A SURVEY FOR BREEDING HORNED GREBES IN MINNESOTA

FINAL REPORT submitted to the
NONGAME WILDLIFE PROGRAM OF THE
MINNESOTA DEPARTMENT OF NATURAL RESOURCES

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Prepared by
Janet Boe, Ph.D.
683 County Road 10
Bovey, MN 55709

ABSTRACT

Horned grebes (*Podiceps auritus*) have become a species of special concern in Minnesota because of a decline in summer observations of the species. I searched available records to document the breeding history of the species in the state and, in June 1991, I surveyed 76 selected wetlands in northwestern Minnesota, the part of the state included in the species' North American breeding range. Seventeen nesting reports, spanning 1931 to 1984, were present in The Flicker, The Loon, or Minnesota Ornithologists' Union files. Roberts (1932) listed an additional 7 reports, from 1885 to 1930. One horned grebe was observed during the wetland survey in 1991; it was present on Pool 1 of Roseau River Wildlife Management Area on 5 June. Horned grebes have probably not been common breeders or summer nonbreeding residents since settlement times, if then. However, their breeding range in the state has contracted recently, probably due to continued habitat loss and deterioration. Horned grebes should be considered uncommon summer residents and rare breeders in Minnesota.

INTRODUCTION

Horned grebes (Podiceps auritus) are small waterbirds that closely resemble eared grebes (Podiceps nigricollis) in size and coloration. However, they are more closely related to red-necked grebes (Podiceps grisegena) (Fjeldsa 1973) and, like red-necked grebes, they tend to be territorial and nest solitarily, aggressively defend their nest, and vocalize conspicuously during the breeding season (Cramp and Simmons 1977). Their overwater nests are built of available vegetation and are anchored to emergents or supported by submergents. Clutches consist of 3-6 (usually 4-5) whitish eggs that stain tan with age. Parents share incubation duties during the 24-25 day incubation period, and chicks are tended and fed by both parents (Palmer 1962). The diet of horned grebes consists of insects (about 1/2 of diet), fish (about 1/3), and crustaceans (about 1/6) (Wetmore 1924).

The breeding range of horned grebes is discontinuously holarctic and is usually in boreal coniferous zones. However, in at least two areas (the steppe of the Commonwealth of Independent States (formerly the Soviet Union) and the northern plains of the United States and the southern prairie provinces of Canada), the range includes semi-arid regions. Fjeldsa (1973) suggested that horned grebes and eared grebes, both mainly shallow water invertebrate feeders, replace each other geographically and may, in some respects, be considered ecological equivalents. In North America, the breeding range of horned grebes extends throughout most of western Canada and into southern Alaska. The range dips south of the border in northwestern Minnesota, North Dakota, and the extreme northern plains of other western states (Ratti 1983). The Checklist of North American Birds (American Ornithologists' Union 1983) extends the breeding range south to northern South Dakota. Duebbert and Lokemoen (1973) reported on three horned grebe nests observed during 1972 in north-central South Dakota. In North Dakota, north and east of the Missouri River, breeding horned grebes are common or fairly common locally (Stewart 1975). In Minnesota, the horned grebe is considered a species of special concern. Its breeding range is restricted to the northwesternmost counties, and grebes have been observed recently only on Roseau River Wildlife Management Area (WMA) and Agassiz National Wildlife Refuge (NWR) (Bird Group of Minnesota Endangered Species Technical Advisory Committee, 1988).

Fjeldsa (1973) studied horned grebes in Norway and used the term "potholes" to describe wetlands used by these grebes. He also recorded their occurrence on protected bays of large lakes. Hardwater lakes with abundant vegetation and animal life were preferred, but about half of the lakes used in Norway were oligotrophic, with emergent vegetation only in sheltered bays. In Finland and Sweden, horned grebes used small (1-10 ha), shallow (<2.5 m) lakes with submerged vegetation and sparse emergent vegetation that gave some wave protection to nests but allowed easy access to open water (Cramp and Simmons 1977). Most breeding pairs in North Dakota are found on fresh to slightly

brackish ponds or lakes from 1/3 acre to several hundred acres or more in size and with extensive beds of submerged aquatic vegetation (Stewart 1975). Faaborg (1976) studied wetland selection by horned grebes and two other small grebe species near Kenmare, ND. He found that 80% of ponds used by horned grebes were less than 2 ha (about 5 acres) in size, that 60% were less than 1 ha, and that all had from 40% to 60% open water. In the aspen parklands of Saskatchewan, horned grebe use of ponds increased with pond size and permanency (Sugden 1977).

Faaborg's study took place in an area where the ranges of three species of grebes overlap. His study suggested that separation was effected by macrohabitat selection and that, in this area, horned grebes used small or very small, relatively open lakes or ponds. Nudds (1982) studied breeding habitat selection by horned and pied-billed grebes and suggested that differential selection of small wetlands by the two species may be due to characteristics of the individual potholes and the microhabitat requirements of each grebe species, rather than competitive exclusion. Horned grebes selected potholes with more patches of open water than those selected by pied-billed grebes.

The decline in sightings of horned grebes during the breeding season in Minnesota prompted concern about the species in the state. The major objectives of this study were to chronicle the decrease in the breeding range of horned grebes in Minnesota and to determine the status of horned grebe breeding in the state by surveying selected wetlands in the species' historical breeding range in the state for breeding pairs.

METHODS

On 30 April 1991, I visited the Department of Natural Resources library in St. Paul and checked issues of The Flicker and The Loon from 1929 through 1989, reviewed and recorded information in the Minnesota Ornithologists' Union (MOU) file on horned grebes, and verified reports of breeding by checking, when available, the nesting records submitted to MOU by observers. In addition, I consulted Roberts' (1932) Birds of Minnesota and other ornithological literature.

In late May, I used maps on file at the National Wetlands Inventory (NWI) office in Minneapolis to select wetlands to check for horned grebes. I selected wetlands classified as palustrine emergent, palustrine unconsolidated bottom, or open water with permanency ratings of F (semipermanent), G (intermittent), or H (permanent). Wetlands were selected in Kittson, Roseau, Marshall, Pennington, Red Lake, and Polk counties, the northwesternmost counties in the state, covering an area usually included in horned grebe breeding range maps. Unfortunately, NWI maps available for this area of the state were limited to enlargements (1:24000) of 1982 aerial photographs which have not yet been field checked and digitized. No information on depth or vegetation was available except that indicated by classification

and permanency ratings. Wetland size was estimated using map scale. Since most reports suggest that horned grebes use small wetlands, I selected 85 wetlands ranging in size from < 1 acre to, with a few exceptions, about 80 acres. I omitted wetlands with the suffixes x (excavated) or d (partially drained or ditched).

Letters to Audubon Society chapters in northwestern Minnesota and the Twin Cities area requesting reports of horned grebe nesting attempts were sent on 12 April 1991. In addition, reports of horned grebes were requested from managers at Tamarac NWR, Agassiz NWR, Roseau River WMA, Thief Lake WMA, Department of Natural Recources (DNR) Area Wildlife Managers in northwestern Minnesota, and U.S. Fish and Wildlife Service (USFWS) Wetlands District offices at Morris and Fergus Falls.

Upon starting field work on 1 June, it became apparent quickly that some wetlands selected using NWI maps were not wetlands that were likely to be used by horned grebes. To ensure the efficient use of time and other resources, I then turned to area wildlife managers and USFWS field personnel, who were a reliable source of current information about the wetlands I had selected. Prior to checking wetlands in an area, I discussed wetland conditions with the wildlife manager responsible for the area, described the conditions that I was looking for (2-3 ft. of standing water, emergent and/or submergent vegetation, < 80 ac. in size), solicited suggestions of wetlands that might meet those criteria, and asked about particular wetlands on the list constructed at NWI.

With information from area wildlife managers in hand, my field assistant and I checked wetlands during June by canoe using Zeiss 8x30 binoculars and from shore using a Bausch and Lomb 15-60 X spotting scope or binoculars. Usually, wetlands were checked by canoeing the periphery of the wetland at the edge of the emergent fringe. On occasion, due to wetland size or shape or weather conditions, wetlands were only partially checked by canoe. On other occasions, usually due to weather or wetland conditions, wetlands were checked only by spotting scope or binoculars from shore.

In addition to searching for horned grebes, we also noted the presence of certain wetland species of interest, including black terns (Childonias niger; BT), red-necked grebes (RNG), eared grebes (EG), American bitterns (Botaurus lentiginosus; AB), least bitterns (Ixobrychus exilis; LB), sandhill cranes (Grus canadensis; SC), Wilson's phalaropes (Phalaropus tricolor; Wil P), American white pelicans (Pelecanus erythrorhynchos; WP), black-crowned night-herons (Nicticorax nycticorax; BCNH), great blue herons (Ardea herodias; GBH), marbled godwits (Limosa fedoa; MG), Franklin's gulls (Larus pipixcan; FG), and Forster's terns (Sterna forsteri; FT).

RESULTS

Historical Distribution in Minnesota

Reported sightings in The Flicker and The Loon indicate that horned grebes may be seen throughout the state during fall and spring migration. The Lake Superior shore near Duluth has been an especially attractive location during spring; hundreds to thousands of horned grebes have been observed in that area at the time of the smelt run (late April-early May) (Janssen 1987). However, in The Flicker, The Loon, and MOU files, I found only 17 reports of horned grebe nesting in Minnesota from 1931-1989 (Fig. 1). Roberts (1932) listed 7 sites (Fig. 1) where breeding was recorded in 1 or more years from 1885 to 1930, including Mud Lake in Marshall County (now Agassiz NWR) and Twin Lakes in Kittson County. Summer observations of nonbreeding birds were not common (Fig. 2).

Survey of Wetlands 1991

Only 1 horned grebe was observed during a survey of 76 wetlands in northwestern Minnesota in June 1991 (Fig. 3). The grebe was observed on 5 June in Pool 1 at Roseau River WMA. County maps with surveyed wetlands marked are included in Appendix A and Appendix C lists surveyed wetlands. If a wetland was only partially surveyed, a drawing of the wetland showing the area surveyed is included in Appendix B. No reports of horned grebe nesting this year have been received from Audubon chapter members, area wildlife managers, or USFWS personnel.

Black terns, Forster's terns, American bitterns, least bitterns, sandhill cranes, American white pelicans, Wilson's phalaropes, Forster's terns, black-crowned night-herons, marbled godwits, Franklin's gulls, great blue herons, red-necked grebes, and eared grebes were observed on some of the surveyed wetlands during the month, and in some cases, nests were observed. Observations of species of interest are included in Appendix A.

DISCUSSION

Although the distribution of reported horned grebe nesting attempts (Fig. 1) suggests a broader breeding distribution in the state in the past, the relatively few reports over a span of 90+ years suggest that the species has not been a common breeder, at least not since the state was settled. In some years, summer passes without a report of an observation of a breeding or nonbreeding horned grebe in the state. The only horned grebe observed during an extensive tour of northwestern Minnesota in 1969 was a single bird at Goose Lake in Pennington County on 13 June (R. Janssen, MOU files, undated). This evidence, coupled with the results of the survey this year, seems to suggest that horned grebes should be considered uncommon summer residents and rare breeders in the state.

In Minnesota, already on the fringe of the horned grebe breeding range in North America, the widespread and enduring practice of wetland drainage has undoubtedly contributed to

Figure 1. Map of all horned grebe nesting attempts reported in The Flicker, The Loon, MOU files, or Roberts (1932). ▲ = breeding wetlands reported in Roberts (1932). He also reported nesting at Mud Lake in Marshall County and Twin Lakes in Kittson County. 1. Becker County, 10 June 1936, 8 nests with 4-6 eggs each. Source: The Flicker. 2. St. Louis County, Lac La Croix, 9 July 1936, brood of small young. Source: The Flicker. 3. Marshall County, Thief Lake, 26 July 1938, adult with young. Source: The Flicker. 4. Roseau County, 1941, 1 nest. Source: The Flicker. 5. Marshall County, 1980, breeding. Source: The Loon. 1985, nested. Source: The Loon. 6. Pennington County, Thief River Falls sewage treatment ponds, 1984, adult and 1 young. Source: The Loon and MOU files. 7. Marshall County, Agassiz NWR, 31 May 1942, nest with 7 eggs. Source: MOU files. 20 June 1984, nest with 8 eggs. Source: The Loon. 8. Kittson County, Twin Lakes, 1 June 1942, 2 nests with eggs and 4 nests being built. Source: MOU files. 11 August 1966, adult with 1 young. Source: MOU files. 9. Pope County, Lake Amelia, 16 July 1977, 4 adults and 2 young. Source: MOU files. 10. Roseau County, Roseau River WMA, 12 June 1971, 1 adult on nest. Source: The Loon. 11. Wright County, Cedar Lake, 21 June 1931, nest with hatching eggs and adult with 1 young. Source: MOU files. 12. Kandiyohi County, 2 roadside sloughs near Willmar, 13 June 1944, 1 nest on each slough. Source: MOU files. 13. Mahnomen County, near Waubun, 3 July 1958, 3 young. Source: MOU files. 14. McLeod County, slough near Brownton, 7 July 1935, 3 nests with 1-7 eggs. Source: MOU files. MOU records compiled by J. Green, R. Janssen, and N. Heimenz.

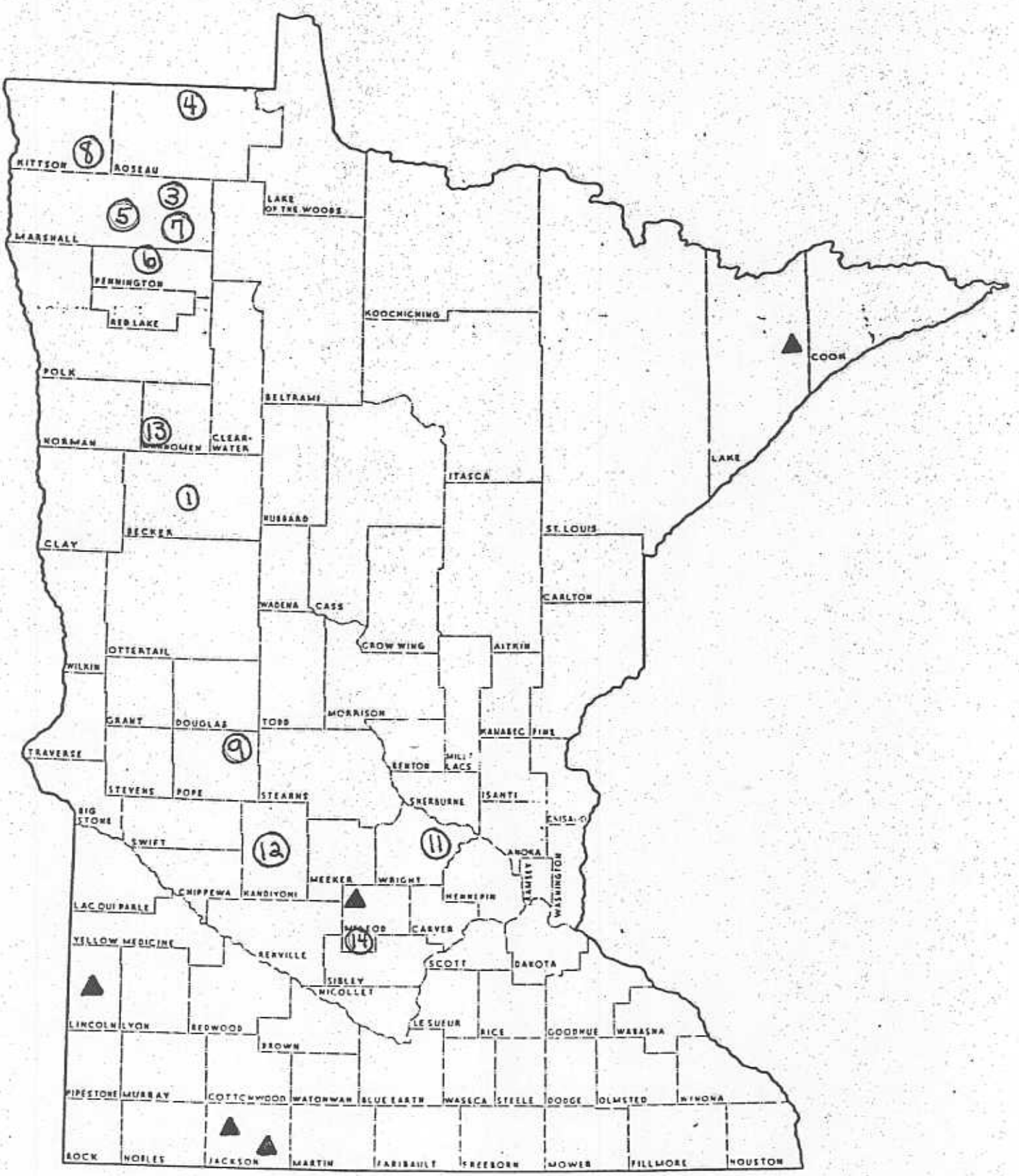
4
8
KITTSON
ROSEAU
3
5
7
LAKE OF THE WOODS
MARSHALL
6
PENNINGTON
RED LAKE
KOOCHICHING
COOK
POLK
BELTRAMI
13
NORMAN
CLEARWATER
LAKE
ITASCA
1
HUBBARD
BECKER
CLAY
ST. LOUIS
WADENA
CASS
CARLTON
CROW WING
AITKIN
OTTERTAIL
WILKIN
MORRISON
GRANT
DOUGLAS
TODD
KANABEC
PINE
9
TRAVERSE
BENTON
MILLE LACS
STEVENS
POPE
STEARNS
SHERBURNE
ISANTI
BIG STONE
SWIFT
12
11
ANOKA
CHISAGO
WASHINGTON
MEEKER
WRIGHT
CHIPPEWA
KANDIYOHI
HENNEPIN
LAC QUI PARLE
MCLEOD
CARVER
14
YELLOW MEDICINE
RENVILLE
SCOTT
DAKOTA
SIBLEY
NICOLLET
LINCOLN
LYON
REDWOOD
LE SUEUR
RICE
GOODHUE
WABASHA
BROWN
PIPESTONE
MURRAY
COTTONWOOD
WATONWAN
BLUE EARTH
WASECA
STEELE
DODGE
OLMSTED
WINONA
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON

Figure 2. Summer (June-July-August) horned grebe observations in Minnesota 1931-1989, excluding nesting attempts, reported in The Flicker, The Loon, or MOU files. One personal observation made in 1989 is included. = one report.


KITTSON
ROSEAU
LAKE OF THE WOODS
MARSHALL
PENNINGTON
RED LAKE
KOOCHICHING
COOK
LAKE
POLK
BELTRAMI
NORMAN
MAHNOMEN
CLEAR-WATER
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HUBBARD
BECKER
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BLUE EARTH
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OLMSTED
WINONA
ROCK
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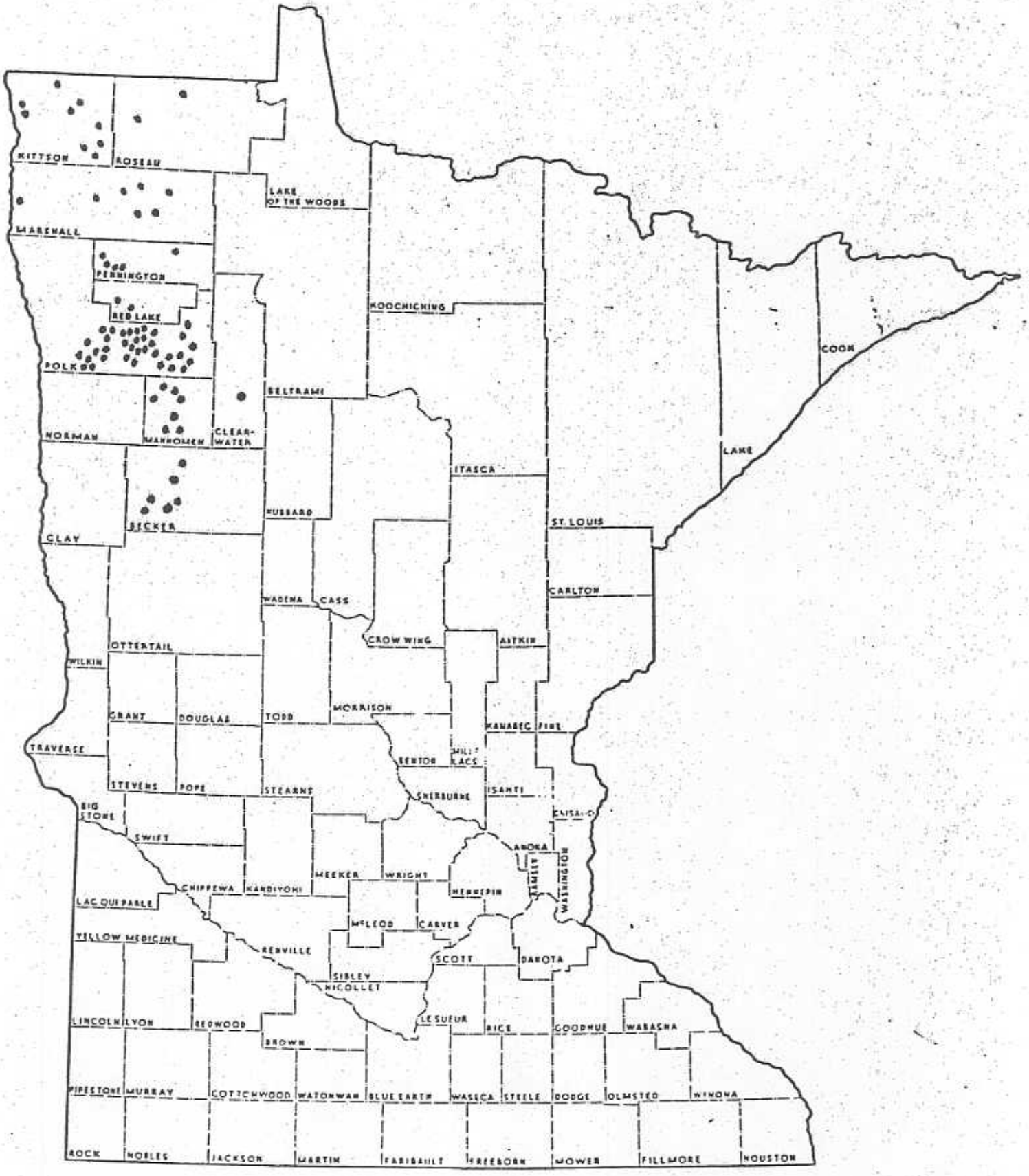
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON

Figure 3. Map of Minnesota showing wetlands searched for horned grebes in June 1991.


KITTSON
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WRIGHT
CHIPPEWA
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HENNEPIN
LAC QUI PARLE
McLEOD
CARVER
YELLOW MEDICINE
RENVILLE
SCOTT
DAKOTA
SIBLEY
NICOLLET
LINCOLN
LYON
REDWOOD
LE SUEUR
RICE
GOODHUE
WABASHA
BROWN
PIPESTONE
MURRAY
COTTONWOOD
WATONWAN
BLUE EARTH
WASECA
STEELE
DODGE
OLMSTED
WINONA
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON

contracting further the horned grebe breeding range in the state. Draining *most* wetlands in an area not only decreases the total pool of available wetlands, but it makes that area less attractive to waterbirds by diminishing the variety of wetlands available there. Wetland drainage probably has forced horned grebes (and other waterbirds) into those areas with large wetlands that provide a reliable water supply or those remaining areas with enough small wetlands to provide variety and, thus, a measure of habitat reliability. Perhaps the most effective management plan for horned grebes would be to improve the quality and increase the number of wetlands in the state. Meanwhile, we should add horned grebes to waterfowl brood survey forms and encourage documentation of observations of summer nonbreeding birds and nesting attempts.

ACKNOWLEDGEMENTS

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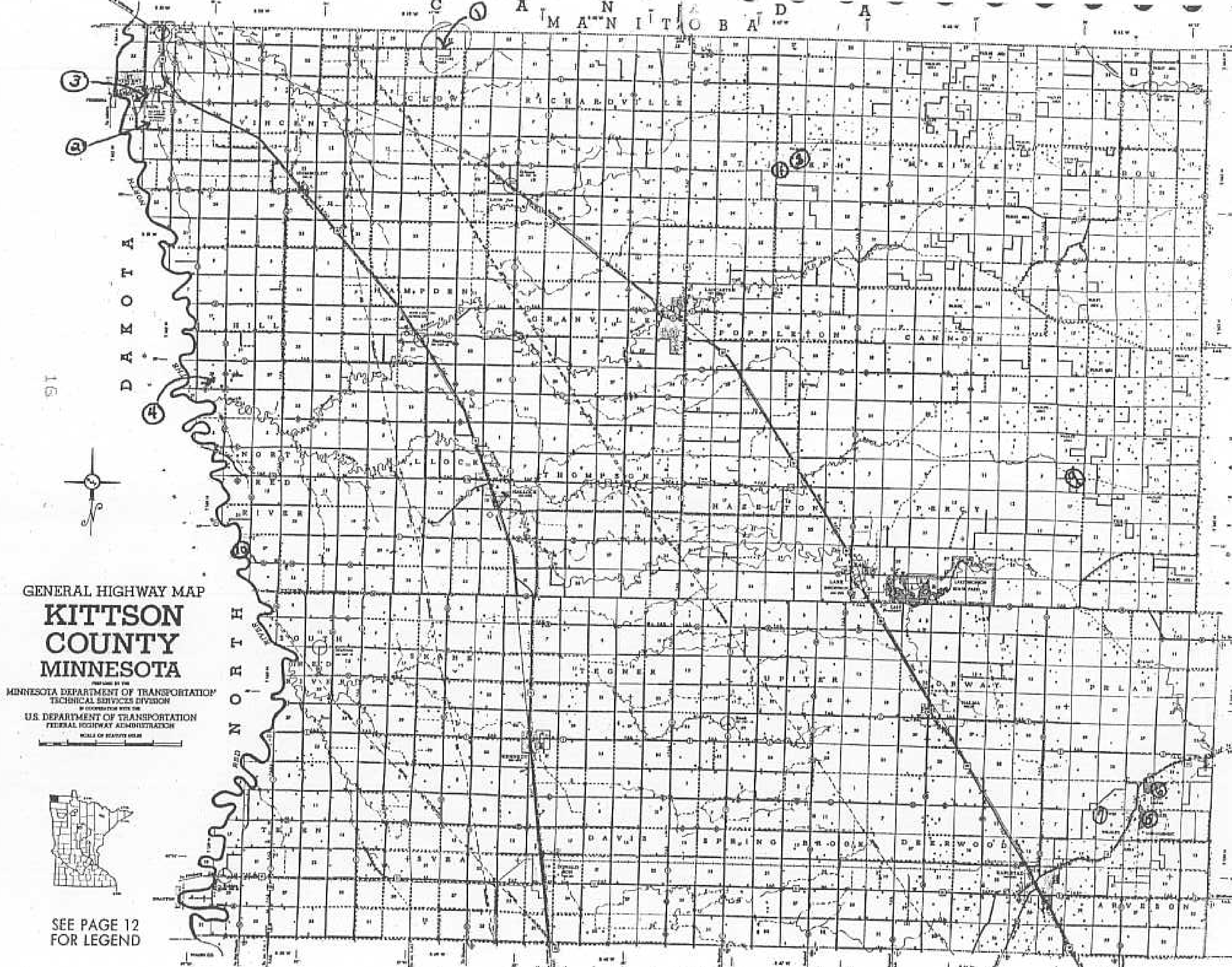
APPENDIX A. County maps with surveyed wetlands marked. Figure headings give wetland identifier, date surveyed, and observations of any bird species of special interest. C = wetland canoed, B = wetland surveyed from shore using binoculars, SS = wetland surveyed from shore using spotting scope, P = wetland partially canoed; refer to Appendix B for area surveyed.

Figure A1. Kittson County. 1. Joe River WMA, 2 June, 3 WG, 10 EG, 1 RNG (C). 2. T163 R51 SW1/4 12, 2 June (B). 3. Stella Lake, 2 June, 1 BT (B). 4. T162 R50 SE1/4 SW1/4 29, 2 June, (B). 5. Twin Lakes WMA (south), 3 June, 1 SC, 50 BT (1 nest/2 eggs), 1 FT (C). 6. Twin Lakes WMA (north), 3 June, 20 BT, 1 LB. 7. Twistal Swamp, 3 June, 30 BT (C). 8. Skull Lake WMA (impoundment), 6 June, 11 BT, (C). 9. Beeches Lake WMA, 6 June, 10 BT, 2 SC, (C). 10. T161 R50 N1/4 NE1/4 28, 2 June, (B). 11. Skull Lake, 6 June, (B).



GENERAL HIGHWAY MAP

KITTSON COUNTY MINNESOTA

MINNESOTA DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES DIVISION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SEE PAGE 12 FOR LEGEND

Figure A2. Roseau County. 1. Roseau River WMA (all but Pool 3). 5 June. Pool 1 E: 2 AB, 2 BCNH, 9 BT, 5 WilP, 1 HG, 1 RNG (2 nests/6 eggs/3 eggs), 7 MG. Pool 1 W: 8 BT, 2 BCNH, 1RNG. Dike Pool: 16 BT, 10 WP. Pool 2 SE: 4 BT. Pool 2 NW: 43 BT. Pool 2 SE (B); others (C). 2. S Lake, 5 June (B).

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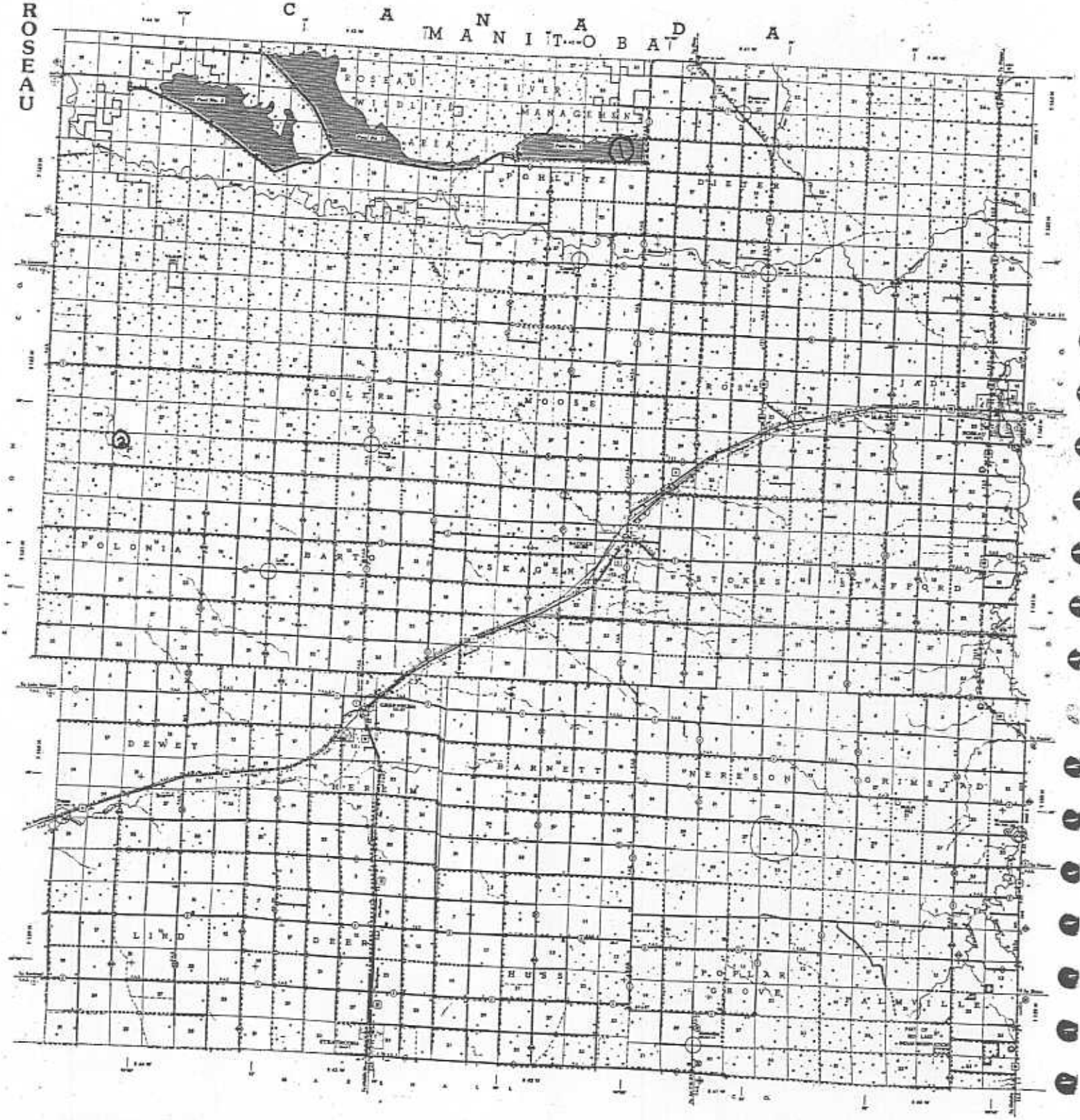
W/P

ROSEAU



GENERAL HIGHWAY MAP

ROSEAU COUNTY MINNESOTA

MINNESOTA DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES DIVISION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

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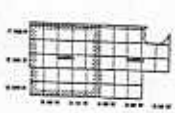

WEST PART

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Figure A3. Marshall County. 1. East Park WMA, 1 June, 3 RNG (1 platform), 12 BT, (C). 2. Horseshoe Lake, 7 June, (C). (3.) Florian WMA, 11 June, 7 MG, 1 WilP, (P). 4. T158 R43 NW1/4 20, 11 June, (C). 5. Elm Lake WMA, 11 June, (B). 6. Lost River Pool WMA, 11 June, (B). 7. Thief Lake, 14 July, EG, FG, FT, BT, WG (see separate report), (C). Agassiz NWR: no horned grebes observed this year (A. Bennett, pers. comm.).

GENERAL HIGHWAY MAP

MARSHALL COUNTY MINNESOTA

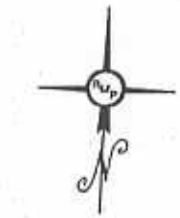
MINNESOTA DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES DIVISION
in cooperation with the
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

EAST PART

SEE PAGE 12
FOR LEGEND

GENERAL HIGHWAY MAP
MARSHALL
COUNTY
MINNESOTA
MINNESOTA DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES DIVISION
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
NORTH DAKOTA
NORTH
WEST PART
SEE PAGE 12
FOR LEGEND

Figure A4. Pennington County. 1. Goose Lake WMA, 10 June, 2 BT, (C). 2. T154 R40 NE1/4 15, 10 June, (B). 3. T152 R45 N1/2 NW1/4 7, 10 June, (B). 4. T152 R45 W1/2 20, 10 June, (B). 5. T152 R45 NE1/4 19, 10 June, (B).



WEST PART

GENERAL HIGHWAY MAP

PENNINGTON COUNTY MINNESOTA

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FEDERAL HIGHWAY ADMINISTRATION

SCALE OF STATUTE MILES

SEE PAGE 12 FOR LEGEND

GENERAL HIGHWAY MAP

PENNINGTON COUNTY MINNESOTA

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FEDERAL HIGHWAY ADMINISTRATION

SCALE OF STATUTE MILES

EAST PART

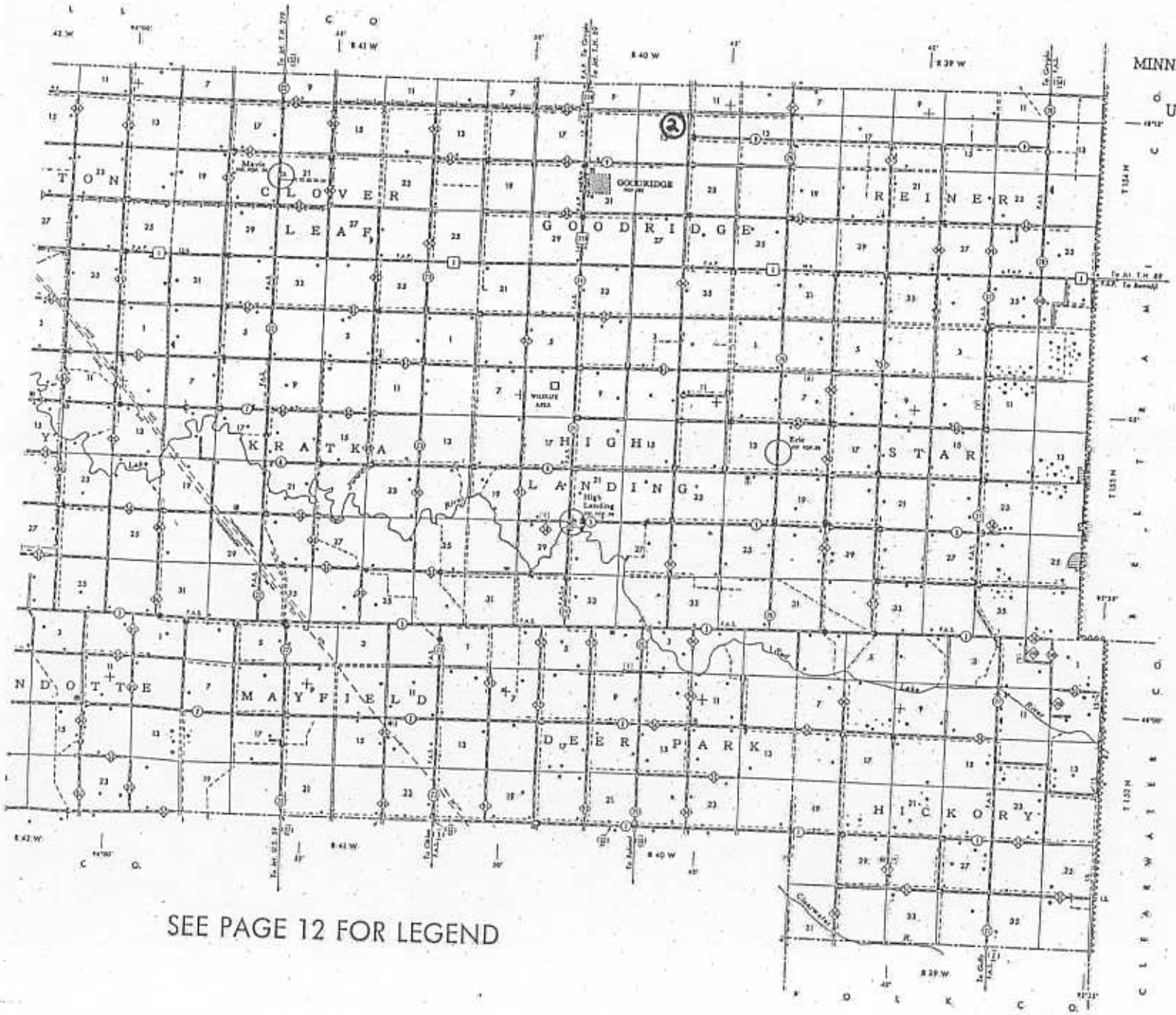

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Figure A5. Red Lake County. 1. T150 R43 NW1/4 19 and T150 R44 NE1/4 24, 13 June, (B). 2. T151 R45 E1/2 SW1/4 21, 13 June, (B).

GENERAL HIGHWAY MAP

RED LAKE COUNTY MINNESOTA

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SCALE OF STATUTE MILES

SEE PAGE 12 FOR LEGEND

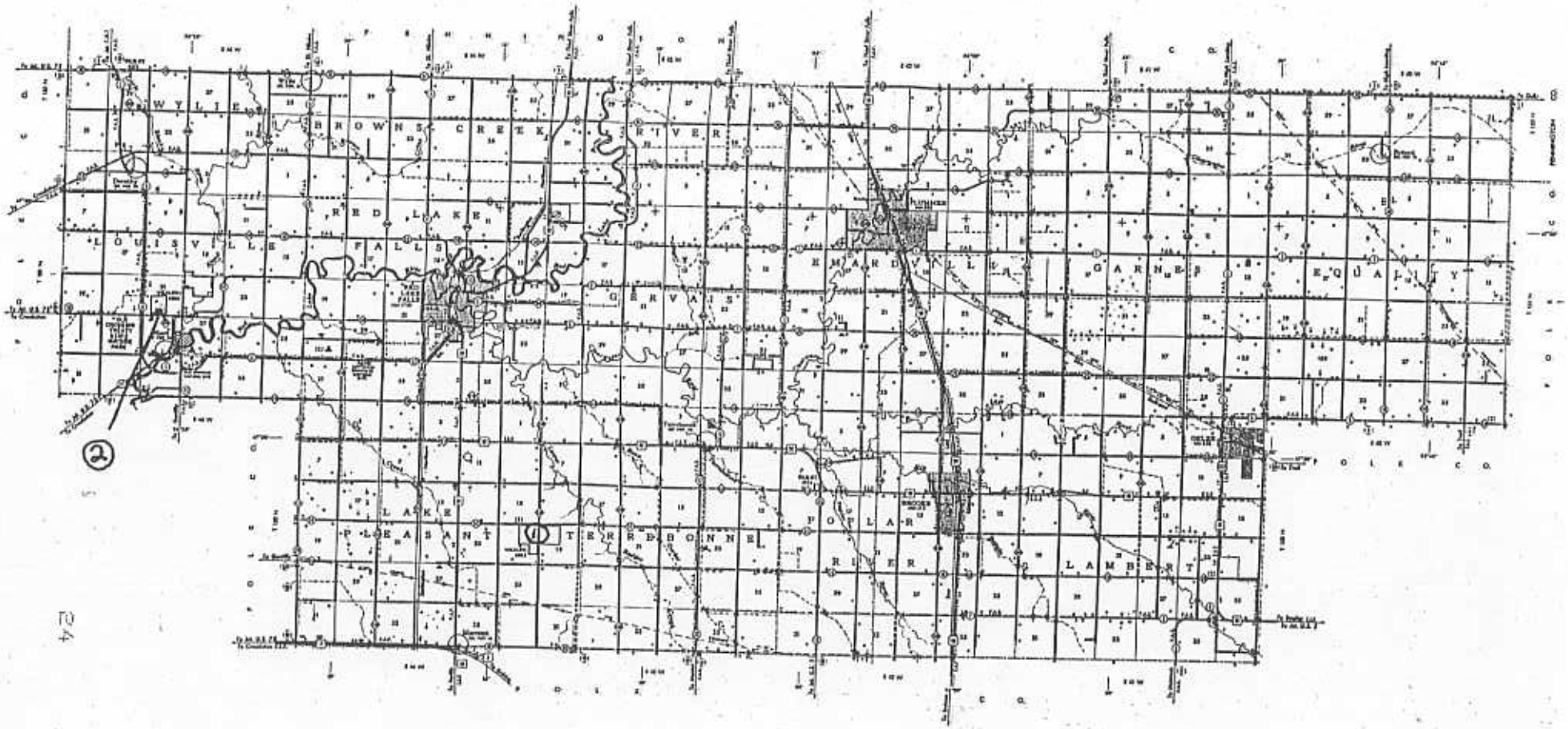

Figure A6. Polk County. 1. Burnham Creek WMA, 13 June, 10 BT (1 nest/3 eggs) (C), and Burnham Creek Impoundment, 13 June, 3 BT (B). 2. T148 R43 SW1/4 6 WPA, 13 June, (C). 3. T148 R 44 SW1/4 24, 13 June, (B). 4. T148 R44 SW1/4 25, 13 June, (B). 5. T148 R44 NW1/4 36, 13 June, (B). 6. Chicog Lake, 17 June, 1 EG, 9 BT, (C). 7. Oak Lake, 18 June, (P). 8. "Little Oak Lake" Refuge, 18 June, 1 GBH, (C). 9. Cameron Lake, 18 June, 2 RNG (nest-building), (B). 10. Budahl Lake, 18 June, (C). 11. Dahl Lake, 18 June, (P). 12. T148 R42 N1/4 6, 18 June, (SS). 13. T148 R42 N1/4 6, 18 June, 1 BT (B). 14. Bee Lake, 18 June, 3 GBH, (C). 15. Badger Lake, 19 June, 27 WP, 1 GBH, (C). 16. Dorr Lake, 19 June, RNG nest/5 eggs, 1 BT, (C). 17. T148 R42 S1/4 6, 19 June, RNG nest/4 eggs, (C). 18. T147 R43 SE1/4 11, 19 June, (P). 19. Rindal Lake, 19 June, (B). 20. T148 R43 NW1/4 29, 19 June, (SS). 21. T148 R43 E1/2 30, 19 June, (SS). 22. T148 R43 W1/2 32, 19 June, (B). 23. T149 R43 S33 WPA, 19 June, (B). 24. T149 R43 E1/4 32 WPA, 20 June, (C). 25. T148 R41 SE1/4 20, 20 June, (SS). 26. T149 R41 W1/2 15 WPA, 2 RNG nests, 3 RNG pr., 1 GBH, (SS). 27. Lengby WMA (T147 R39 W1/2 29), 23 June, 2 GBH, (C north side, B south side). 28. T147 R40 SE1/4 25 WPA, 23 June, (B). 29. T147 R40 NW1/4 27 WMA, 23 June, 2 BT, 1 GBH, (C). 30. T147 R40 SE1/4 33 WMA, 23 June, (C). 31. T148 R40 SW1/4 NW1/4 5 WPA, 23 June, (SS). 32. T148 R40 SW1/4 25, 23 June, (B). 33. T147 R40 W1/2 12 WPA, 24 June, (B). 34. Sagaiigan WMA, 24 June, 5 BT nests/3 with 3-4 eggs/2 with young, (C). 35. La Voi WMA, 24 June, (B).

GENERAL HIGHWAY MAP

POLK COUNTY MINNESOTA

PREPARED BY THE
MINNESOTA DEPARTMENT OF TRANSPORTATION
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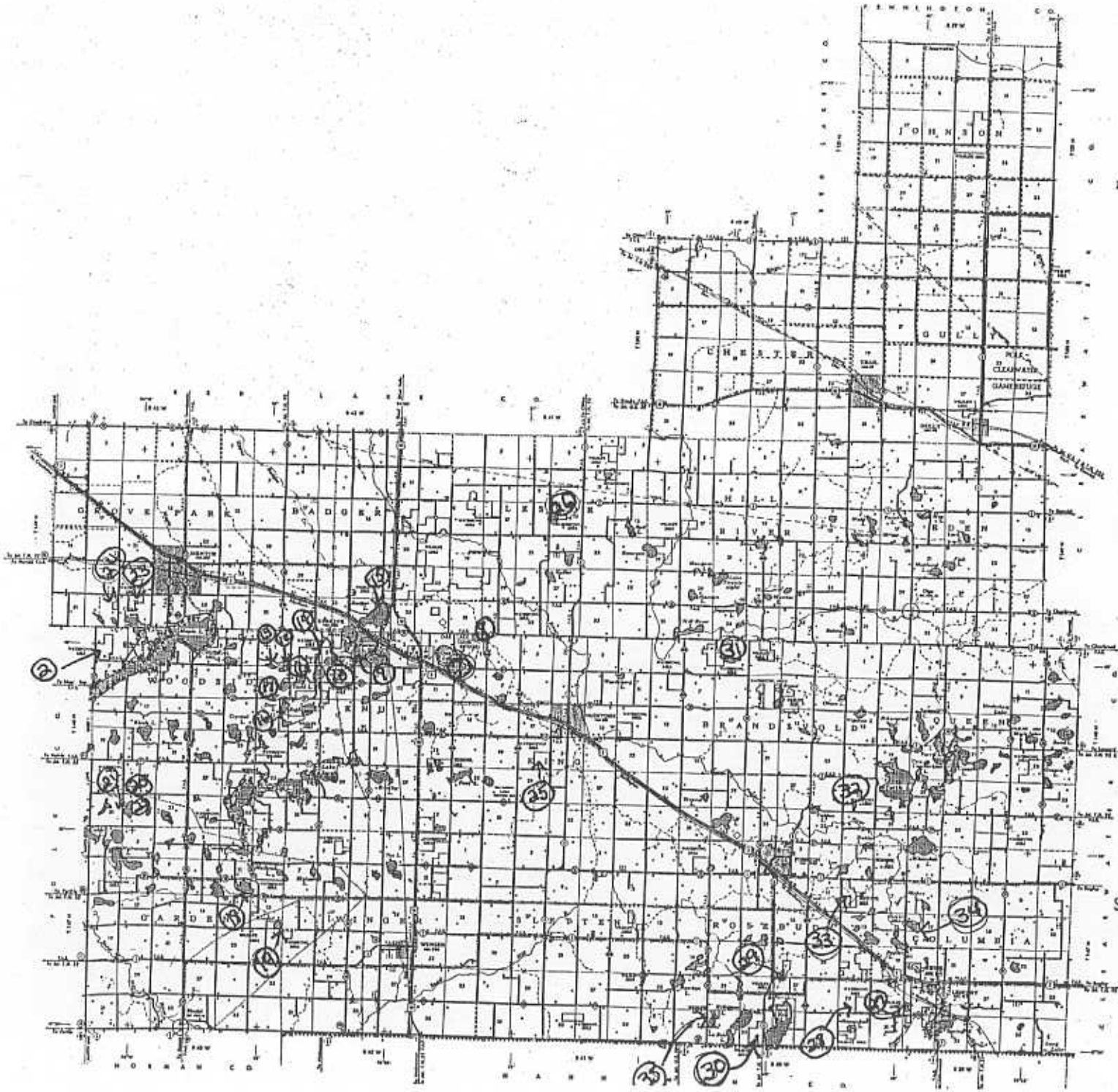
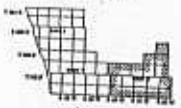
FEDERAL HIGHWAY ADMINISTRATION

SCALE OF STATUTE MILES



EAST PART

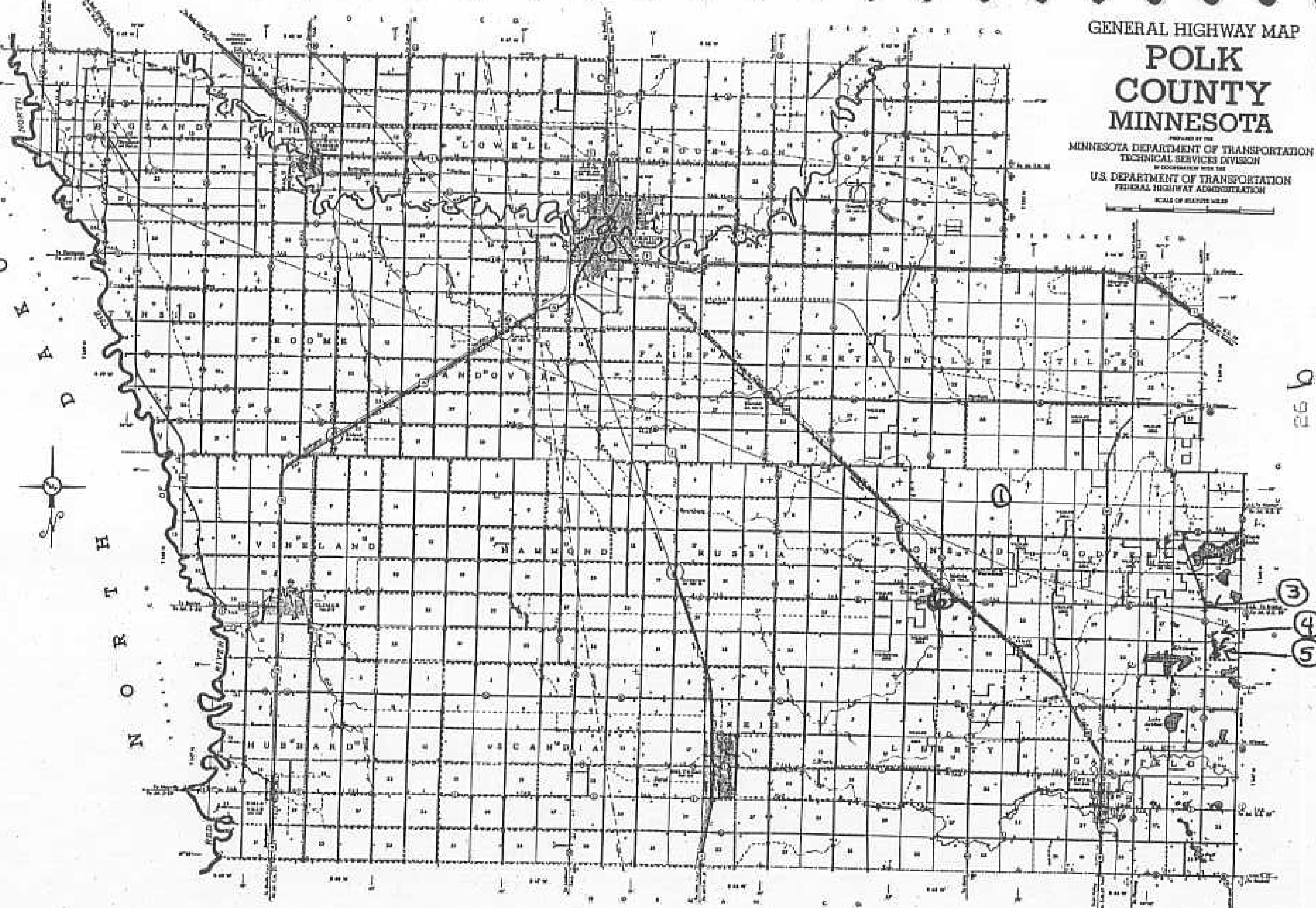


SEE PAGE 12 FOR LEGEND

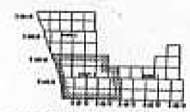
GENERAL HIGHWAY MAP
POLK COUNTY
MINNESOTA

MINNESOTA DEPARTMENT OF TRANSPORTATION
TECHNICAL SERVICES DIVISION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

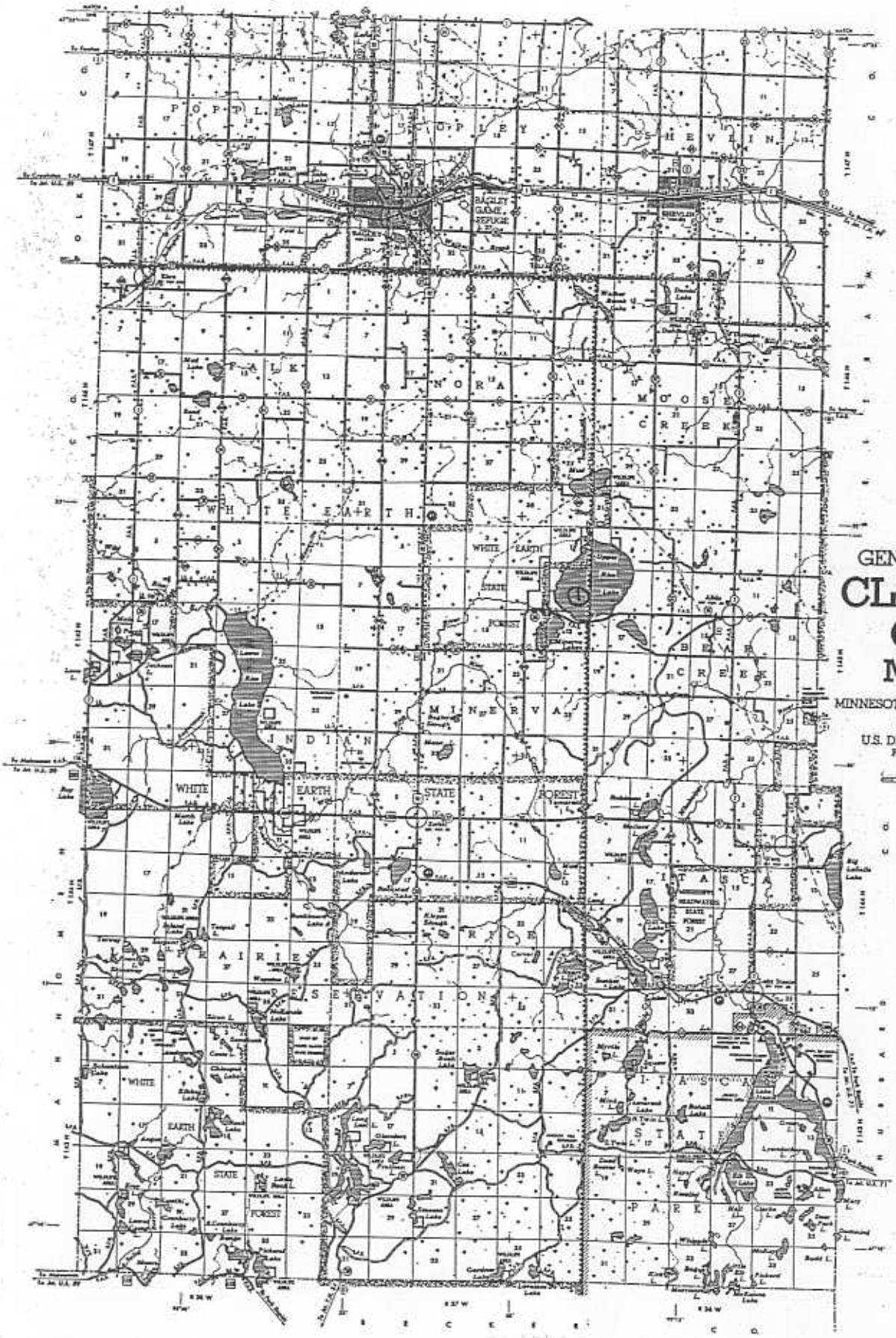


SEE PAGE 12 FOR LEGEND



SOUTHWEST PART

Figure A7. Clearwater County. 1. Upper Rice Lake, 14 June, 9 RNG nests/1-7 eggs, several RNG pr. back-brooding young, 3 BT, (P).



SOUTH PART

GENERAL HIGHWAY MAP

CLEARWATER COUNTY MINNESOTA

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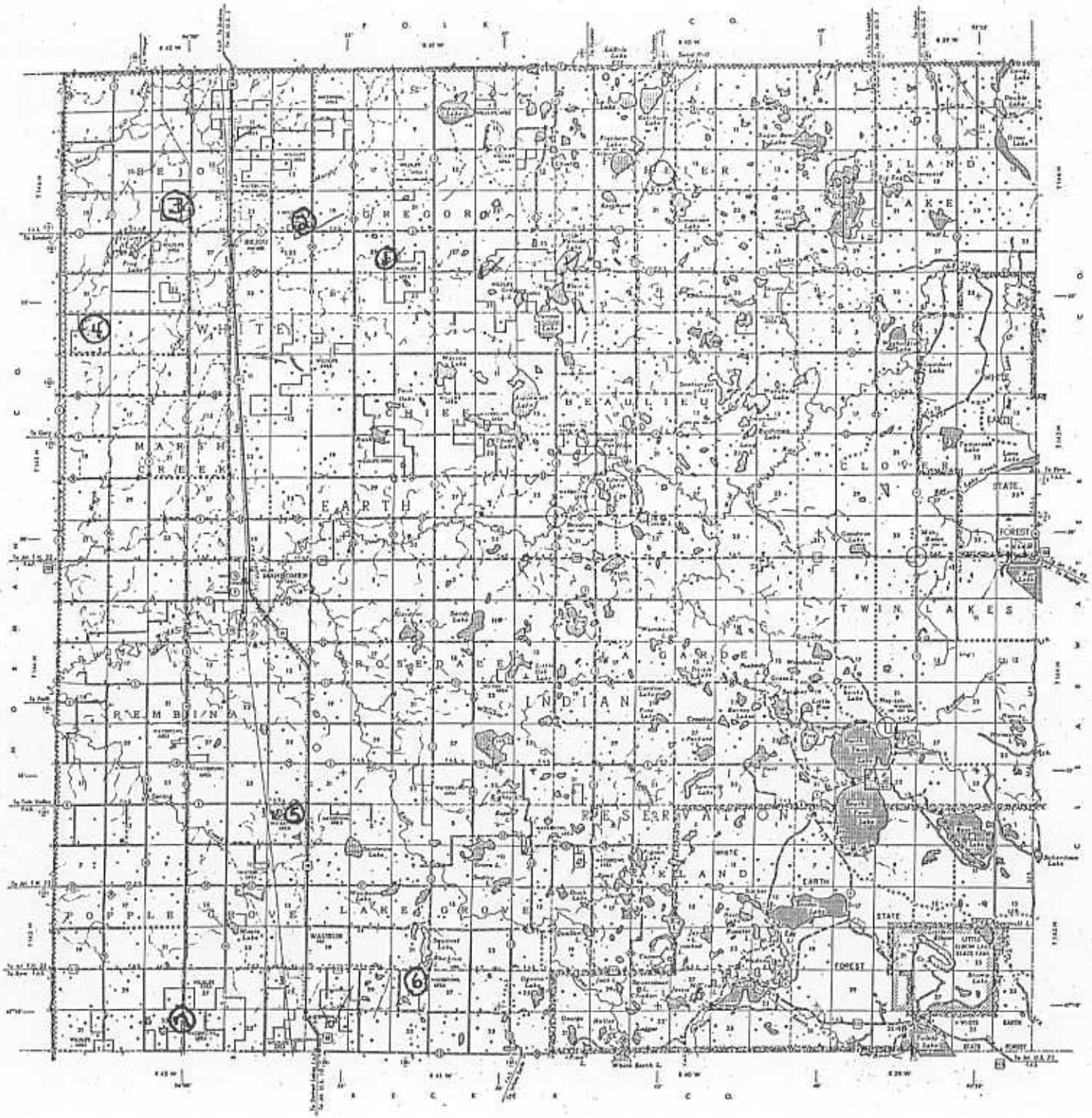
SCALE OF STATUTE MILES

SEE PAGE 12
FOR LEGEND

Figure A8. Mahnomen County. 1. T146 R41 T29 WMA, 24 June, (B). 2. T146 R42 SE1/4 24 WMA, 24 June (B). 3. T146 R42 NE1/4 21, 24 June, (B). 4. T145 R42 NE1/4 6, 24 June, (B). 5. T143, R42, NW1/4 1 WPA, 24 June, (B). 6. T143 R41 NE1/4 28, 24 June, (B). 7. T143 R42 S33/34, 25 June, (B).



GENERAL HIGHWAY MAP

MAHNOMEN COUNTY MINNESOTA

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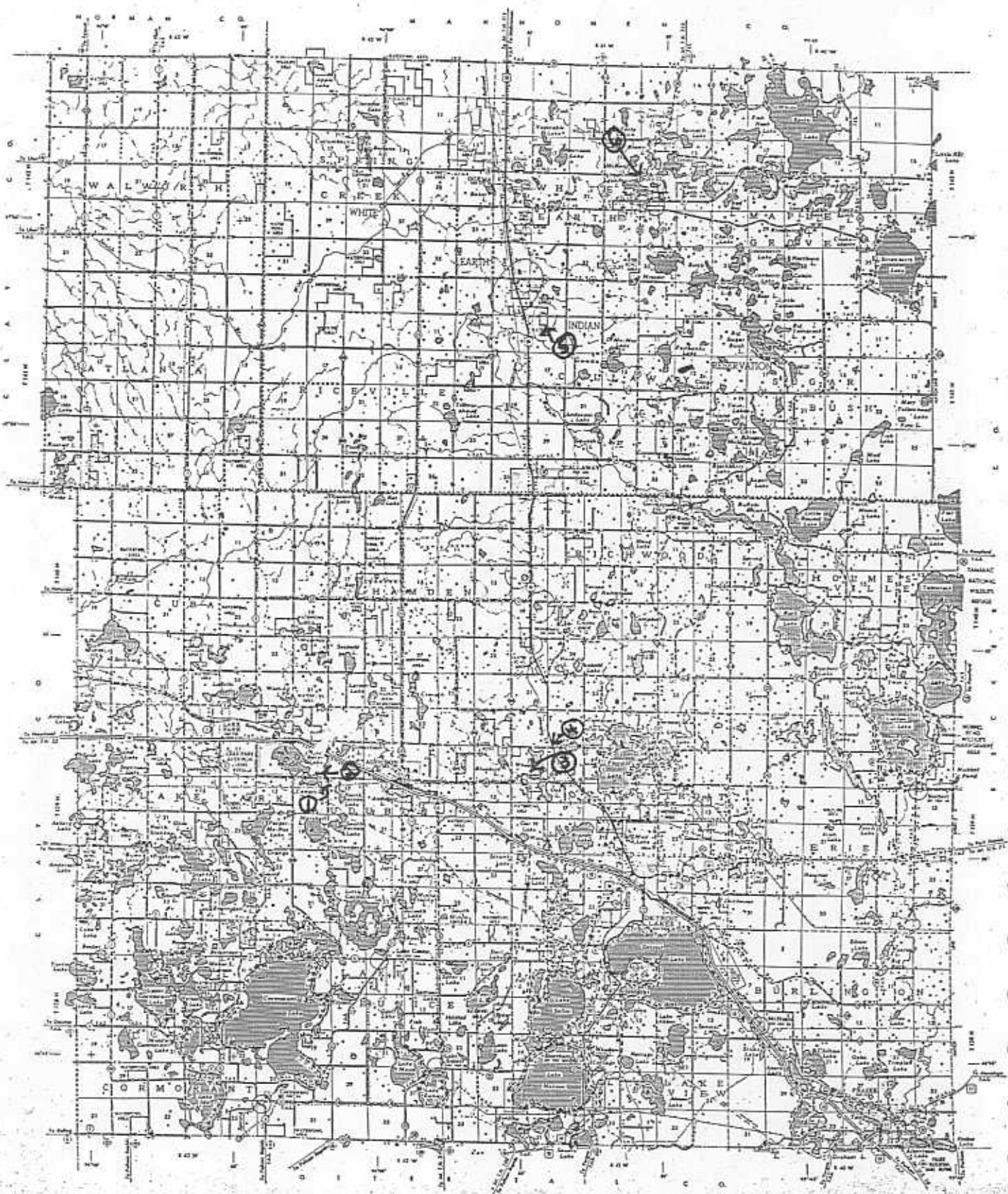
SCALE OF STATUTE MILES

SEE PAGE 12 FOR LEGEND

Figure A9. Becker County. 1. Canary Lake, 25 June, (B). 2. T139 R42 SE1/4 7, 25 June, (B). 3. T139 R41 S7, 25 June, (B). 4. T139 R41 Sw1/4 5, 25 June, 2 BT, (B). 5. T141 R41 NW1/4 8 WPA, 25 June, (B). 6. T142 R41 NW1/4 23 WPA, 25 June, (B).



GENERAL HIGHWAY MAP

BECKER COUNTY MINNESOTA

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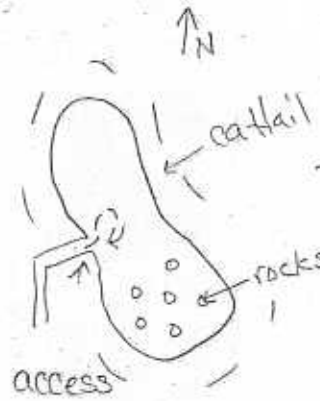
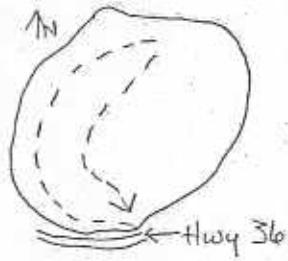
WEST PART

APPENDIX B. Hand-drawn maps of partially canoed wetlands.
= canoe route.

Florian WMA

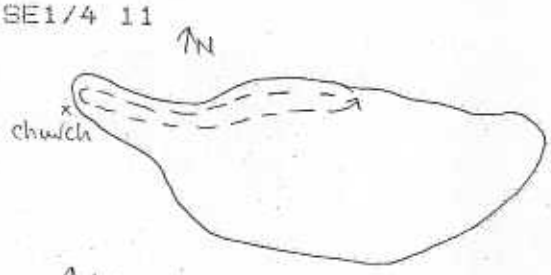


Upper Rice Lake



Dahl Lake

T147 R43 SE1/4 11



Oak Lake