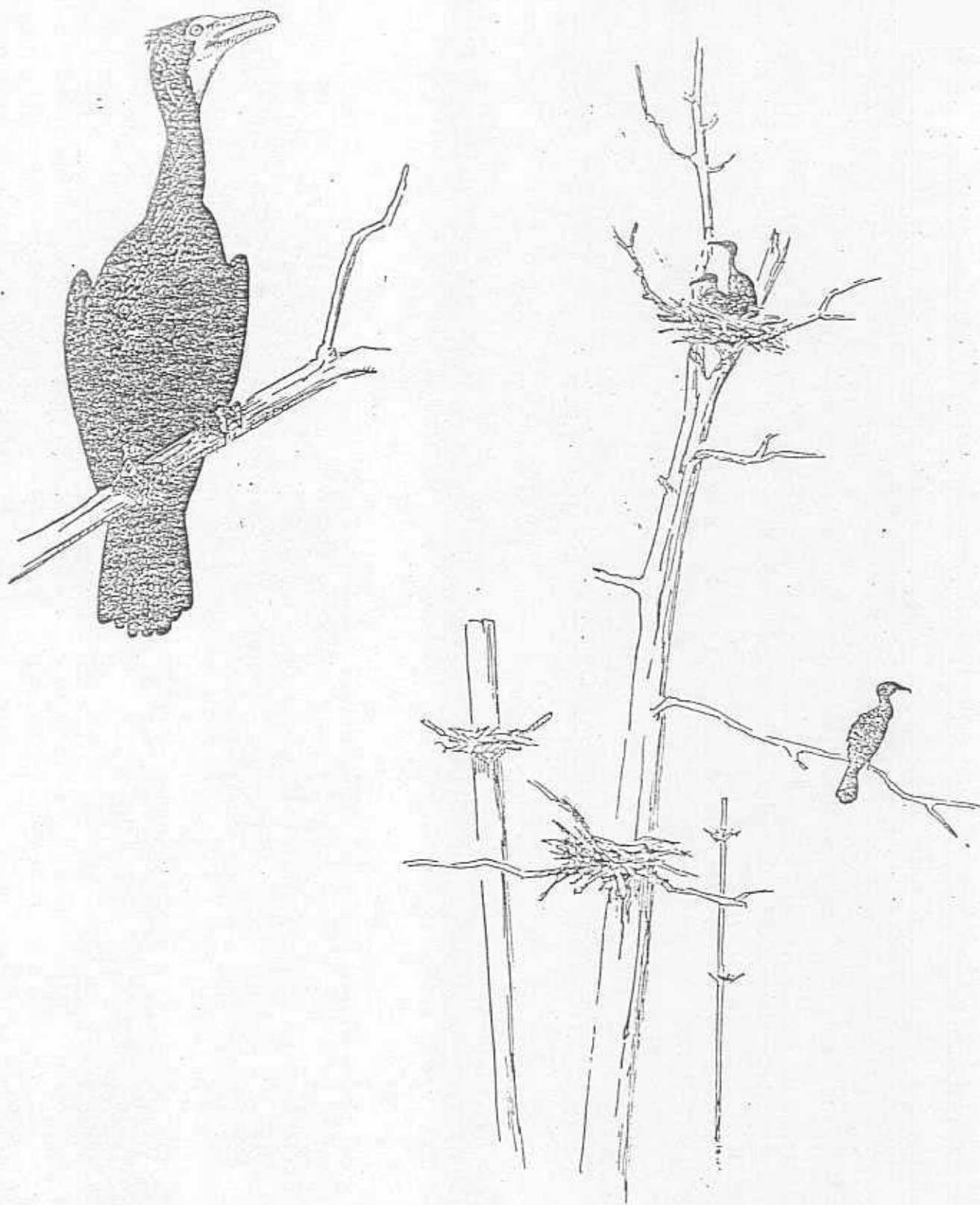


SOME NOTES ON A
DOUBLE-CRESTED CORMORANT
ROOKERY IN MEEKER COUNTY MINNESOTA

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The Double-Crested Cormorant (Phalacrocorax auritus)

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IDENTIFYING FEATURES AND
DISTRIBUTION OF THE DOUBLE-CRESTED CORMORANT

Cormorants belong to the order Pelecaniformes which also includes pelicans, frigate birds, gannets and tropic birds. The cormorant family (Phalacrocoracidae) includes about 30 species most of which are found along coastal areas.

Cormorants are large, aquatic, fish-eating birds. Adults range in length from 48 to 102 centimeters. These birds have long necks and slender, strongly hooked beaks. Immature birds tend to be browner and duller than the dark-colored adults. The short legs are set far back. All four toes are webbed. Cormorants are clumsy on land but are very adept at swimming and diving.

Cormorants may nest on the ground or in dead trees. The nest is a rather large bulky structure constructed from sticks and herbaceous vegetation. The nest is often located in precarious situations in dead trees. The usual clutch is two to four eggs. Both parents take part in the incubation of eggs.

The double-crested cormorant (Phalacrocorax auritus) is the most widespread species of cormorant in North America. Adults are black with orange faces and bills. The twin crest is difficult to see. Adults average about 69 centimeters in length with a wingspan of 127 centimeters.

Double-crested cormorants are highly colonial in their nesting habits. They may nest in mixed colonies with herons and pelicans.

The double-crested cormorant breeds along coastal areas and inland lakes from the Gulf of St. Lawrence westward to Nebraska and northward to Central Saskatchewan and northern Ontario (Robbins, Bruun, Zim, and Singer 1966). It winters along the Atlantic coast from New Jersey south to Florida and along the Gulf coast.

Prior to 1950, double-crested cormorants bred throughout Minnesota (Green and Janssen 1975). To date, breeding cormorants primarily occur in the west central and northwestern part of the state. According to Grewe (1979) eleven active

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cormorant rookeries exist in Minnesota. Active rookeries occur in Meeker, Marshall, Pope, and Lac qui Parle Counties.

Several factors can be attributed to the decline of cormorant populations in Minnesota. Development and associated disturbance has caused some rookeries to be abandoned. Roberts (1932) spoke of a cormorant rookery that existed in upper Lake Minnetonka near Minneapolis in 1925. By 1930 this rookery had very few nesting birds. The urbanization of this area was probably the major factor in the abandonment of the rookery.

The cormorant often nests in dead trees occurring in shallow lakes and marshes and river bottomlands. Flood control projects such as dikes and levees have reduced the amount of flooded timber. This in turn means less available nesting habitat for cormorants.

Shooting has also contributed to declines in cormorant populations. According to Roberts (1932) the Minnesota Game and Fish Department at one time actually issued permits allowing persons to kill cormorants. Permits were primarily granted to commercial and sport fishermen who felt that the cormorant was taking a considerable amount of valuable game fish.

During the biennial period ending June 30, 1922, 1200 cormorants were killed in Minnesota. By 1925 only about 1000 cormorants existed in the state (Roberts 1932). Much of the shooting of cormorants took place in southern Minnesota. Today repeated studies have shown that cormorants primarily take undesirable rough fish which compete with game fish.

Pesticide poisoning is another factor contributing to declining cormorant populations. The fish-eating habit of the cormorant makes it particularly susceptible to the accumulation of pesticides such as DDT in its tissues. Nonbiodegradable pesticides such as DDT are transferred through the aquatic food chain passing from fish to cormorant. DDT in turn interferes with hormones that control eggshell

deposition around the embryo. The bird thus lays thin-shelled eggs which easily break due to the weight of an incubating bird. According to Brynildson (1979), DDT was a factor in contributing to declines of cormorant numbers in Minnesota and Wisconsin. Fortunately the use of DDT in the United States was banned in 1972.

OBJECTIVES OF THIS REPORT

The major objectives of this report include;

1. To document the existence of a relatively new rookery of double crested cormorants in Minnesota.
2. To evaluate the use of artificial nest platforms by cormorants.
3. To report on banding activities at the Mud Lake rookery.

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LOCATION AND DESCRIPTION
OF THE STUDY AREA

The Mud Lake cormorant rookery is located in Meeker County Minnesota, one and one-half miles east of the city of Dassel (Figure 1, 2, 3). Mud Lake is situated on the east side of section 24 and west side of section 25 in Dassel Township (T119 N and R29 W). The rookery can be observed by traveling one mile east of Dassel on U.S. Highway 12 and one-half mile north on Meeker County Road 205.

Mud Lake encompasses an open water surface area of approximately 44 hectares (107 acres). The maximum depth of the lake is about 1.2 meters. A zone of vegetation dominated by reed canary grass (Phalaris arundinacea) and common cattail (Typha latifolia) averaging about 50 meters in width surrounds most of the lake. Dead trees occur in the central and north areas of the lake. The lake receives water from a stream inlet on the west side and is drained by a ditch outlet on the east side.

The upland areas surrounding Mud Lake consist of cash crop on the east side, pasture on the south side, forest (mostly American elm - Ulmus Americanus) on the west side, and a county gravel road on the north side.

HISTORY OF MUD LAKE

According to Vold (1980) Mud Lake was drained in 1915 when Judicial Ditch Number 3 was completed. Haapala (1980) indicated that the drainage project was partially successful in that the area remained too wet for the cultivation of crops. The area therefore was used mainly for pasturing cattle.

In the fall of 1970 a water control structure was installed at the outlet of the drainage ditch on the east side of the lake. This flooded the area with approximately 44 hectares (107 acres) of water. The project was a cooperative

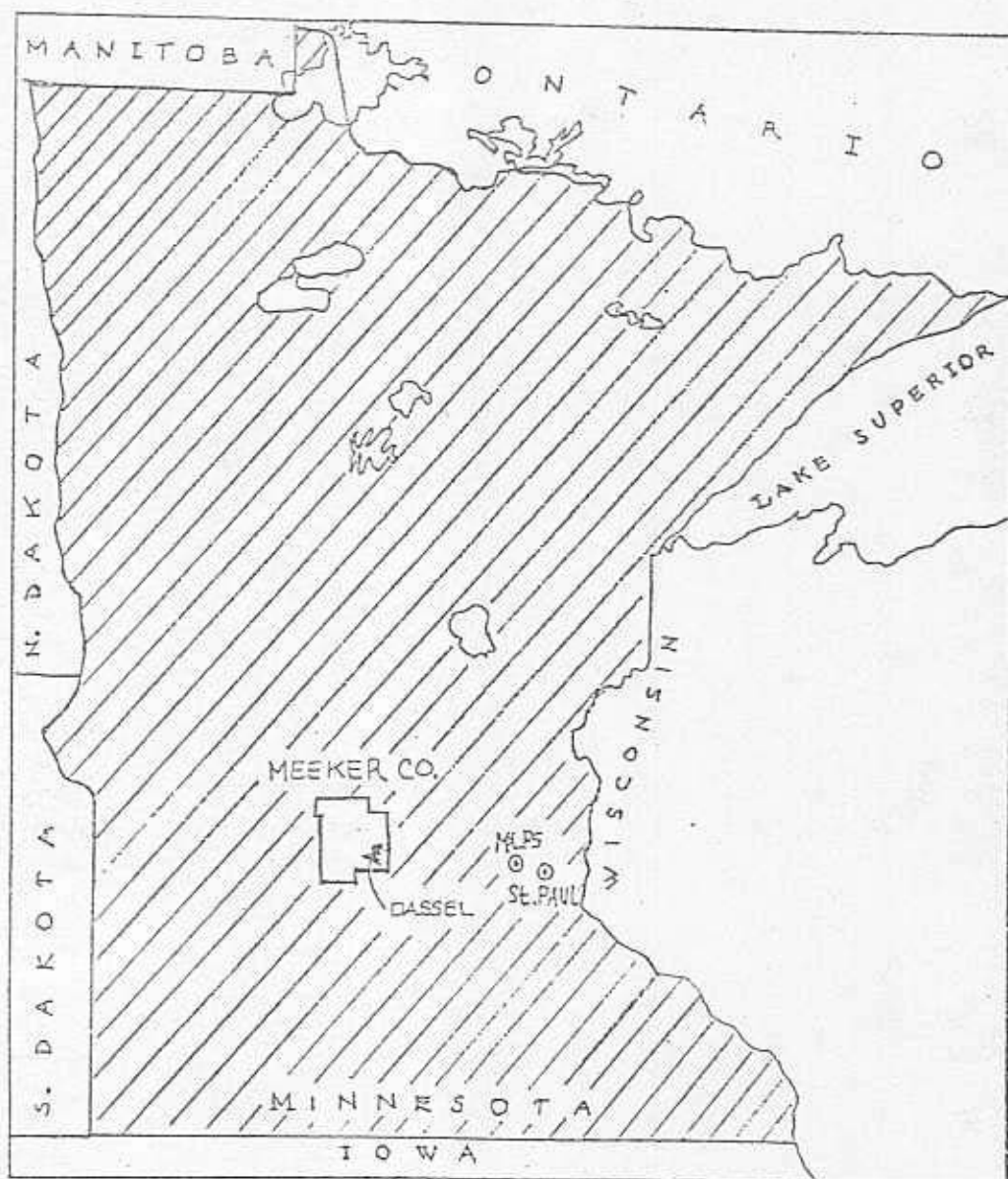


FIGURE 1. Location of Meeker County Minnesota

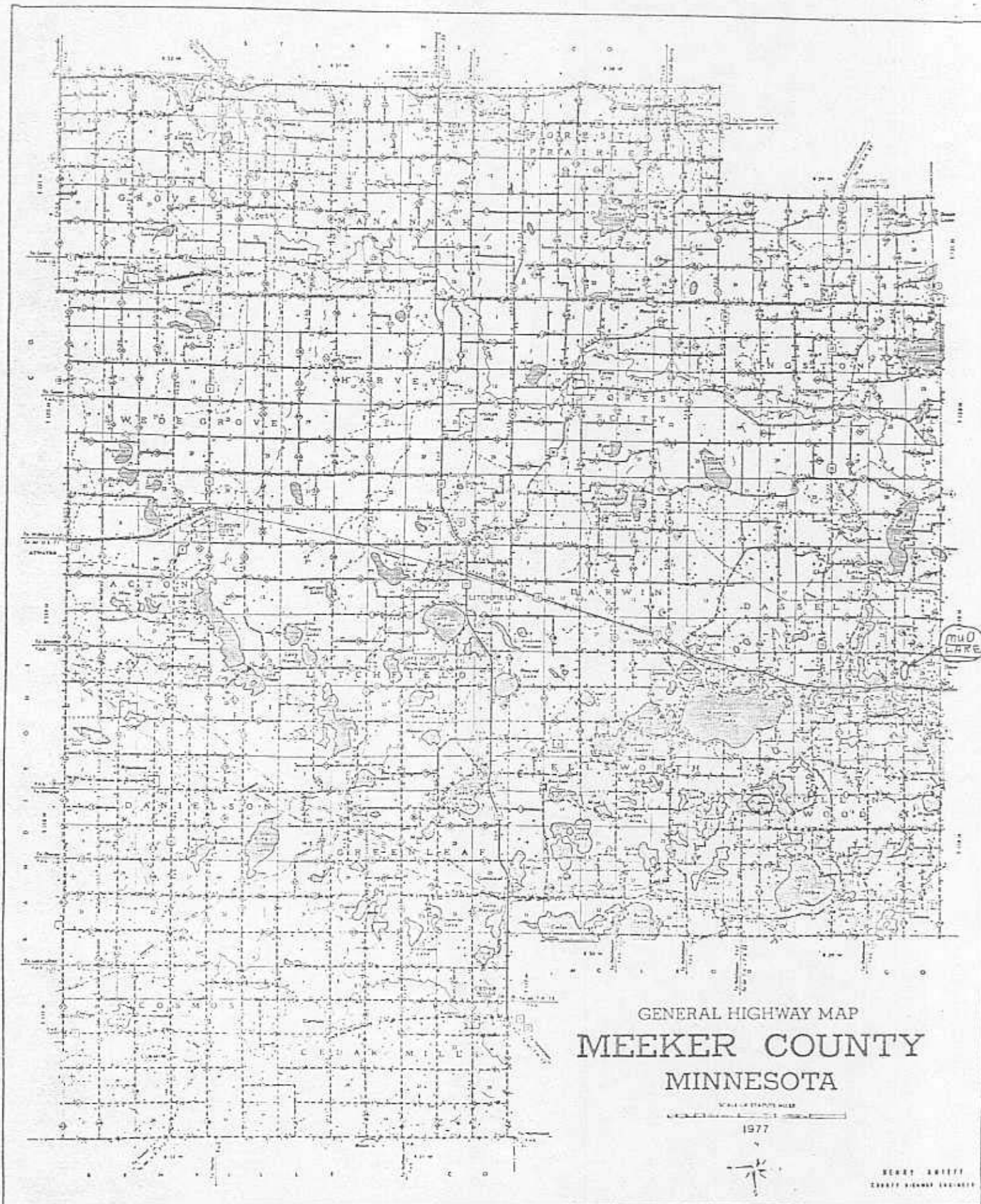


FIGURE 2. Location of Mud Lake in Meeker County, Minnesota

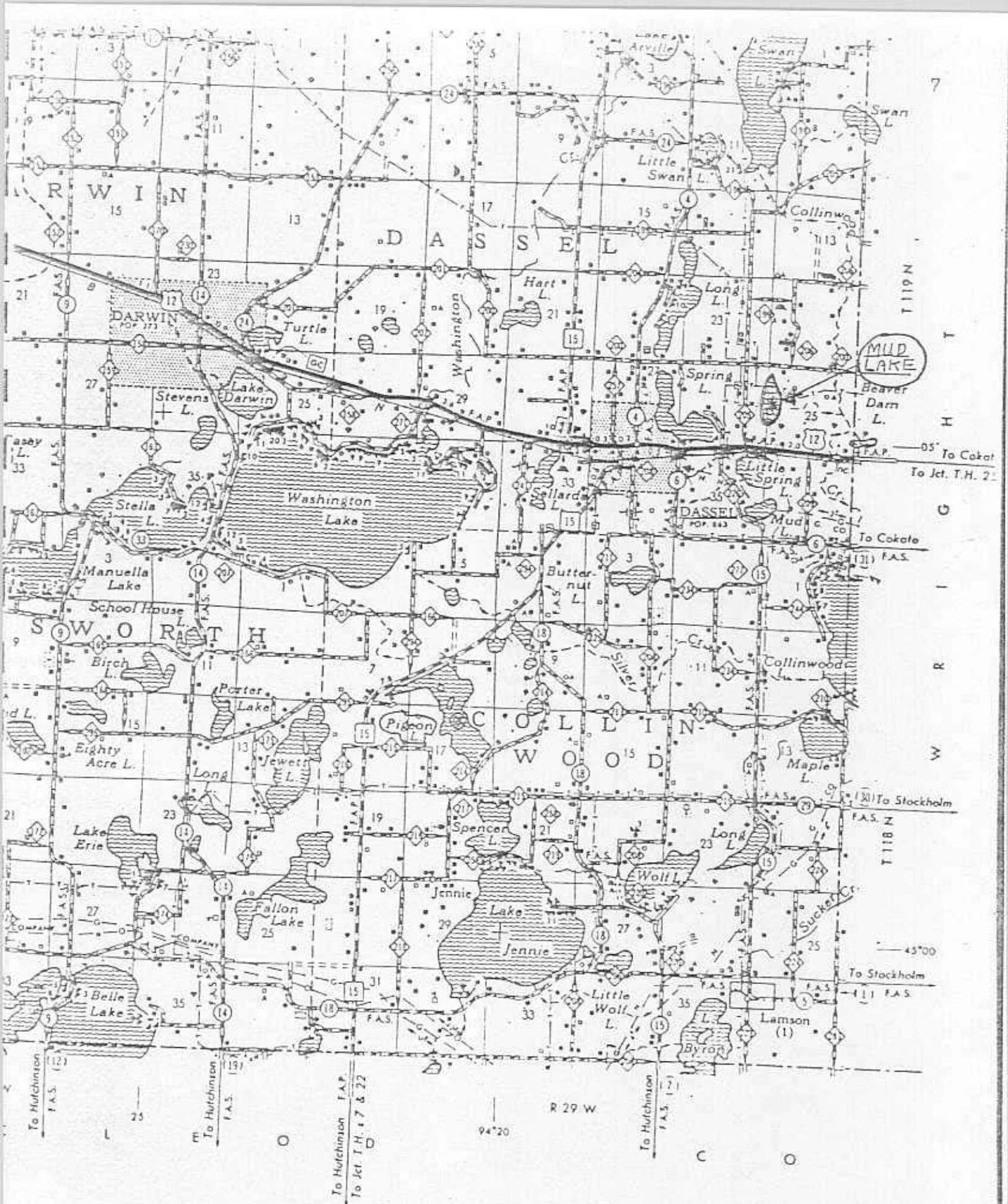


FIGURE 3. Location of Mud Lake in Dassel Township, Minnesota

effort between the Agricultural Stabilization Conservation Service, Minnesota Department of Natural Resources, Dassel Red Rooster Club, and Landowners adjacent to Mud Lake.

The restoration of the lake killed large trees which had become established in the exposed lake bottom. The dead trees in turn attracted nesting cormorants. No one seems to know exactly what year the cormorant rookery became established. I first became aware of the rookery in 1974. The rookery was well established at that time. I assume that the cormorants began nesting at Mud Lake in 1972 or 1973.

USE OF ARTIFICIAL NEST STRUCTURES BY CORMORANTS

When cormorants first began nesting at Mud Lake numerous dead trees provided many nest sites. However, during the last few years high winds, shifting ice, and gradual decomposition of tree trunks resulted in the toppling of many dead trees. In August of 1978 high winds toppled several trees that held at least 20 nests. The result is that fewer suitable nest sites remain in the main part of the rookery.

Competition for nest sites is evident by the fact that great blue herons (Ardea herodias) and cormorants will utilize downed trees for nest sites (Figure 4 and 5). Many of these nests on downed trees lie a few inches above the water surface. Presumably some eggs and nestlings could be destroyed by a sudden raising of the lake level due to heavy rains.

Artificial platforms have been used in Minnesota and Wisconsin for a number of years to increase available nest sites for cormorants in active rookeries (Minnesota Volunteer 1977 and Brynildson 1979).

Since 1973 over 200 platforms have been erected in five rookeries in Wisconsin. Use of artificial platforms by cormorants is high. In 1978, 35 of 45 (78%) platforms held active cormorant nests at the Cat Island rookery in Green Bay, Wisconsin

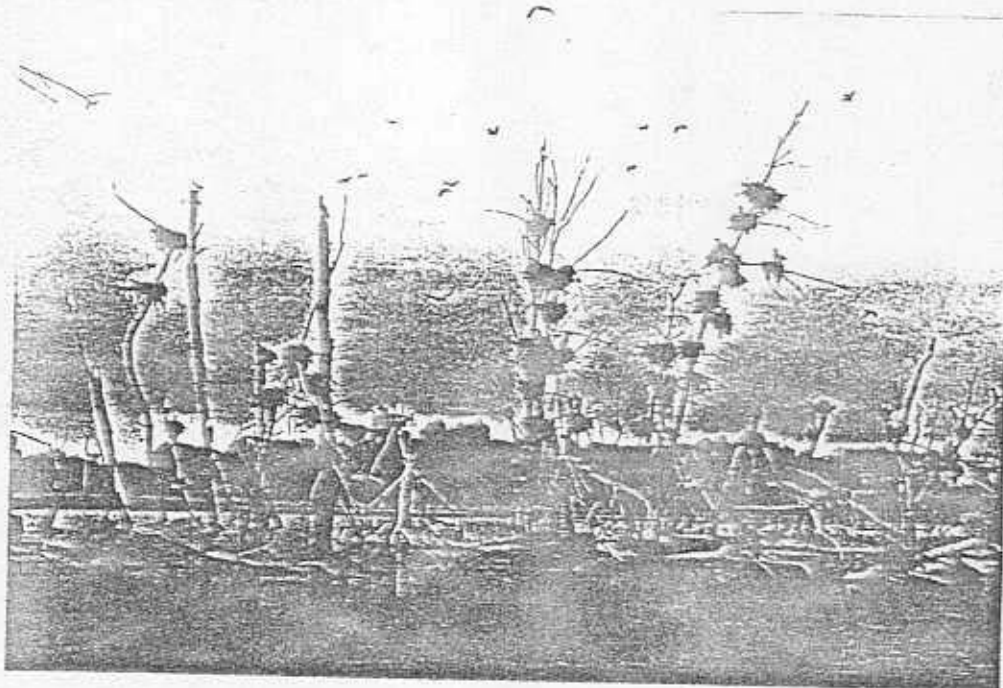


FIGURE 4. Mud Lake Rookery, June 1980. Note cormorants nesting in downed trees.

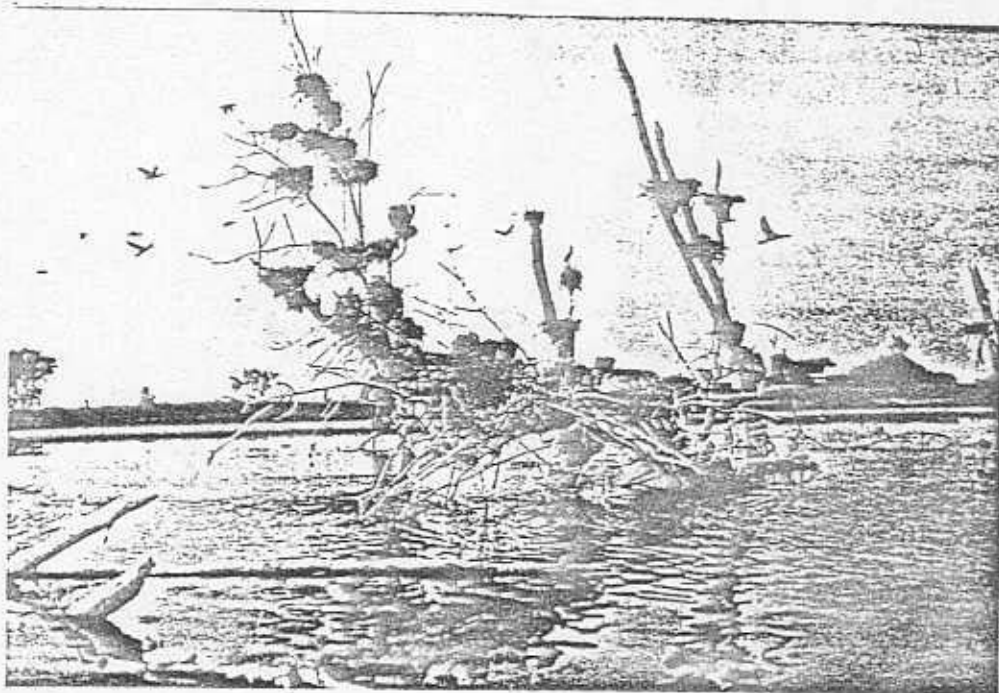


FIGURE 5. Mud Lake Rookery, June 1980. Note the three nestling Great Blue Herons in nest located in toppled tree.

(Crehore 1979). In May 1980 I observed that 25 of 26 (96%) artificial platforms held active cormorant nests at Fish Lake Wildlife Area in Burnett County, Wisconsin (Figure 6).

In 1979 artificial nest structures were installed for breeding cormorants by the U.S. Fish and Wildlife Service at Pool No. 13 on the Mississippi River near Clinton, Iowa (Stone 1979).

In August and December of 1977 two artificial platforms were erected at the Mud Lake rookery. One platform consisted of a 15 centimeter x 0.5 meter x 0.5 meter wooden box fastened to the top of a 3 meter pole. The pole was driven into the lake bottom. The other nest structure consisted of a bushel basket that was fastened to a large tree at a height of about 3 meters. Both nest structures contained active cormorant nests in 1978.

In August of 1978 three more platforms were installed. These platforms consisted of two 2.5 centimeter x 10 centimeter x 1 meter boards nailed to tree trunks in a "V" pattern. Two additional boards were nailed across the top of the boards forming the "V" (Figure 7 and 8). The top board closest to the tree trunk serves as a support for the nest. The outer board provides a flat perch for young and adults.

All five platforms contained active nests in 1979. The bushel basket nest structure was occupied by herons and the other four structures were occupied by cormorants.

Twenty six additional platforms were erected in December of 1979. Most of the platforms were generally similar to the one depicted in Figure 7. A few "peach crates" were also used as nest structures (Figure 9). With the assistance of three persons, the structures were installed in about one and one-half hours. All structures were nailed to dead trees. Most of the platforms were installed at heights less than 2 meters in the perimeter of the rookery. This was done to

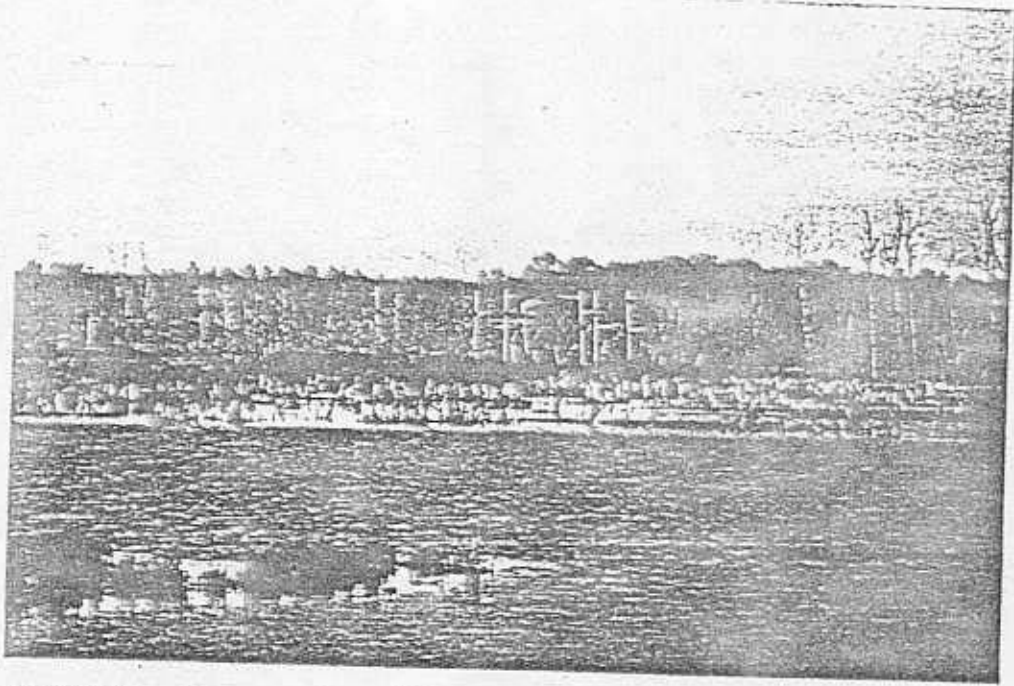


FIGURE 6. Cormorants utilizing artificial nest structures at Fish Lake Wildlife Area, Burnett County, WI., June 1980.

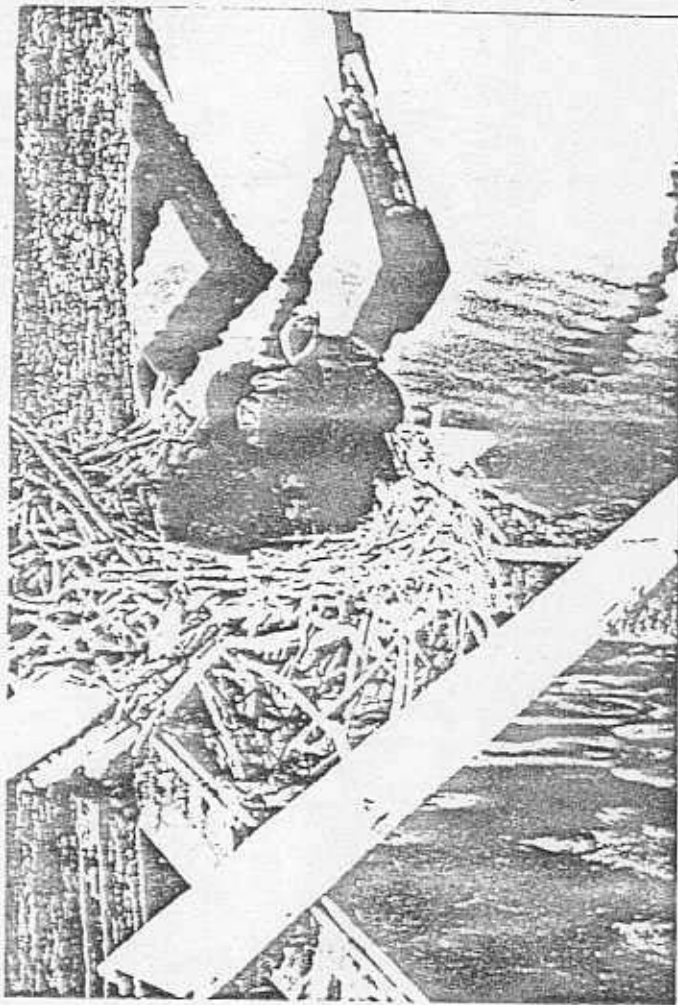


FIGURE 7. Nestling cormorants in nest built on artificial nest structure at the Mud Lake Rookery, June 1980.

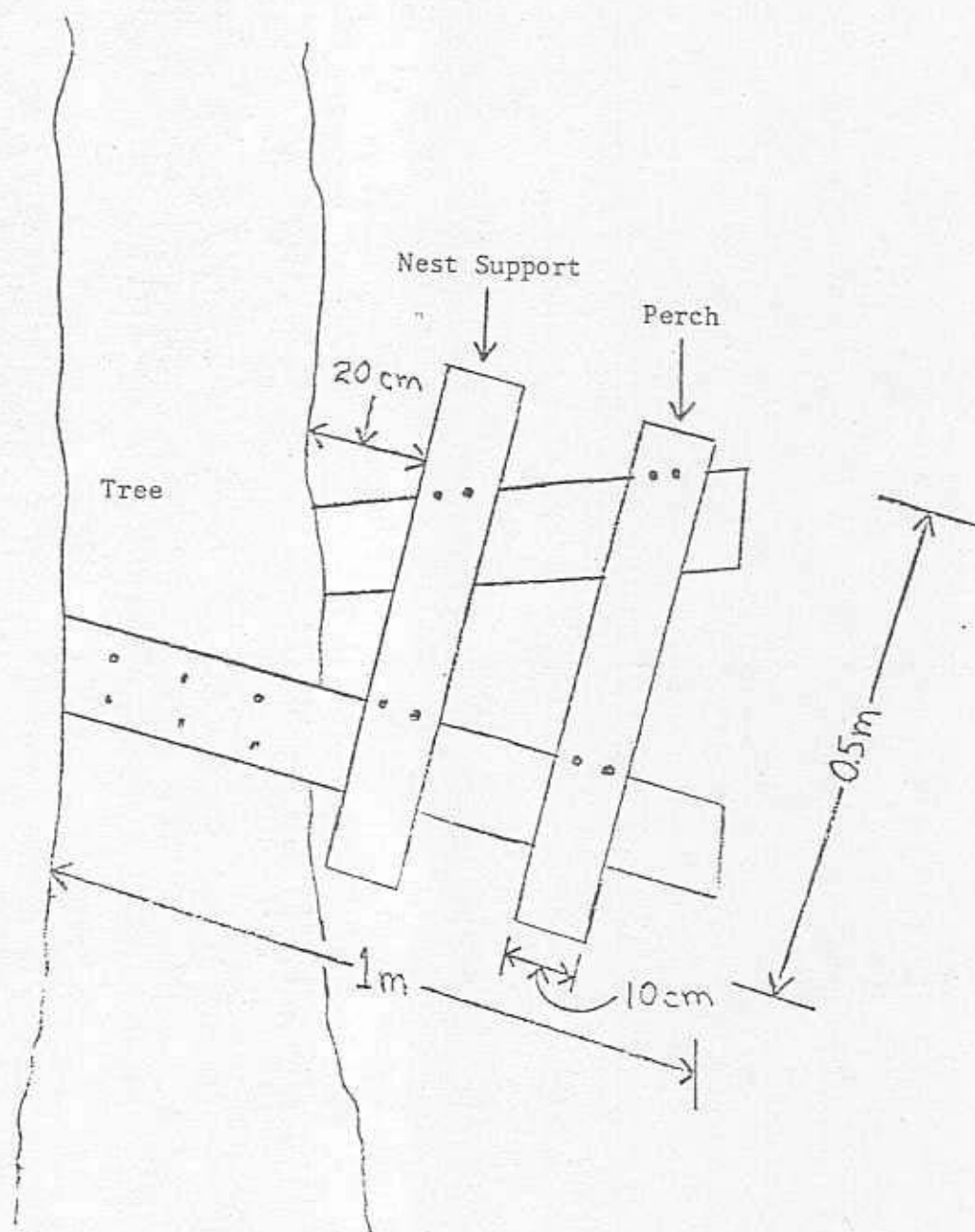


FIGURE 8. Construction plan for artificial nest structures built at the Mud Lake Rookery.

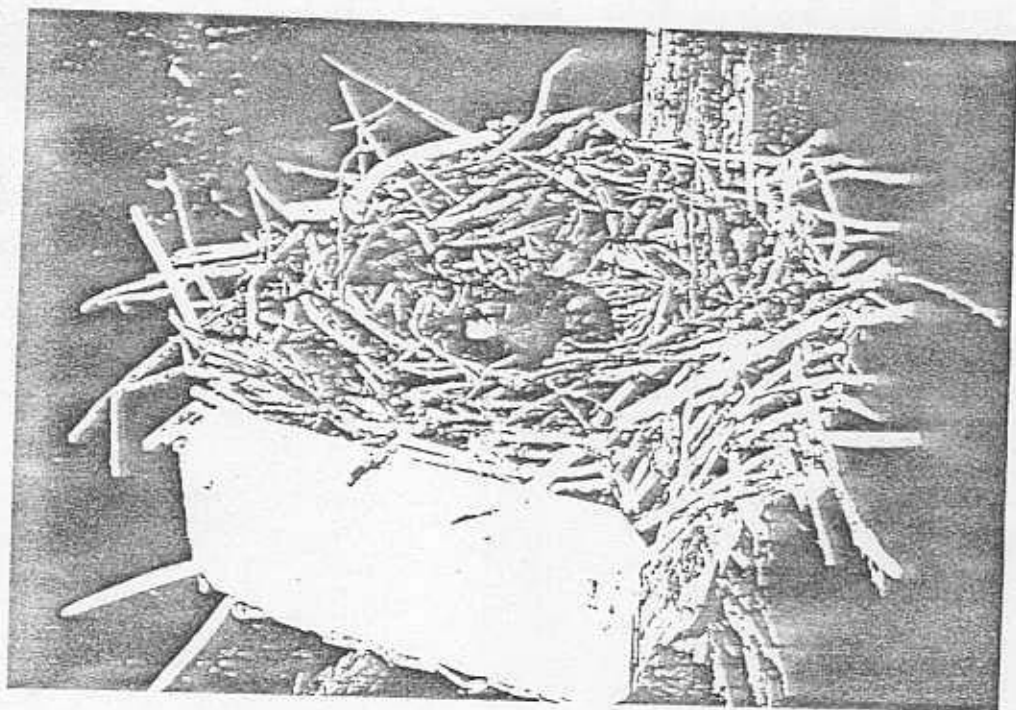


FIGURE 9. Cormorant nestlings in artificial nest structure at the Mud Lake Rookery, June 1980.

facilitate canoe access to the nest structure for the banding of young cormorants.

We found that installing nest structures in winter was far better than summer installation for the following reasons:

1. Installing nest structures in summer results in excessive disturbance of cormorants and herons. In 1978 and 1979 four structures were installed in August. Most birds were done breeding. Only a couple of nests contained young. However the human activity and noise associated with the installing of the structures caused the birds to unnecessarily circle the lake and rookery.
2. The nest structures were easier to nail together when standing on ice or snow as compared to standing in the bottom of a canoe.
3. It was relatively easy to transport building materials over ice with a toboggan. We found it difficult to maneuver and anchor a small load of materials with a canoe.

In June 1980, 28 of the 31 (90%) artificial nest structures held active cormorant nests. Of the three structures not used, one was inaccessible to cormorants because its supporting tree had toppled over. The use of artificial nest structures is summarized in Table 1.

TABLE 1. Use of artificial nest structures by cormorants and herons.

Year	Artificial Nest Structures Available	Number Containing Active Nests		
		Cormorants	Herons	Percent Use
1978	2	2	-	100
1979	5	4	1	100
1980	31	28	-	90

Thus far the project seems to indicate that cormorants will utilize a variety of artificial nest structures. Generally it seems that any flat board platform large enough (at least 0.5 meters x 0.5 meters) to accommodate a cormorant nest will be utilized by breeding birds in an active rookery.

Thirty of the 31 nest structures that were installed were simply nailed to dead trees. An effort was made to utilize the most solid existing trees. However, since dead trees occasionally topple over, it will be necessary to visit the rookery each winter and repair or replace any damaged nest structures.

The Wisconsin Department of Natural Resources utilizes 10 meter treated telephone poles (Crehore 1979). The poles are anchored to the lake bottom in winter. Three nest structures are fastened to each pole (Figure 6). This results in more permanent artificial nest sites. Ideally, this is what should eventually be done at Mud Lake. However, this type of project would be quite expensive in terms of the cost of the telephone poles and heavy equipment (tractors or catipillars) that would be needed.

BANDING ACTIVITIES

For the past three years, nestling cormorants have been banded with size 8 U.S. Fish and Wildlife Service bands. A major objective in banding cormorants is to gain some information on the dispersal of young birds. It is not known whether or not cormorants hatched at the Mud Lake rookery return to breed at Mud Lake or take up residence at rookeries in other parts of the state.

All banding of cormorants was done with the use of a canoe. Only birds in nests less than 2 meters above the water surface were banded. Other nests were too high to reach while standing in the canoe. Trees were not climbed to reach nests. Very few herons were banded. Most of the herons nested toward the top of large trees which made their nests inaccessible.

A problem encountered during banding involves flightless young cormorants jumping out of nests and into the water. During the 1978 and 1979 banding trips, large nestling cormorants jumped out of several nests. However, some young cormorants that jumped out of nests were observed crawling out of the water up onto downed trees. It is assumed that the adult cormorants continued to feed these young.

The 1980 banding trip was conducted two and three weeks earlier than the 1979 and 1978 trips. A number of nestling cormorants could not be banded because they were too small. However, not a single young cormorant was observed jumping out of a nest. The bandable birds were smaller and less motile than the nestlings encountered in 1978 and 1979. During the 1980 banding trip more nestlings were banded because we could easily maneuver the canoe throughout the rookery without fear of young birds jumping out of the nests. In 1978 and 1979 only nestlings on the perimeter of the rookery were banded.

The banding operation is carried out as quickly as possible to minimize disturbance to adult cormorants. The operation usually takes about one hour with two people banding cormorants and one person maneuvering the canoe.

The adult cormorants settle down in the south end of the lake while we are in the rookery. Most of the adults return to the rookery within a few minutes after we leave the rookery. Numbers of cormorants and herons banded are summarized in Table 2.

TABLE 2. Cormorants and herons banded at the Mud Lake rookery.

Date	Birds Banded		Total
	Cormorants	Herons	
July 6, 1978	13	-	13
June 30, 1979	33	3	36
June 14, 1980	74	-	74
	<u>120</u>	<u>3</u>	<u>123</u>

Banding data from the United States and Canada reveals that recovery rates for double-crested cormorants are relatively high. Houston (1971) reports that the double-crested cormorant has yielded the highest recovery rate of any nongame bird banded in Saskatchewan. Of 4838 birds banded in Saskatchewan from 1923 through 1969, 688 or 14.3% were recovered.

The U.S. Fish and Wildlife Service (1974-1980) reports that of 4906 double-crested cormorants banded from 1968 through 1974, 296 or 6% have been recovered. Most recovered cormorants are shot during migration or are recovered on wintering grounds by shooting or entanglement in commercial fishing nets (Houston 1971).

To date only one cormorant has been recovered from the birds banded at the Mud Lake rookery. The bird was recovered in November 1979. The person turning in the recovery reported no other information. As more artificial platforms are installed and banding operations improve more cormorants will be banded which should increase the potential for recoveries.

POPULATIONS

A total of 212 active nests (194 cormorant and 16 heron nests) were counted in 1979. In 1980, 308 active nests (273 cormorant and 35 heron nests) were observed.

The data is too limited to evaluate whether or not the breeding population of the rookery has been increasing or decreasing since it was first established. Exact counts of active nests were not made prior to 1979. However it is estimated that the rookery has held at least 200 active nests each year since I began observing the rookery in 1974.

The increase in the number of active nests from 1979 to 1980 may have been due to two factors. First of all an additional 23 artificial platforms were being utilized. Secondly, 48 new nests were established on the west side of the lake in American elm trees that apparently had died from Dutch elm disease. None of the elm trees occur in water. Hopefully additional cormorants and herons will utilize

other existing elms on the west side of the lake as fewer nest sites become available in the center of the lake.

An average of three young cormorants occupied each active nest in June of 1979 and 1980. However, the number of young per nest ranged from one to five.

The population of young cormorant present in June of each year was estimated by tripling the number of active nests. Since cormorants are monogamous, the breeding population was estimated by doubling the number of active nests.

Productivity at the Mud Lake rookery seems to be quite high. Wolfson (1955) states that double-crested cormorant populations are characterized by high mortality and high productivity. According to Wolfson, mortality rates for inland-banded cormorants are 68% the first year, 30% the second year, and 24% thereafter. Cormorant populations at the Mud Lake rookery are summarized in Table 3. The high density of nests at Mud Lake is depicted in Figure 10, 11, 12, 13, and 14.

TABLE 3. Cormorant populations at the Mud Lake rookery in June of 1979 and 1980.

Year	Number of Active Nests	Number of Adults	Number of Young	Total Number of Birds
1979	194	388	582	970
1980	273	546	819	1365

FEEDING HABITS OF CORMORANTS

Detailed studies of food habits of cormorants were not made. However, general observations support other studies which indicate that cormorants primarily take rough fish. Carp (Cyprinus carpio) and bluegill (Lepomis macrochirus) were most commonly observed amongst the fish remains regurgitated by nestling cormorants at Mud Lake.

The bluegill is an important gamefish. However, overcrowding is common among bluegill populations. A dense bluegill population results in reduced growth rates

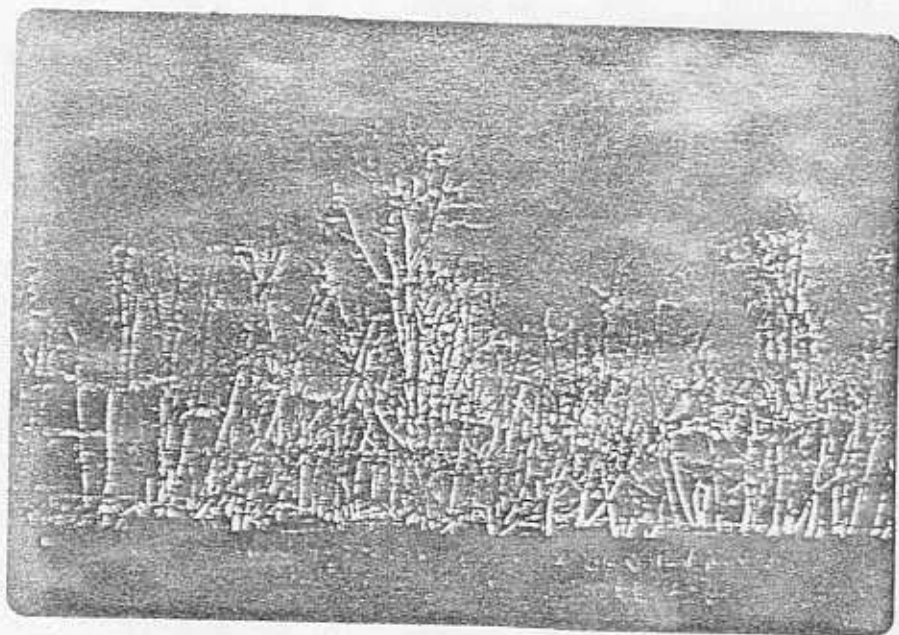


FIGURE 10. Mud Lake Rookery, August 1976.

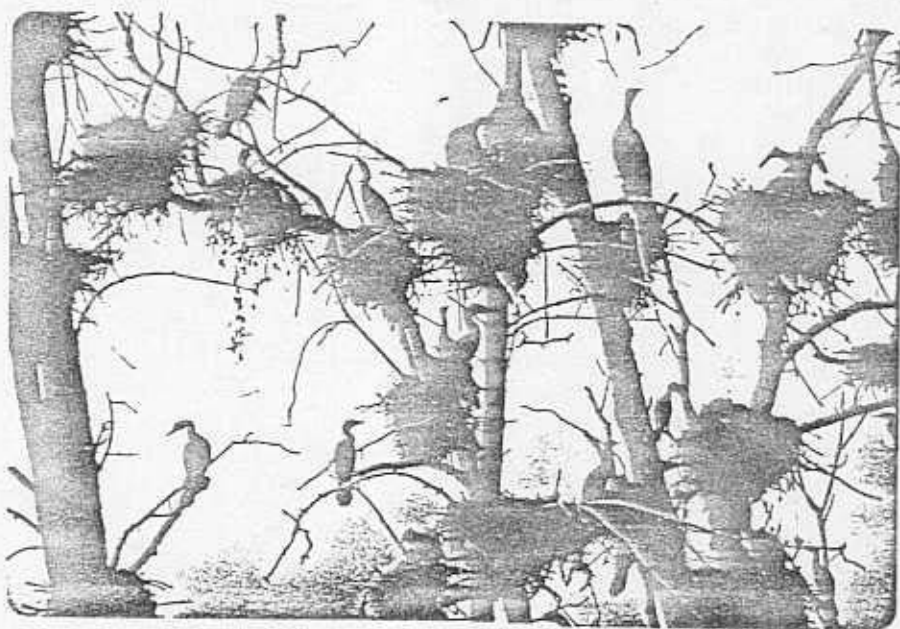


FIGURE 11. Mud Lake Rookery, June 1977.

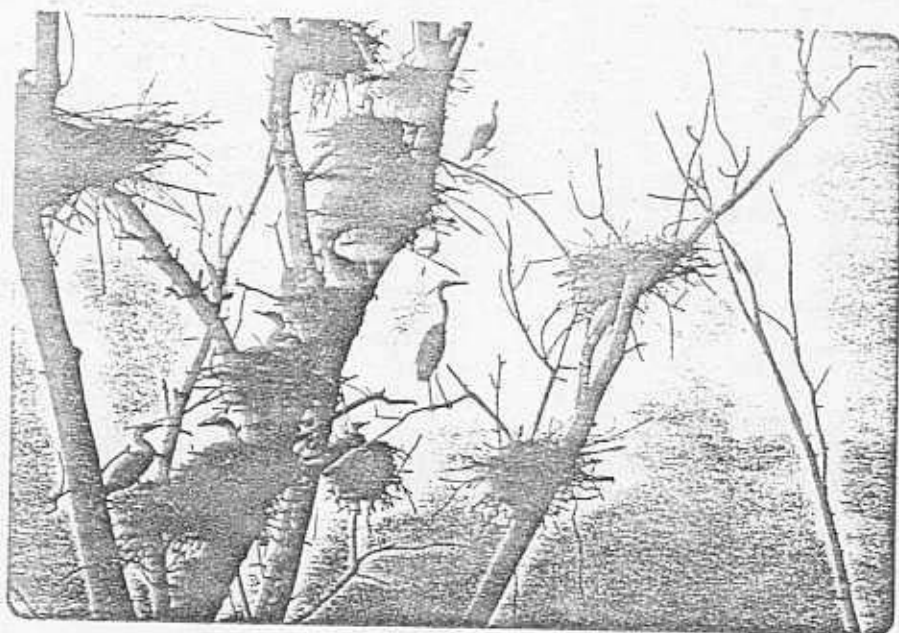


FIGURE 12. Mud Lake Rookery, August 1977.

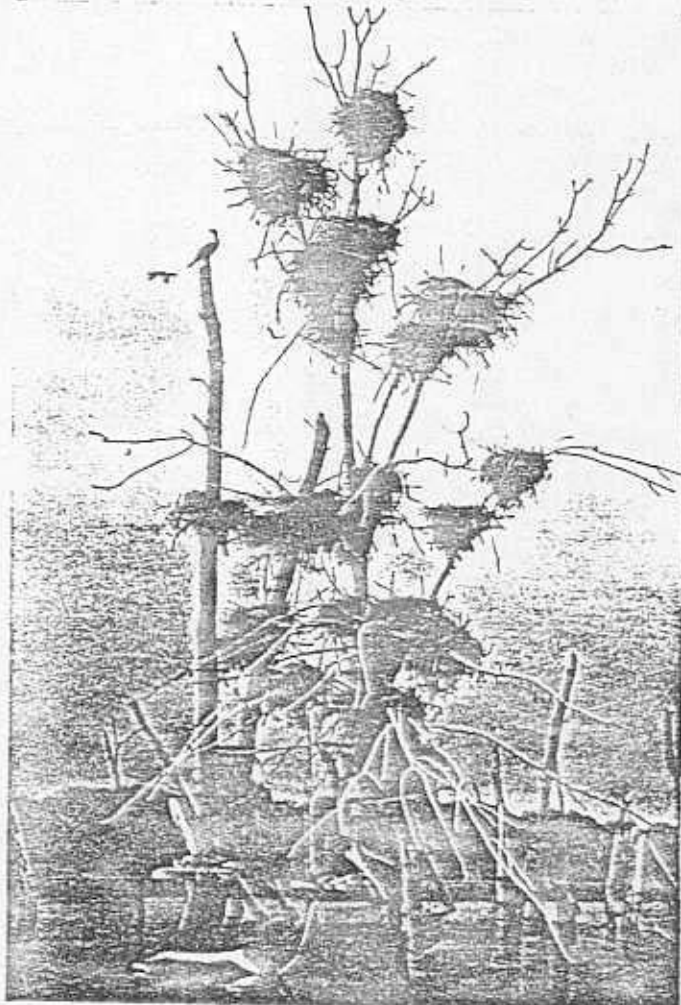


FIGURE 13. Mud Lake Rookery, June 1980. Three artificial nest structures are visible in photo. The tree in the center held 16 active nests of cormorants or herons.



FIGURE 14. Mud Lake Rookery, June 1980. Note the dead cormorant caught in the tree. The large tree in the background held 36 active nests of cormorants or herons. Some nests on the other side of this tree are not visible in the photo.

for individuals and therefore small sized fish. It is doubtful that the cormorant has any negative impact on gamefish populations in the Mud Lake area.

LIMITING FACTORS AFFECTING CORMORANT POPULATIONS AT THE MUD LAKE ROOKERY

Shooting

Occasionally cormorants are shot by hunters who mistake them for geese. No incidences of cormorants being shot and killed at Mud Lake have been documented. Landowners adjacent to Mud Lake have reported observing hunters stopping on U.S. Highway 12 and shooting at cormorants as they fly over.

The total impact of this is probably insignificant. The cormorants leave the rookery within a week after the waterfowl season opens.

Pesticides

The relationship between organochloride insecticides and eggshell thinning in fish-eating birds has been documented in many studies (Brynildson 1979). Several organochloride insecticides have been banned from use in the United States since 1972.

Pesticides do not appear to be a problem at Mud Lake rookery. No broken eggs, thin shelled eggs, or no-shelled eggs were observed in active nests at Mud Lake.

Disturbance of Cormorants During the Breeding Season

There appears to be no disturbance of cormorants from human activity (fishing or boating) during the breeding season. There currently is no public access on Mud lake for launching boats. Boaters must have permission from landowners to enter their property in order to gain access to the lake. This greatly restricts useage of the lake. Actually Mud Lake is a shallow marshy lake which is practically unsuitable for gamefish and sport fishing. The entire lake be-

comes colonized with submerged aquatic plants during the summer.

Available Nest Sites

The number of nest sites in the center of the lake has declined as trees have toppled over. However as previously noted, cormorants and herons began making use of dead elm trees on the west side of the lake in 1980. A number of large elm trees remained unused on the west side of the lake. Hopefully the birds will continue to shift to the west side of the lake as fewer trees remain in the center of the lake.

Additional artificial nest structures will be erected each year along with repairing and replacing existing structures. A few dead tree trunks exist in the north end of the lake. No cormorants or herons have been observed nesting there. A few nest structures will be erected at the north end in an attempt to encourage the use of that part of the lake by nesting birds.

There is no immediate concern for a serious shortage of nest sites unless the lake experiences a severe windstorm. The Agricultural Stabilization Conservation Service, Minnesota Department of Natural Resources, Dassel Red Rooster Club, and landowners might be contacted in the future concerning the possibility of financing a project involving the installation of nest structures supported by telephone poles.

Availability of Fish

Availability of adequate fish food for breeding cormorants does not appear to be a problem. In addition to numerous marshes, over 20 lakes occur within a five mile radius of Mud Lake.

Cormorants seem to be well dispersed for feeding. I have observed small groups of cormorants (4 or 5 birds) feeding on Spring Lake, Long Lake, Collinwood Lake, Sellards Lake, and Beaver Dam Lake.

Drainage

A limiting factor of far reaching impact involves the drainage of Mud Lake. This would certainly eliminate all of the aquatic life at Mud Lake. However since the installment of the water control structure at Mud Lake was funded by the ASCS, it is doubtful that the area could be legally drained. Also according to Henderson (1977), Mud Lake is a designated lake basin in Minnesota. This means it would be quite difficult for landowners to obtain a permit to drain such an area.

OBSERVATIONS OF OTHER
BIRD SPECIES AT MUD LAKE

In addition to double-crested cormorants and great blue herons, a number of other water birds have been observed during the breeding season at Mud Lake.

A pair of Canadian geese (Branta canadensis) were observed with a brood of several young in June 1978. Approximately 250 white pelicans (Pelecanus erythrorhynchos) were present on Mud Lake August 28, 1979 (Figure 15 and 16). A few American egrets (Casmerodius albus) are regularly observed each year at Mud Lake. Observations of other bird species is summarized in Table 4.

TABLE 4. Observations of other bird species at Mud Lake, 1974-1980

Common Name	Scientific Name
*Tree Swallow	<u>Iridoprocne bicolor</u>
*Redwinged Blackbird	<u>Agelaius phoeniceus</u>
*Yellow-headed Blackbird	<u>Xanthocephalus xanthocephalus</u>
Belted Kingfisher	<u>Megasceryle alcyon</u>
Black Tern	<u>Chlidonias nigra</u>
Green Heron	<u>Butorides virescens</u>
American Egret	<u>Casmerodius albus</u>
White Pelican	<u>Pelecanus erythrorhynchos</u>
American Coot	<u>Fulica americana</u>
Ruddy Duck	<u>Erismatura jamaicensis</u>

TABLE 4. Continued

*Blue-winged Teal

Anus discors

*Wood Duck

Aix sponsa

*Mallard

Anus platyrhynchos

*Canada Goose

Branta canadensis

*Known to have nested at Mud Lake. Nest and eggs or young were observed.

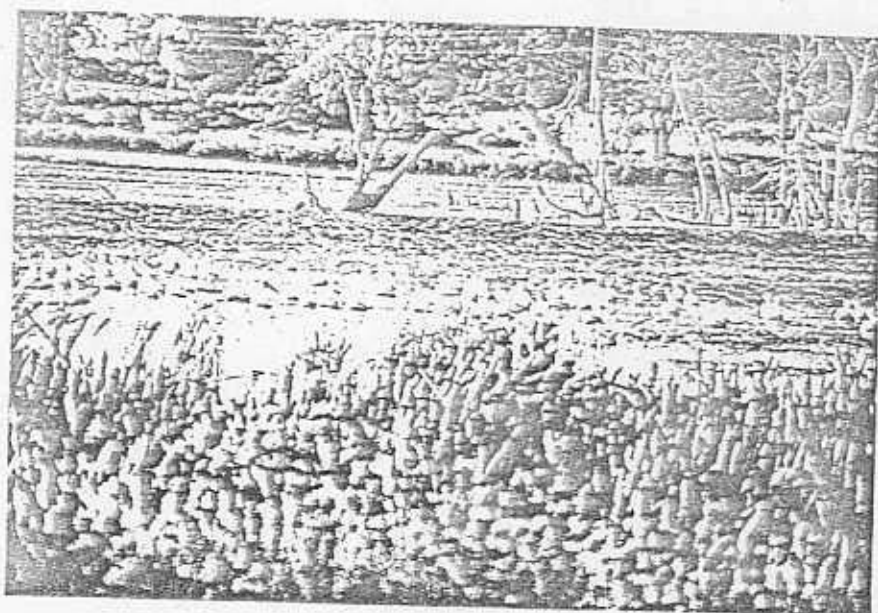


FIGURE 15. White Pelicans at Mud Lake, August 1979.

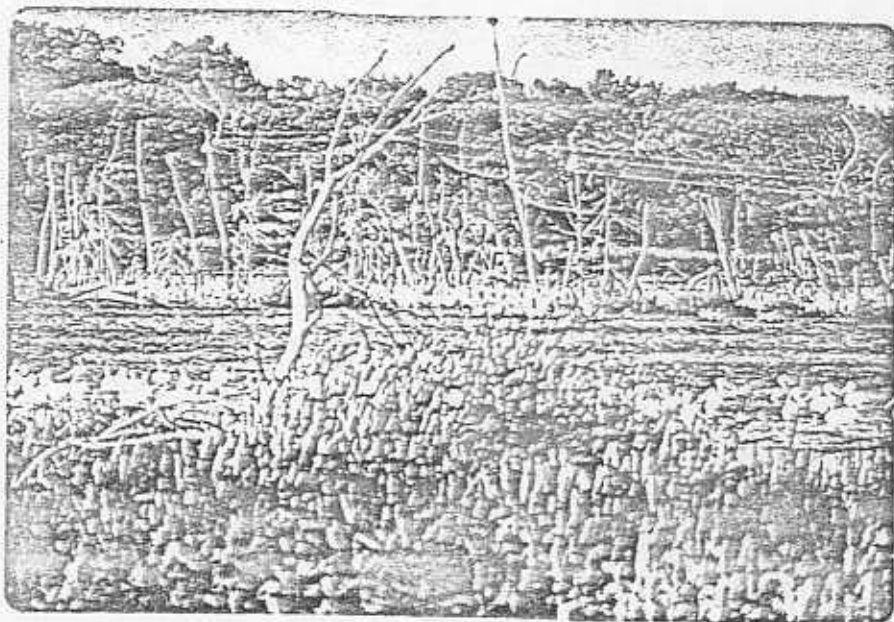


FIGURE 16. White Pelicans at Mud Lake, August 1979.

SUMMARY

Populations of double-crested cormorants have declined in recent years in Minnesota. Shooting, pesticides, and habitat destruction have been cited as the major reasons for this decline. Today, active cormorant rookeries exist primarily in the west-central and northwestern regions of Minnesota.

This study has documented the existence of a relatively new rookery of cormorants in Meeker County, Minnesota. The rookery is located at Mud Lake in Dassel Township. The rookery was probably established in 1972 or 1973. A total of 194 active cormorant nests were present in 1979 and 273 in 1980. In addition 16 active nests of great blue herons were counted in 1979 and 35 in 1980.

Many dead nest trees used by cormorants in this rookery have gradually deteriorated and toppled over. Thirty one artificial nest structures were installed over a three year period from 1977 through 1979 to replace the loss of nest sites from toppled trees. Cormorants have made extensive use of the artificial nest structures. In 1980, 28 of the 31 (90%) nest structures held active cormorant nests. Cormorants appear to use any flat wooden platform that is large enough (at least 0.5 meters on a side) to accommodate a cormorant nest.

A total of 120 nestling cormorants and 3 nestling herons were banded in 1978 through 1980. As of this writing, only one bird has been recovered. No information other than date of recovery was reported on the band report card.

General observations indicate that cormorants are primarily feeding on rough fish. Small carp and bluegills were most commonly observed in the fish remains regurgitated by the nestling cormorants.

Shooting, pesticides, disturbance during the breeding season, availability of nest sites, availability of fish and drainage were discussed in terms of their potential negative impact on the rookery. None of these factors appear to pose

any immediate threat to the rookery. However, additional artificial nest structures will be installed to replace nest sites lost from toppled trees.

In addition to cormorants and herons, 14 other species of water birds have been observed during the breeding season at Mud Lake. Seven of these species are known to have nested at Mud Lake.