 9 pairs; Marathon 3 pairs; Marquette 7 pairs; Monroe 1 pair; Outagamie 5 pairs; Portage 3 pairs; and Waukesha 1 pair.

Possible errors in censusing sandhill cranes on the breeding grounds result from the movements of non-breeders, insufficient coverage in some areas, and the fact that some pairs are so secretive that they are not detected (Walkinshaw and Wing 1955).

I have often been asked about the status of sandhill cranes in Wisconsin. Based on the results of this study, it is obvious that their numbers have increased dramatically since Henika's (1936) estimate of twenty-five pairs thirty-seven years ago. In fact, the most recent information (Lewis, et al. 1973) indicates the entire Eastern population is rapidly increasing in numbers.

One possible method of showing a change in population numbers is to plot the number of pairs against the number of years they were known to exist in various marshes. For example, if a particular marsh had two pairs for fifty years and some other marshes had eight pairs for twenty years, then twenty years ago there were at least ten pairs in the state. The known increase in numbers was eight pairs in thirty years. This information was available for eighty-two pairs and the results are shown in Figure 13. Figure 13 shows that between four to ten years ago the number of new

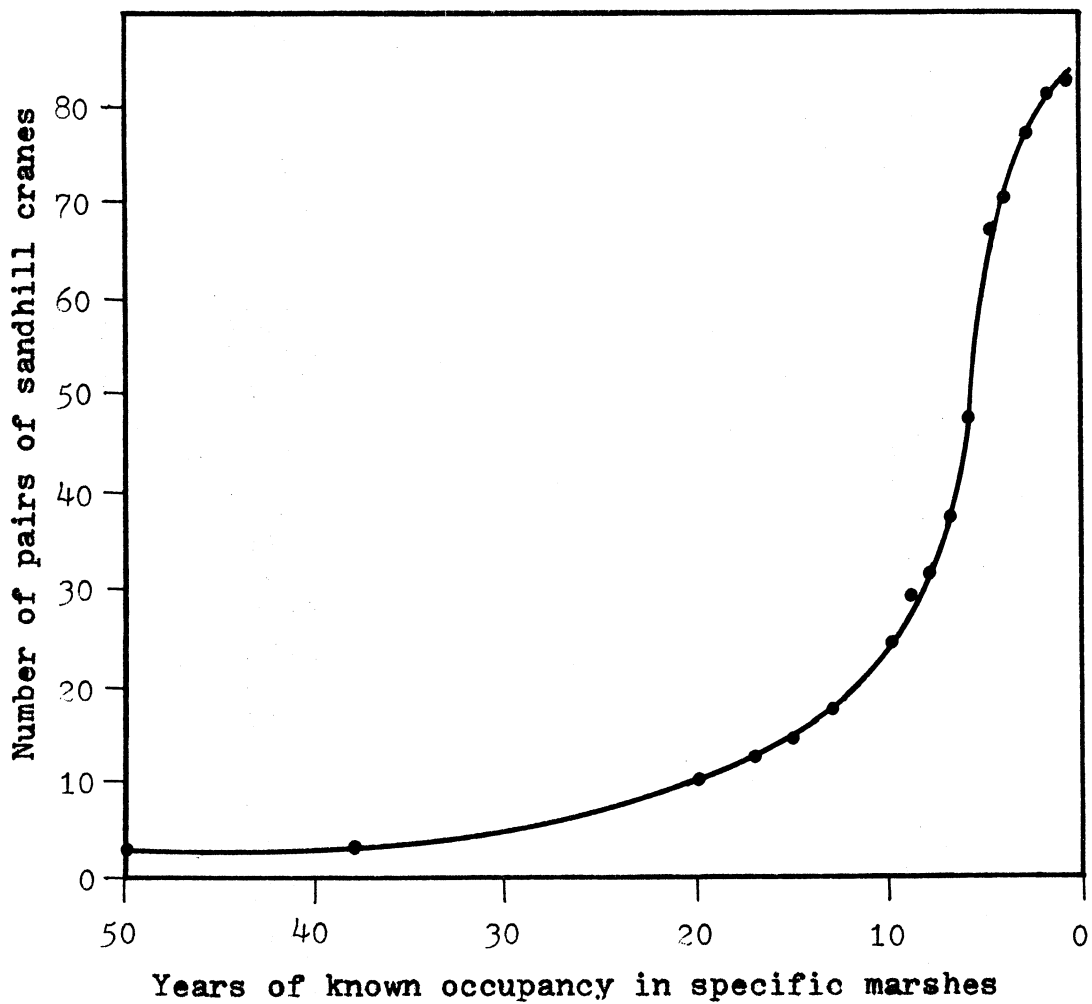


Figure 13. Increase in the number of new pairs of sandhill cranes observed in specific marshes during the last 50 years.

pairs appearing in various marshes increased significantly, but during the last three years the rate at which new pairs were observed was declining. The curve shown in Figure 13 is inconclusive with regard to the status of sandhill cranes in Wisconsin and should be treated as such. Its similarity in shape to a population growth is probably coincidental.

Capturing

Sandhill cranes were captured with recoilless rocket-projected nets and a cannon-projected net. The versatility and ease in handling of rockets compared to cannons has already been discussed by Wheeler and Lewis (1972). During this study recoilless rockets were fired from a height of approximately 60 inches and at a 15-20 degree angle (Figure 3). This produced a low net trajectory resulting in the capture of most of the cranes within range of the net. In contrast, cannons embedded in the ground must be fired at a 45 degree angle to reduce injuries caused by the leading edge of the net (Wheeler and Lewis 1972). The high trajectory of cannon-projected nets allowed many cranes to escape by flying or running out from underneath the net before it settled low enough to capture them. The one crane that died of a broken neck was the result of rockets angled improperly on the initial attempt.

The substitution of ten-foot lengths of nylon rope for rubber anchor straps increased the efficiency of each capture attempt. Dragging the net an extra ten feet absorbed part

of the kinetic energy, resulting in less recoil, and also allowed the net to be in front of the cranes when it settled causing a larger number to be captured.

Each captured crane was tangled in the net and required two men to remove it (Figure 14). Cranes were considered juveniles if feathers were present on the forehead (Walkinshaw 1949, Munro 1950) (Figure 2). Sandhill cranes must be removed from the net quickly and handled as little as possible to reduce stress. Wheeler and Lewis (1972) and Huey (1961) experienced the same difficulties. Removing cranes from the net and placing them in burlap sacks until they could be processed appeared to reduce the amount of stress. Generally the cranes remained quiet while in the burlap sacks and those that continued to struggle were processed first. The one crane that died during handling had not been placed in a burlap sack. Once a crane was released it would walk and/or run a few paces and then fly out of sight, however, a few cranes had to be prodded or rolled over before they would leave the capture site.

All capturing was done in the morning and the site was ready again for firing before noon. In some cases cranes were using the capture site a few hours later. Once cranes were captured and color marked they were never observed again on a capture site even though they remained at the refuge.

The presence of a crane with a white collar did not



Figure 14. Sandhill cranes captured at the Necedah National Wildlife Refuge, Juneau County, Wisconsin, October 9, 1973. Photograph courtesy of Juneau County Publishers, Mauston, Wisconsin.

appear to affect other marked or unmarked cranes. At the Necedah National Wildlife Refuge collared cranes were observed in pairs or groups and with unmarked cranes. There were two observations of cranes with their bill caught in the collar. In both cases, when approached by humans, the crane flew away with its bill still in the collar. Abnormalities in behavior of color-marked cranes was reported by Wheeler and Lewis (1972) and Huey (1960) reported an injured crane unable to remove its bill when it became inserted between the plexiglass collar and its neck. Except for the instances already noted and another observation of three cranes pecking at their collars, the behavior of collared cranes on the refuge appeared to be normal. A total of twenty observations of one or more collared cranes was made between October 4 and November 2 (Gerald Updike personal communication).

The visibility of neck collars is excellent and generally has not produced abnormal behavior (Huey 1960, Rod Drewien personal communication), but because of the abnormalities discussed above, further use of collars should be restricted in favor of alternate methods. An excellent alternative exists in the form of a $2\frac{1}{2}$ inch square colored plastic tag snap-riveted above the tibiotarsus-tarsometatarsus joint. These tags are easily observed in flight and no abnormalities in behavior have been associated with their use (Rod Drewien personal communication).

SUMMARY

Approximately 850 sandhill cranes were present in Wisconsin during the summer of 1973. Of the 250 known pairs, nests were located for 40 pairs and a total of 66 pairs were known to produce 87 young. An estimated 55 additional pairs were not observed and an estimated 152 cranes were present as non-breeders. A total of 36 sandhill cranes were captured and banded. White aluminum collars individually marked with a black letter-number combination were placed on 29 of the 36 banded cranes. Measurements of captured cranes indicated that none could be definitely classified as belonging to the rowani subspecies.

This study has shown that Wisconsin has a significant number of sandhill cranes and that many nests can be located within a short period of time with the aid of a helicopter. The densities of cranes in Wisconsin were low in relation to other populations of greater sandhill cranes, indicating that the number of cranes in Wisconsin should continue to increase if their habitat is preserved.

The population of sandhill cranes should be monitored annually by field personnel of the Wisconsin Department of Natural Resources. A comprehensive census should be conducted at least once every five years. By using the results of this study as a base, it may be possible to census future breeding populations of sandhill cranes by stratified sampling.

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Appendix A. Sightings of sandhill cranes in Wisconsin through 1972.

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Adams County</u>				
1929		obs.	O. Gromme (Friendship)	Notes
1933		obs.	O. Gromme	Notes
1934		nst.	A. Leopold	Walkinshaw 1949:177
1934		eggs	S. Reese	1934 Pass. Pigeon 6:33
1944	Apr. 17	obs.	F. Hamerstrom, L. Walkinshaw	Walkinshaw 1949:177
1944	May	2 eggs	S. Reese (photograph)	1944 Pass. Pigeon 6(2):34
1947	Apr. 31	4	T. Deerwester	1947 Pass. Pigeon 9(4):148
1947	Oct. 17	many	G. Johnson	1948 Pass. Pigeon 10(1):34
1948	Oct. 23	obs.	E. Roak	1949 Pass. Pigeon 11(2):84
1953	May 14	obs.	S. Robbins	1953 Pass. Pigeon 15(3):138
1953	Aug. 17	obs.	S. Robbins	1954 Pass. Pigeon 16(1):36
1954	Apr. 30	obs.	S. Robbins	1954 Pass. Pigeon 16(3):116
1954	Sep. 14	obs.	S. Robbins	1955 Pass. Pigeon 17(1):39
1955	Spring	obs.	S. Robbins (Leola Marsh)	1955 Pass. Pigeon 17(3):136
1955	Sep. 26	obs.	S. Robbins	1956 Pass. Pigeon 18(1):37
1956	Spring	obs.	Anonymous	1956 Pass. Pigeon 18(3):130
1956	Summer	obs.	S. Robbins	1956 Pass. Pigeon 18(4):180
1956	Sep. 1	obs.	S. Robbins	1957 Pass. Pigeon 19(1):37
1957	Apr. 8	obs.	S. Robbins	1957 Pass. Pigeon 19(3):130
1957	Summer	obs.	S. Robbins	1957 Pass. Pigeon 19(4):178
1957	Oct. 3	obs.	S. Robbins	1958 Pass. Pigeon 20(1):35
1958	Apr. 3	obs.	S. Robbins	1958 Pass. Pigeon 20(3):126
1959	Spring	obs.	S. Robbins	1959 Pass. Pigeon 21(4):158
1959	Sep. 24	obs.	T. Soulen	1960 Pass. Pigeon 22(2):20
1960	Apr. 14	obs.	S. Robbins	1960 Pass. Pigeon 22(4):199
1960	Summer	obs.	S. Robbins	1961 Pass. Pigeon 23(1):16
1961	Apr. 8	obs.	S. Robbins	1961 Pass. Pigeon 23(4):154
1962	May 9	obs.	M. Donald	1962 Pass. Pigeon 24(4):138
1964	Jul. 14	obs.	S. Robbins	1965 Pass. Pigeon 27(2):83

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Adams County (continued)</u>				
1966		2 young	DNR personnel	Gregg and Hunt 1970
1967	Summer	obs.	T. Renn (Leola Marsh)	1968 Pass. Pigeon 30(2):94
1971	Jun. 4	obs.	S. Robbins	1972 Pass. Pigeon 34(2):77
<u>Ashland County</u>				
1950	May 23	2	J. Kiener (Outer Island)	1950 Pass. Pigeon 12(4):174
1970	July	pair	D. Chape	Personal communication
<u>Bayfield County</u>				
1963	Nov. 27	3	J. Kozolocoski	1964 Pass. Pigeon 26(2):98
<u>Burnett County</u>				
1903		nst.		Walkinshaw 1949:177
1903		eggs		Roberts 1936
1931	May 6	nst.	O. Gromme (Grantsburg)	Notes
1931	Jun. 26	nst.	O. Gromme	Notes
1952	May 10	obs.	N. Stone	1952 Pass. Pigeon 14(3):115
1956	Apr. 9	1	N. Stone	1956 Pass. Pigeon 18(3):130
1956	Jul. 26	obs.	N. Stone	1956 Pass. Pigeon 18(4):180
1956	Sep. 14	obs.	N. Stone	1957 Pass. Pigeon 19(1):37
1957	Apr. 2	obs.	N. Stone	1957 Pass. Pigeon 19(3):130
1958	Apr. 4	obs.	N. Stone	1958 Pass. Pigeon 20(3):126
1959	Apr. 18	obs.	N. Stone	1959 Pass. Pigeon 21(4):158
1959	Sep. 27	obs.	N. Stone	1960 Pass. Pigeon 22(2):20
1960	Apr. 14	obs.	N. Stone	1960 Pass. Pigeon 22(4):199
1960	Aug. 17	3	N. Stone, W. Southern	1961 Pass. Pigeon 23(2):69
1961	Apr. 4	obs.	N. Stone	1961 Pass. Pigeon 23(4):154
1961	Oct. 4	obs.	N. Stone	1962 Pass. Pigeon 24(2):51

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Burnett County (continued)</u>				
1962	Apr. 11	obs.	N. Stone	1963 Pass. Pigeon 25(4):166
1962		nst.	DNR personnel	Gregg and Hunt 1970
1963	Apr. 1	obs.	N. Stone	1963 Pass. Pigeon 25(4):166
1963	Jun. 11	1 young	N. Stone (Crex Meadows)	1964 Pass. Pigeon 26(1):65
1963	Aug. 24	obs.	J. Jackson	1964 Pass. Pigeon 26(2):98
1964	Apr. 9	obs.	N. Stone	1965 Pass. Pigeon 27(1):32
1964	Jul. 9	obs.	N. Stone	1965 Pass. Pigeon 27(2):83
1964	Aug. 13	obs.	R. Fiehweg	1965 Pass. Pigeon 27(2):83
1965	Apr. 13	obs.	N. Stone	1966 Pass. Pigeon 28(1):29
1965	Aug. 30	4	N. Stone	1966 Pass. Pigeon 28(2):48
1965	Aug. 23	3	T. Soulen	1966 Pass. Pigeon 28(3):117
1966		1 young	DNR personnel	Gregg and Hunt 1970
1967		1 young	N. Stone	1968 Pass. Pigeon 30(2):94
1968	Mar. 29	obs.	N. Stone	1969 Pass. Pigeon 31(1):212
1969	Aug. 14	2	J. Rosso	1970 Pass. Pigeon 32(2):64
1969	Sep. 24	82	N. Stone	1970 Pass. Pigeon 32(4):167
1970		obs.	D. Gustafson, J. Rosso, Mrs. E. Schmidt	1971 Pass. Pigeon 33(2):92
1971		young	N. Stone	1972 Pass. Pigeon 34(2):77
1971	Sep. 30	41	N. Stone	1973 Pass. Pigeon 34(3):112
1972	March	obs.	R. Knuth	1973 Pass. Pigeon 35(1):22
1972	Oct. 10	137	N. Stone	1973 Pass. Pigeon 35(3):139
<u>Bayfield County</u>				
1963	Nov. 27	3	J. Kozolocoski	1964 Pass. Pigeon 26(2):98
<u>Calumet County</u>				
1925		nst.	O. Gromme (Chilton)	Notes

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Chippewa County</u>				
1957	Oct. 1	obs.	G. Fisher	1958 Pass. Pigeon 20(1):35
1967		2 young	DNR personnel	Gregg and Hunt 1970
1971	May	1	C. Kemper (Hallie Township)	1973 Pass. Pigeon 35(2):55-91
<u>Columbia County</u>				
1940	May 7	obs.	W. Scott	1941 Pass. Pigeon 2:94
1954	Mar. 27	obs.	H. Winkler	1954 Pass. Pigeon 16(3):116
1956	Jul. 24	2	D. Walker (Dates Mill Pond)	1956 Pass. Pigeon 18(4):180
1956	Aug. 7	4	D. Walker	1956 Pass. Pigeon 18(4):180
1957	Oct. 4	obs.	D. Cors	1958 Pass. Pigeon 20(1):35
1958	Apr. 27	obs.	D. Cors	1958 Pass. Pigeon 20(3):126
1959	Apr. 15	obs.	D. Cors	1959 Pass. Pigeon 21(4):158
1960	Apr. 24	obs.	D. Cors	1960 Pass. Pigeon 22(4):199
1963		young	DNR personnel (French Creek)	Gregg and Hunt 1970
1965	Summer	15 young	C. Balliet	1966 Pass. Pigeon 28(2):80
1965		young	DNR personnel (French Creek)	Gregg and Hunt 1970
1965	Nov. 16	obs.	M. Tomlinson	1966 Pass. Pigeon 28(3):117
1966	Oct. 10	obs.	M. Tomlinson	1967 Pass. Pigeon 29(2):88
1967	Summer	obs.	T. Renn (Portage)	1968 Pass. Pigeon 30(2):94
1967		young	DNR personnel	Gregg and Hunt 1970
1970	Aug. 9	2	N. Baiger	1971 Pass. Pigeon 33(2):92
<u>Dane County</u>				
1947	Apr. 15	69	J. Hale, O. Gromme	1947 Pass. Pigeon 9(3):114
1949	Mar. 21	obs.	S. Robbins	1949 Pass. Pigeon 11(2):66
1949	Apr. 27	2	J. Hickey	1949 Pass. Pigeon 11(3):135
1950	Mar. 31	obs.	S. Robbins (Mazomanie)	1950 Pass. Pigeon 12(3):138
1953	Sep. 27	obs.	Mrs. R. Walker	1954 Pass. Pigeon 16(1):36

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Dane County (continued)</u>				
1964	Jun. 21	obs.	H. Orians	1965 Pass. Pigeon 27(2):83
1965	Oct. 24	obs.	N. Ashman	1966 Pass. Pigeon 28(3):117
1966	Oct. 25	obs.	N. Ashman	1967 Pass. Pigeon 29(2):88
1971	Mar. 14	obs.	N. Ashman	1972 Pass. Pigeon 34(1):24
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
<u>Dodge County</u>				
1944	Apr. 8	75	F. Burkhardt	1944 Pass. Pigeon 6(3):70
1945	Nov. 26	1	H. Mathiak (Horicon)	1946 Pass. Pigeon 8(1):31
1948	Nov. 16	40	H. Mathiak (Horicon)	1949 Pass. Pigeon 11(2):84
1949		nst.	W. Scott	Walkinshaw 1949:177
1949	Oct. 20	obs.	P. Mallow (Mud Lake)	1950 Pass. Pigeon 12(1):43
1950	Apr. 1	10	L. Gunther (Horicon)	1950 Pass. Pigeon 12(3):138
1950	Apr. 7	34	L. Gunther (Horicon)	1950 Pass. Pigeon 12(3):138
1950	Apr. 9	1	L. Grnther (Horicon)	1950 Pass. Pigeon 12(3):138
1962	May 5	obs.	E. Degner	1962 Pass. Pigeon 24(4):138
1963	May 9	obs.	W. Carter, R. Hunt (Horicon)	1963 Pass. Pigeon 25(4):166
1964	Spring	2	M. Donald, W. Carter	1965 Pass. Pigeon 27(1):32
1964	Oct. 17	55	E. Prins, B. Weber	1965 Pass. Pigeon 27(3):123
1971	Jun. 8	1	D. Gustafson	1972 Pass. Pigeon 34(2):77
1971	Oct. 4	100+	J. March	1972 Pass. Pigeon 34(3):112
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
1972	Oct. 7	250	R. Fiehweg	1973 Pass. Pigeon 35(3):139
<u>Dunn County</u>				
1953	Oct. 1	obs.	H. Clark	1954 Pass. Pigeon 16(1):36

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Green Lake County</u>				
1893-1903		nst.		Kumlien and Hollister 1903
1934		nst.	A. Leopold	Walkinshaw 1949:177
1935		nst.	D. Trainer (W. Scott)	Walkinshaw 1949:177
1941		young	W. Scott	1941 Pass. Pigeon 3:84
1947	Oct. 7	250	D. Trainer	1948 Pass. Pigeon 10(1):34
1948	Oct. 8	obs.	M. Donald	1949 Pass. Pigeon 11(2):84
1949	October	700	N. Damaske	1950 Pass. Pigeon 12(1):43
1950	Apr. 20	obs.	H. Shrine	1950 Pass. Pigeon 12(3):138
1951	Apr. 15	26	S. Robbins	1951 Pass. Pigeon 13(3):110
1951	Aug. 21	young	N. Damaske	1952 Pass. Pigeon 14(1):42
1952	Mar. 28	obs.	D. Trainer	1952 Pass. Pigeon 14(3):115
1952	Nov. 5	obs.	N. Damaske	1953 Pass. Pigeon 15(1):43
1953	Oct. 22	37	F. King, N. Damaske	1954 Pass. Pigeon 16(1):36
1954	Sep. 24	400	F. King, N. Damaske	1955 Pass. Pigeon 17(1):39
1955	Sep. 15	obs.	Anonymous	1956 Pass. Pigeon 18(1):37
1957	May 5	obs.	Anonymous	1957 Pass. Pigeon 19(3):130
1957	Oct. 6	obs.	Anonymous	1958 Pass. Pigeon 20(1):35
1960	Sep. 25	obs.	N. Ashman	1961 Pass. Pigeon 23(2):69
1962	Apr. 8	obs.	H. Bauers	1962 Pass. Pigeon 24(1):38
1963	Fall	obs.	Anonymous	1964 Pass. Pigeon 26(2):98
1964		young	DNR personnel (Grand River)	Gregg and Hunt 1970
1965		young	DNR personnel (White River)	Gregg and Hunt 1970
1966		young	DNR personnel (White River)	Gregg and Hunt 1970
1969		nst.	DNR personnel (White River)	Gregg and Hunt 1970
1969	Sep. 28	140+	D. Greenman	1970 Pass. Pigeon 32(4):167
1971	Oct. 4	obs.	J. March	1972 Pass. Pigeon 34(3):112
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
1972	Sep. 30	23	D. Tessen, D. Greenman	1973 Pass. Pigeon 35(3):139
1972	Oct. 11	18	D. Tessen, D. Greenman	1973 Pass. Pigeon 35(3):139

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Jackson County</u>				
1931	May 20	nst.	O. Gromme	Notes
1936?		nst.		Henika 1936
1936		eggs		Hamerstrom 1938
1938?		obs.		Hamerstrom 1938
1941	May 6	obs.	N. Barger	1941 Pass. Pigeon 3:18-20, 57-60
1941	May 7	obs.	F. Hamerstrom, L. Walkinshaw	Walkinshaw 1949:177
1952	Summer	14 pairs	S. DeBoer (Black River Falls)	1953 Pass. Pigeon 15(1):41
1954	Jun. 30	obs.	R. Dryer	1954 Pass. Pigeon 16(4):154
1955	Jun. 21	obs.	S. DeBoer	1955 Pass. Pigeon 17(4):166
1957	Spring	7	J. Hale	1957 Pass. Pigeon 19(3):130
1961-1965		nst./young	DNR personnel	Gregg and Hunt 1970
1966	Jun. 2	obs.	S. Robbins	1967 Pass. Pigeon 29(2):39
1969	Jun. 12	obs.	S. Robbins	1970 Pass. Pigeon 32(2):64
1971	Jun. 4	5	S. Robbins (Bear Bluff)	1972 Pass. Pigeon 34(2):77
<u>Jefferson County</u>				
1898		nst.		Kumlien and Hollister 1903
1900		nst.		Kumlien and Hollister 1903
1950	Apr. 2	2	M. Haas	1950 Pass. Pigeon 12(3):138
1950	Oct. 19	obs.	P. Kennedy	1951 Pass. Pigeon 13(1):40
1952	Mar. 27	obs.	L. Brosig	1952 Pass. Pigeon 14(3):115
1953	May 24	3	C. Frister (Jefferson)	1953 Pass. Pigeon 15(4):173
1954	Apr. 4	obs.	Mrs. A. Balsom, T. Stone	1954 Pass. Pigeon 16(3):116
1955	Summer	obs.	P. Kennedy	1955 Pass. Pigeon 17(4):166
1956	Spring	obs.	Anonymous	1956 Pass. Pigeon 18(3):130
1956	Oct. 12	obs.	N. Dahlstrand	1957 Pass. Pigeon 19(1):37
1957	Apr. 15	obs.	T. Stone	1957 Pass. Pigeon 19(3):130
1957	Aug. 6	obs.	E. Parfit	1957 Pass. Pigeon 19(4):178

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Jefferson County (continued)</u>				
1957	Aug. 7	obs.	N. Dahlstrand	1957 Pass. Pigeon 19(4):178
1958	May 31	2	R. Gordon (Deer Creek)	1958 Pass. Pigeon 20(3):126
1959	May 3	obs.	D. Hammel	1959 Pass. Pigeon 21(4):158
1963	Mar. 28	250	E. Degner	1963 Pass. Pigeon 25(4):166
1964	Summer	obs.	E. Peartree, T. Soulen	1965 Pass. Pigeon 27(1):32
1964	Jul. 14	obs.	T. Soulen	1965 Pass. Pigeon 27(2):83
1965		young	DNR personnel	Gregg and Hunt 1970
1967	Mar. 19	obs.	M. Maxson	1968 Pass. Pigeon 30(1):40
1967	Sep. 2	2	E. Stock, A. Rusch	1968 Pass. Pigeon 30(3):134
1968	Mar. 23	obs.	D. Sharp	1969 Pass. Pigeon 31(1):212
1968	Aug. 12	obs.	E. Stock	1969 Pass. Pigeon 31(2):248
1968	September	37	L. Compton	1969 Pass. Pigeon 31(3):292
1969	Oct. 1	72	J. Brakefield, R. Livengood	1970 Pass. Pigeon 32(4):167
1969	Oct. 19	30	L. Compton (Oak Hill)	1970 Pass. Pigeon 32(4):167
1970	Mar. 30	obs.	Anonymous	1971 Pass. Pigeon 33(1):22
1970	Jun. 9	1	D. Gustafson	1971 Pass. Pigeon 33(2):92
1970	Aug. 30	28	L. Compton	1971 Pass. Pigeon 33(3):144
1972	April	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
<u>Juneau County</u>				
1896		nst.	(Mauston)	Kumlien and Hollister 1903
1936?		nst.		Henika 1936
1938?		nst.	F. Hamerstrom (Cutler-Range)	Hamerstrom 1938
1952	Summer	obs.	S. DeBoer	1953 Pass. Pigeon 15(1):22
1959	Summer	40+ pairs	B. Hubbard	1959 Wis. Cons. Bull. 24(8):27
1961	Nov. 8	obs.	C. Pospichal	1962 Pass. Pigeon 24(2):51
1962	Apr. 6	obs.	C. Pospichal	1962 Pass. Pigeon 24(4):162
1964	Mar. 23	3	E. Allan	1965 Pass. Pigeon 27(1):32
1966		young	DNR personnel	Gregg and Hunt 1970

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Juneau County (continued)</u>				
1968	Nov. 16	2	D. Gustafson	1969 Pass. Pigeon 31(3):292
1969	Jun. 12	obs.	S. Robbins	1970 Pass. Pigeon 32(2):64
1969	September	82	R. Personius	1970 Pass. Pigeon 32(4):167
1970	Jun. 23	3 young	C. Smith	1971 Pass. Pigeon 33(2):92
1970	Oct. 24	obs.	F. Leshar	1971 Pass. Pigeon 33(3):144
1971	Jun. 4	4	S. Robbins	1972 Pass. Pigeon 34(2):77
1971	October	obs.	W. Brown	1972 Pass. Pigeon 34(3):112
<u>LaCross County</u>				
1966	Oct. 22	obs.	F. Leshar	1967 Pass. Pigeon 29(2):88
<u>Langlade County</u>				
1964	Spring	obs.	Anonymous (Antigo)	1965 Pass. Pigeon 27(1):32
1968		1 young	DNR personnel	Gregg and Hunt 1970
1970	Summer	obs.	L. Schimmels	1971 Pass. Pigeon 33(2):92
1970	Fall	obs.	Anonymous	1971 Pass. Pigeon 33(3):144
1972	May 20	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
<u>Manitowoc County</u>				
1950	May 17	2	F. King	1950 Pass. Pigeon 12(4):74
1973	April	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
<u>Marathon County</u>				
1959	Apr. 19	obs.	E. Biebrauer, S. Dotys	1950 Pass. Pigeon 21(4):158
1959	Oct. 7	obs.	Mr. and Mrs. S. Dotys	1960 Pass. Pigeon 22(2):20
1963	May 12	obs.	Anonymous	1963 Pass. Pigeon 25(4):166
1965	Jun. 15	5	E. Biebrauer, J. Williams	1966 Pass. Pigeon 28(2):48
1972	Aug. 2	6	Hoffman	1973 Pass. Pigeon 35(2):94

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Marquette County</u>				
1933		nst.	A. Leopold	Walkinshaw 1949:177
1934		nst.	A. Leopold	Walkinshaw 1949:177
1939	Oct. 12	obs.	Anonymous	1939 Wis. Cons. Bull. 4(11):4
1944	May 20	4	G. Curran	1944 Pass. Pigeon 6(3):70
1946	Sep. 15	14	Tagatz	1947 Pass. Pigeon 9(1):30
1946	Sep. 28	50	Tagatz	1947 Pass. Pigeon 9(1):30
1948	Sep. 21	29	Shine	1949 Pass. Pigeon 11(2):84
1952	Nov. 15	obs.	N. Damaske	1953 Pass. Pigeon 15(1):43
1953	Sep. 21	2	S. Robbins	1954 Pass. Pigeon 16(1):53
1954	Oct. 16	obs.	F. Zimmerman	1955 Pass. Pigeon 17(1):39
1955	May 17	32	N. Damaske	1955 Pass. Pigeon 17(4):166
1957	May 3	egg	O. Gromme	Notes
1957	May 31	pipping	O. Gromme	Notes
1957	Aug. 9	4	E. Parfett	1957 Pass. Pigeon 19(4):178
1957	Aug. 19	4	E. Parfett	1958 Pass. Pigeon 20(1):35
1958	May 25	obs.	E. Roark	1958 Pass. Pigeon 20(3):126
1959	Oct. 5	obs.	T. Soulen	1960 Pass. Pigeon 22(2):20
1961	May 15	eggs	R. Hopkins (photograph)	1961 Pass. Pigeon 23(3):95
1963	Fall	obs.	Anonymous	1964 Pass. Pigeon 26(2):98
1964	Spring	5	R. Narf	1965 Pass. Pigeon 27(1):32
1964	Oct. 17	58	E. Prins, B. Weber	1965 Pass. Pigeon 27(3):123
1967	Sep. 10	obs.	A. Rusch, E. Stock	1968 Pass. Pigeon 30(3):134
1971	Oct. 3	100+	J. March	1972 Pass. Pigeon 34(3):112
1972	April	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
<u>Milwaukee County</u>				
1965	Mar. 31	obs.	M. Donald	1966 Pass. Pigeon 28(1):29
1971	Oct. 3	30	C. Magulski	1972 Pass. Pigeon 34(3):112
1972	April	obs.	Anonymous	1973 Pass. Pigeon 35(1):22

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Monroe County</u>				
1938?		obs.		Hamerstrom 1938
1939		obs.	W. Scott	1939 Pass. Pigeon 1:121
1952	Summer	30	S. DeBoer	1953 Pass. Pigeon 15(1):41
1966	Summer	obs.	S. Robbins	1967 Pass. Pigeon 29(2):39
<u>Oconto County</u>				
1895	Jun. 6	nst.	A. Schoenebeck	1939 Pass. Pigeon 1:79-88
1924	June	1 young	O. Gromme (Peshtigo Brook)	Notes
1925	May 29	1 young	O. Gromme	Walkinshaw 1949:177
1926	May	obs.	O. Gromme (Peshtigo Brook)	Notes
1927		obs.	O. Gromme (Kellybrook Marsh)	Notes
1929	Aug. 19	obs.	O. Gromme (Bagley)	Notes
1930	May 4	obs.	O. Gromme (Peshtigo Brook)	Notes
1938		obs.	C. Richter	1939 Pass. Pigeon 1:114-119
1939		obs.	C. Richter	1939 Pass. Pigeon 1:114-119
1970	Fall	obs.	Anonymous	1971 Pass. Pigeon 33(3):144
<u>Outagamie County</u>				
1883		nst.	F. Grundtvig	Walkinshaw 1949:177
1931	May 12	nst.	O. Gromme (New London)	Notes
1941		nst.	F. Dayton	1941 Pass. Pigeon 3:91
1947	Apr. 17	15	C. Schlumpf (Shiocton)	1947 Pass. Pigeon 9(3):114
1949	Oct. 11	8	F. King (Shiocton)	1950 Pass. Pigeon 12(1):43
1949	Oct. 11	15	F. King (New London)	1950 Pass. Pigeon 12(1):43
1954	Spring	obs.	A. Bradford	1954 Pass. Pigeon 16(3):116
1955	Sep. 21	obs.	A. Bradford	1956 Pass. Pigeon 18(1):37
1956	Sep. 15	obs.	A. Bradford	1957 Pass. Pigeon 19(1):37
1957	Oct. 1	obs.	A. Bradford	1958 Pass. Pigeon 20(1):35
1958	Mar. 29	obs.	A. Bradford	1958 Pass. Pigeon 20(3):126
1959	Mar. 27	obs.	A. Bradford	1959 Pass. Pigeon 21(4):158
1959	Oct. 4	100	A. Bradford	1960 Pass. Pigeon 22(2):20

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Outagamie County (continued)</u>				
1960	Mar. 29	obs.	A. Bradford	1960 Pass. Pigeon 22(4):199
1960	Sep. 10	3	A. Bradford	1961 Pass. Pigeon 23(2):69
1968	Jun. 10	obs.	J. Green	1969 Pass. Pigeon 31(2):48
1971	Sep. 29	150	A. Bradford	1972 Pass. Pigeon 34(3):112
<u>Ozaukee County</u>				
1953		obs.	F. Larkin (Cedar Grove)	1953 Pass. Pigeon 15(2):70
1965	Summer	obs.	Anonymous	1966 Pass. Pigeon 28(1):29
1967	Oct. 21	obs.	D. Gustafson	1968 Pass. Pigeon 30(3):134
1969	Fall	obs.	Anonymous	1970 Pass. Pigeon 32(4):167
<u>Pepin County</u>				
1946	July	5	R. Neugebauer	1946 Pass. Pigeon 8(4):126
<u>Polk County</u>				
1950	Apr. 29	obs.	L. Heinsohn	1950 Pass. Pigeon 12(3):138
<u>Portage County</u>				
1893-1903		nst.	(Plover)	Kumlien and Hollister 1903
1955	Spring	obs.	T. Stone	1955 Pass. Pigeon 17(4):166
1959	Mar. 31	obs.	D. Berger	1959 Pass. Pigeon 21(4):158
1967	Summer	obs.	F. Renn (Buena Vista)	1968 Pass. Pigeon 30(2):94
1969	Jul. 10	3	D. Gustafson	1970 Pass. Pigeon 32(2):64
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
1972	Sep. 29	40	S. Krings	1973 Pass. Pigeon 35(3):139

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Racine County</u>				
1853		nst.	P. Hoy	Walkinshaw 1949:177
1946	Apr. 13	obs.	Mrs. Prins	1946 Pass. Pigeon 8(3):90
1946	Apr. 17	obs.	R. Eckbald	1946 Pass. Pigeon 8(3):90
1962		young	DNR personnel	Gregg and Hunt 1970
1963	May 5	obs.	L. Erickson	1963 Pass. Pigeon 25(4):116
1965	Summer	obs.	S. Robbins	1966 Pass. Pigeon 28(1):29
1965	Jun. 14	obs.	R. Fiehweg	1966 Pass. Pigeon 28(2):80
1967	Mar. 19	obs.	E. Prins	1968 Pass. Pigeon 30(1):40
1967	Jun. 1	4	L. Erickson	1968 Pass. Pigeon 30(2):94
1970	Mar. 28	obs.	W. Pugh	1971 Pass. Pigeon 33(1):22
1970	Sep. 20	50	W. Pugh	1971 Pass. Pigeon 33(3):144
<u>Rock County</u>				
1949	Oct. 28	obs.	T. Stone	1950 Pass. Pigeon 12(1):43
1958	Mar. 30	8	J. Wilde	1958 Pass. Pigeon 20(3):126
1961	Apr. 14	obs.	Mrs. J. Mahlum	1961 Pass. Pigeon 23(4):154
1966	Jun. 12	2	Mrs. J. Brakefield	1967 Pass. Pigeon 29(2):39
1972	April	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
<u>Shawano County</u>				
1941	Jun. 7	1 young	J. Klein	Walkinshaw 1949:177
1953	Aug. 27	6	C. Banasiak	1954 Pass. Pigeon 16(1):36
1971		young	DNR personnel	Gregg and Hunt 1970
1972		young	DNR personnel	Gregg and Hunt 1970
<u>Taylor County</u>				
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Trempealeau County</u>				
1953	Nov. 2	obs.	R. Dryer	1953 Pass. Pigeon 16(2):78
1972	Apr. 26	1	C. Kemper	1973 Pass. Pigeon 35(2):55-91
<u>Vilas County</u>				
1958	Sep. 27	obs.	A. Bradford	1959 Pass. Pigeon 21(2):84
<u>Walworth County</u>				
1883		eggs	(Delavan)	Kumlien and Hollister 1903
1942	Spring	obs.	M. Deusing	1942 Pass. Pigeon 4:55-57
1954	Oct. 5	50	H. Higgins	1955 Pass. Pigeon 17(1):39
<u>Washington County</u>				
1972	Mar. 18	obs.	R. Sharp	1973 Pass. Pigeon 35(1):22
<u>Waukesha County</u>				
1949	Sep. 20	12	T. Stone	1950 Pass. Pigeon 12(1):43
1950	Apr. 7	16	S. Jones	1950 Pass. Pigeon 12(3):138
1954	May 13	obs.	Mrs. A. Balsom	1954 Pass. Pigeon 16(4):154
1956	Spring	obs.	Anonymous	1956 Pass. Pigeon 18(3):130
1959	Sep. 14	obs.	P. Hoffman	1960 Pass. Pigeon 22(2):20
1961	May 9	obs.	Mrs. E. Sauer	1961 Pass. Pigeon 23(4):154
1962	May 2	obs.	J. Bielefeldt	1962 Pass. Pigeon 24(4):138
1963	Fall	obs.	Anonymous	1964 Pass. Pigeon 26(2):98
1964	Spring	3	E. Peartree, T. Soulen	1965 Pass. Pigeon 27(1):32
1964	Jun. 21	2	E. Peartree	1965 Pass. Pigeon 27(2):83
1965	Oct. 2	30	L. Compton	1966 Pass. Pigeon 28(3):117
1966		nst.	DNR personnel	Gregg and Hunt 1970
1967	Sep. 17	obs.	D. Beimborn	1968 Pass. Pigeon 30(3):134
1969	Sep. 27	37	D. Bratley	1970 Pass. Pigeon 32(4):167

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Waukesha County (continued)</u>				
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
1972	Nov.23	3	L. Davis	1973 Pass. Pigeon 35(3):139
<u>Waupaca County</u>				
1961	Apr. 2	obs.	F. Peterson	1961 Pass. Pigeon 23(4):154
1963	Apr. 13	obs.	Mrs. R. Rill	1963 Pass. Pigeon 25(4):166
1968	Mar. 19	obs.	K. Rill	1969 Pass. Pigeon 31(1):212
1970	Jun. 21	obs.	K. Rill	1970 Pass. Pigeon 33(2):92
<u>Waushara County</u>				
1949	(before)	nst.	C. Terrel (W. Scott)	Walkinshaw 1949:177
1948	Nov. 5	46	J. Hale	1949 Pass. Pigeon 11(2):84
1949	Summer	obs.	Anonymous	1949 Pass. Pigeon 11(4):186
1950	Apr. 7	16	S. Jones	1950 Pass. Pigeon 12(3):138
1966	Sep. 14	obs.	I. Chipman	1967 Pass. Pigeon 29(2):88
1967	Summer	obs.	T. Renn	1968 Pass. Pigeon 30(2):94
1968	Mar. 25	obs.	I. Chipman	1969 Pass. Pigeon 31(1):212
1969	Fall	obs.	Anonymous	1970 Pass. Pigeon 32(4):167
1970	Mar. 24	obs.	D. Greenman	1971 Pass. Pigeon 33(1):22
1970	Fall	obs.	Anonymous	1971 Pass. Pigeon 33(3):144
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22
1972	Summer	2 pairs	I. Chipman	1973 Pass. Pigeon 35(2):94
<u>Winnebago County</u>				
1955	Jul. 6	2	F. King	1955 Pass. Pigeon 17(4):166
1968	Summer	obs.	D. Tessen	1969 Pass. Pigeon 31(2):248
1968	Jul. 10	obs.	J. Green	1969 Pass. Pigeon 31(2):248
1970	Fall	obs.	Anonymous	1971 Pass. Pigeon 33(3):144
1971	Summer	obs.	D. Tessen (SW of Appleton)	1972 Pass. Pigeon 34(2):77
1972	March	obs.	Anonymous	1973 Pass. Pigeon 35(1):22

Appendix A. (continued)

Year	Date	Observation	Authoritative Source	Literature Reference
<u>Wood County</u>				
1918		young	(Hog Island)	Hamerstrom 1938
1931	May 14	eggs	O. Gromme (Bearbluff Marsh)	Notes
1931	Jun. 19	pipped	O. Gromme (Bearbluff Marsh)	Notes
1931	May 12	eggs	O. Gromme (Cranmore)	Notes
1932		nst.	F. Schmidt (W. Scott)	Walkinshaw 1949:177
1935		obs.	F. Schmidt (W. Scott)	Walkinshaw 1949:177
1936	Jun. 30	young	J. Goodlad (W. Scott)	Walkinshaw 1949:177
1938	(before)	nst.		Hamerstrom 1938
1941	May 18	nst.	N. Barger (Walker)	1941 Pass. Pigeon 3:18-20, 57-60
1947	Apr. 1	obs.	C. Searles	1947 Pass. Pigeon 9(3):114
1949	Apr. 4	2	B. Hubbard	1949 Pass. Pigeon 11(3):135
1949	Summer	obs.	Anonymous	1949 Pass. Pigeon 11(4):186
1949	Oct. 1	obs.	F. Benson	1950 Pass. Pigeon 12(1):43
1950	Mar. 28	obs.	W. Grange	1950 Pass. Pigeon 12(3):138
1952	Mar. 29	obs.	C. Searles	1952 Pass. Pigeon 14(3):115
1956	Spring	obs.	Anonymous	1956 Pass. Pigeon 18(3):130
1957	Oct. 6	7	H. Bauers	1958 Pass. Pigeon 20(1):35
1958	May 3	obs.	Mrs. Stocking, E. Peartree, Mr. and Mrs. D. Cox	1958 Pass. Pigeon 20(3):126
1963	Nov. 11	1	Anonymous	1964 Pass. Pigeon 26(2):98
1965	Oct. 22	90+	F. Leshner	1966 Pass. Pigeon 28(3):117
1967	Sep. 30	100	DC	1967 Pass. Pigeon 30(3):134
1968	Sep. 19	17	B. Zager, M. Kohel	1969 Pass. Pigeon 31(3):292
1970	May 9	2 eggs	L. Walkinshaw, W. Pugh	1971 Pass. Pigeon 33(1):22

obs.--Observation of sandhill cranes, but the number not reported.

nst.--nest

Appendix B. Questionnaires mailed to Wisconsin Department of Natural Resources Game Managers and Conservation Wardens to obtain information on the number of migrating and summer resident sandhill cranes

February 7, 1973

TO ALL GAME MANAGERS AND CONSERVATION WARDENS:

The University of Wisconsin-Stevens Point with support from the Bureau of Research, Wisconsin Department of Natural Resources, is currently involved in a survey of sandhill crane status in Wisconsin.

The objectives of the program are to determine recent distribution of summer resident cranes and the use of the state by migrant cranes in 1973.

I would appreciate your help in providing information for this program.

Enclosed are two post card questionnaires. Would you please report the information requested on post card A and return it at your earliest convenience. Post card A will be used in determining distribution and characteristics of past summer populations.

Post card B requests information on the spring migration of 1973. Depending on weather conditions, the cranes can be expected sometime in March or April. Please return post card B after you have obtained spring migration data.

Any additional information would be greatly appreciated and I will contact you personally if necessary.

With your help, we will be able to get the state-wide picture of sandhill cranes.

Ernest Gluesing
College of Natural Resources
University of Wisconsin-
Stevens Point
Stevens Point, Wisconsin
54481

Appendix B. (continued)

August 3, 1973

TO ALL GAME MANAGERS AND CONSERVATION WARDENS:

First let me thank all of you for your response to my first post card questionnaire and your cooperation during this search for sandhill cranes. With your help I have found many cranes and over 30 nests were located in the spring.

I am still in the process of collecting data and need your help again. Enclosed are two post card questionnaires requesting information on reproduction and fall migration. Post card A requests information on summer populations for 1973 and should be returned at your earliest convenience.

Post card B requests information on this years fall migration and should be returned after you have noticed a drop in the number of migrants in your area. This will probably be shortly after the opening of the waterfowl hunting season.

I am still trying to contact some of your personally and will continue to do so.

Thank you again for your help and cooperation.

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