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EFFECTS OF DRAINAGE ON WILDLIFE  
IN THE STONY RUN WATERSHED,  
LAC QUI PARLE AND YELLOW  
MEDICINE COUNTIES, MINNESOTA

Thesis for the Degree of M. S.  
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Keith W. Harmon  
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## ABSTRACT

### EFFECTS OF DRAINAGE ON WILDLIFE IN THE STONY RUN WATERSHED, LAC QUI PARLE AND YELLOW MEDICINE COUNTIES, MINNESOTA

by Keith W. Harmon

The Stony Run Watershed located in Lac qui Parle and Yellow Medicine Counties, Minnesota contained 2,578 acres of permanent wetlands and 2,500 acres of seasonally flooded wetlands. Wildlife data indicating the importance of wetlands to waterfowl, ring-necked pheasants (Cholchicus phasianus), and white-tailed deer (Odocoileus virginianus) were obtained from similar wetlands outside the watershed and were assumed to be representative of the wetlands in the Stony Run Watershed. Waterfowl production was estimated to be 0.76 ducklings per acre of water (Bue, 1950). Pheasant densities in wetland cover were estimated to be 2.8 to 3.7 birds per wetland acre during the 1961-62 winter. Deer counts during the winters of 1961-62 and 1963-64 averaged .035 deer per wetland acre.

Judicial Ditch 21, which was locally-financed, drained 2,151.8 acres of permanent wetlands and approximately 2,500 acres of seasonally flooded wetlands. Waterfowl losses were estimated to be 1,635 ducks annually during years of normal rainfall. Pheasants and deer using wetlands for winter cover are estimated to be reduced by 73 percent.



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RUN WATERSHED, LAC QUI PARLE AND YELLOW  
MEDICINE COUNTIES, MINNESOTA

By

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## INTRODUCTION

The drainage of prairie marshes by federal subsidies has been well documented (Jahn, 1961; Reuss, 1958; and Seaton, 1959).

Public Law 87-732, which requires U. S. Fish and Wildlife Service approval for federal cost-shared drainage, as well as other laws designed to reduce wetland drainage, has not successfully curtailed the draining of permanent wetlands or seasonally-flooded basins. I have observed, in the past several years, an increase in locally-financed drainage projects. These projects have acted to eliminate the objectives of federal anti-drainage legislation.

Local drainage projects are usually established at the request of a majority (51 percent) of the landowners by a board of county commissioners or by a State of Minnesota District Court, if more than one county is involved. Most southwestern Minnesota counties contain fifty or more such legal drainage systems.

This study is to document one locally-sponsored and financed drainage project, to determine the loss of wetland wildlife habitat resulting therefrom, and to determine the evident and probable effects on wildlife populations.

I wish to thank Dr. George A. Petrides for guiding my course of graduate study in the Department of Fisheries and Wildlife at Michigan State University and for considerable editorial advice. I also wish to thank Jerome Janeczek and LeRoy Rutske of the Minnesota Division of Game and Fish for their participation in the aerial counts. Special thanks are due to Area Game Managers Les Koopmann and Jim Ruos and to Regional Game Manager Hiram Southwick of the Minnesota

Division of Game and **F**ish. Their dedicated efforts made possible the saving of the remaining wetlands in the Stony Run Watershed.

## STUDY AREA

The Stony Run Watershed is located in Lac qui Parle and Yellow Medicine Counties, Minnesota. These two counties lie in a portion of Minnesota that was originally vegetated by tall-grass prairie (Barnes, 1948). The physical features of the watershed were determined in large part by glaciation (Elwell et al., 1929).

The watershed is approximately 13 miles long and 5 miles wide. It contains 31,200 acres of nearly-flat to undulating land. Elevations are from 940 feet to 1070 feet above sea level. Stony Run Creek runs northeast into the Minnesota River.

Soils were formed from glacial parent materials under a prairie climate (Elwell et al., 1929). Parnell soil, poorly-drained and developed from medium to heavy textured glacial till, is restricted to marshes and the floodplain. The major upland soil type is Barnes. This type is well drained and was developed from medium textured glacial till (Anon., 1956).

Weather data collected at Montevideo, Minnesota, seven miles northeast of the study area, lists the average annual temperature as 44.1° F. with average extremes of 72.8° F. in July and 12.1° F. in January. The average annual precipitation is 25.53 inches (Strub, 1960).

Using Shaw and Fredine's (1956) wetland classification system, aerial photographs taken in 1955 showed 2,578 acres in 86 permanent wetland areas. The wetland areas consisted of 16 meadows (Type II) containing 304 acres, 44 shallow marshes (Type III) containing 1,341 acres, and 26 deep marshes (Type IV) containing 933 acres (Table 1). In addition to the permanent wetlands, Southwick (1957) estimated that

there were 80 seasonally-flooded basins (Type I) containing 2,500 acres (Table 1). Wetland acreage comprised 16.2 percent of the watershed.

The majority of the wetland acreage in the watershed was in private ownership. The Minnesota Division of Game and Fish had purchased, through the "Save Minnesota Wetlands" program, 669.3 acres of permanent wetlands (Table 2).



## METHODS

At the time the study was undertaken, Judicial Ditch 21 was in the final stages of construction. All privately owned wetlands had been drained and the wetland complex around the remaining state-owned marshes had been altered. Data indicating the importance of wetland habitat to wildlife were obtained from wetland areas outside the watershed (Figure 1). Soil Conservation Service soils maps showed that these wetlands had soil types similar to the wetlands in the Stony Run Watershed. Agricultural practices on the adjacent cropland were also similar. I have therefore assumed that the data obtained were applicable to the wetlands formerly found in the Stony Run Watershed.

Waterfowl production estimates (Bue, 1950) were based on a duck brood survey conducted in 1950 on 12 state-owned areas known as the St. Leo Marshes. These are located 10 miles west of the study area in Yellow Medicine County, Minnesota (Figure 1) and contained 350 acres of permanent wetlands. Aerial photographs taken in 1950 showed maximum to nearly maximum water levels.

I censused ring-necked pheasants (Cholchicus phasianus) wintering on the Shaokatan Wildlife Management Unit located in Lincoln County, Minnesota (Figure 1) by airplane during the winter of 1961-62. Approximately 20 inches of snow covered the ground then. The pilot circled the Unit until an observer and I agreed on the approximate number of pheasants using the area. No winter cover, except for farmhouse windbreaks, was present within a three mile radius of the Unit. Aerial observations within this radius indicated that the pheasants

in the area were in the wetland cover on the Unit. Several days later the same observer and I, using a dog, attempted to flush and count the pheasants on one-half the unit only, in order to eliminate recounting birds that had been flushed and counted previously. Observations during the aerial count indicated that the pheasants were distributed more or less evenly throughout the entire marsh. The ground count was therefore started at the most accessible point and run in a north south direction until approximately half the area was covered.

During the winters of 1961-62 and 1963-64, an aerial deer count was conducted on seven Wildlife Management Units (Figure 1). Observations were made (Harmon and Janecek, 1962 and Harmon and Rutske, 1964) when heavy snow cover made sighting conditions favorable. Each Unit was circled at an altitude of 150 feet. If the two observers disagreed on the number of deer counted, the count was repeated. Intensive farming practices (drainage, burning, and fall plowing) adjacent to the wetlands had eliminated all winter cover within several square miles of each Unit. Observations were also made on adjoining land to determine if any movement had occurred prior to the count. No evidence of movement was observed and the counts were considered to be indicative of the true number of deer on the Unit.

Wetland acreages and classification (Type II, III, and IV), before drainage, were determined from 1955 large-scale aerial photographs. The aerial photographs indicated that maximum to nearly maximum water levels were present.

A photographic flight made in 1961 failed to show the total effects of Judicial Ditch 21 since construction of the ditch was not complete at that time. In order to determine the effects of Judicial Ditch 21, I made a ground check of all wetlands within the watershed. Observations were also made in the watershed while conducting the 1964 aerial deer count.

## WILDLIFE POPULATIONS IN WETLAND HABITAT

The general importance of wetlands for the courtship, rearing young, feeding, and migration of waterfowl is common knowledge to game management personnel. Waterfowl brood data collected on the St. Leo Marshes indicated that 0.76 ducklings per acre of water were being produced (Bue, 1950). Farming practices and soil types in the St. Leo area are essentially the same as in the Stony Run Watershed and I have assumed that a waterfowl production estimate of 0.76 ducklings per acre of water per year also occurred in the study area during years of normal precipitation.

Winter cover is considered necessary in Minnesota to reduce losses of pheasants during blizzards. A study by Carlson (1947) in Minnesota showed that cover types such as cattail (Typha spp.), bulrush (Scirpus spp.), and willow (Salix spp.) were preferred by pheasants as winter cover. I have assumed that the willow referred to by Carlson was located on marsh shorelines since willow, except in wetlands, is not common in southwestern Minnesota. Aerial and ground observations on the 213-acre Shaokatan Wildlife Management Unit indicated a winter pheasant density of between 2.8 and 3.7 birds per wetland acre.

The 1955 aerial photographs showed that in the Stony Run Watershed 2,578 acres of wetland were available as potential pheasant winter cover. The precise acreage that would have been available as winter cover during any one year would depend on the water levels in the marshes and the invasion of emergent vegetation.

There is evidently little known of the white-tailed deer's requirements in intensively farmed regions. Aerial observations in

southwestern Minnesota showed that deer were using wetlands and wooded river bottoms as winter cover (Harmon and Janecek, 1962 and Harmon and Rutske, 1964). Thirty-six percent of the deer observed were using wetlands as winter cover. Data collected on seven Wildlife Management Units during the winters of 1961-62 and 1963-64 averaged .035 deer per acre on 2,169 acres of wetland (Harmon and Janecek, 1962 and Harmon and Rutske, 1964).

The wetland acreage available to deer as winter cover in the Stony Run Watershed would have varied depending on the amount of water present in the marshes. The watershed contained 2,578 acres of potential winter cover for deer.

## EFFECTS OF THE DRAINAGE ON WILDLIFE

Judicial Ditch 21 was constructed under order of the District Court, Sixth Judicial District and completed during the fall of 1963. The drainage system consisted of 67 miles of open ditch and 101 miles of tile (Figure 2) and cost approximately \$1, 000, 000 (O. Skramstad, Civil Eng., Personal communications). Eighteen percent of the costs were paid by state, county, and township agencies. The remainder was financed by the local landowners (Anon., 1959).

Judicial Ditch 21 drained 2, 151.8 acres of Type II, III, and IV wetlands (Figure 3 and Table 1). A large percentage of the Type I marshes was drained, but I was unable to determine the exact amount. Twenty-six miles of the tile installed as a part of the ditch system was designed for internal drainage of 1, 760 acres of Type I wetlands. The remaining Type I marshes are still being tiled by individual landowners because of improved drainage tile outlets. I have assumed a 100 percent loss of Type I marshes.

Wetlands owned by the Minnesota Division of Game and Fish were adversely affected by Judicial Ditch 21 (Figures 4 and 5). This was particularly true for those wetland areas in which private interests remained at the time the ditch was established. Forty-two percent of the wetland acreage in public ownership was drained (Table 2).

The effect of Judicial Ditch 21 on waterfowl and their habitat was almost immediate (Figures 6, 7, 8, and 9). Based on Bue's (1950) data the Stony Run Watershed, before drainage, was producing an estimated 1, 959 ducks during years of normal water levels (2, 578 acres x 0.76 ducklings per acre of water). The drainage of 2, 151.8 acres of permanent wetlands therefore resulted in an estimated annual

loss of 1,635 local ducks ( $2,151.8 \text{ acres drained} \times 0.76 \text{ ducklings per acre of water}$ ) during years of normal rainfall. Production on the 426.6 acres of wetlands not drained is expected to be lower in the future since only when a water area is surrounded by temporary wetlands will its maximum carrying capacity for brood production be realized (Schrader, 1955).

Based on the figures I obtained on the Shaokatan Wildlife Management Unit, I estimated that during the 1961-62 winter the wetlands in the Stony Run Watershed could have been wintering between 7,218 ( $2,578 \text{ acres} \times 2.8 \text{ pheasants per wetland acre}$ ) and 9,539 pheasants ( $2,578 \text{ acres} \times 3.7 \text{ pheasants per wetland acre}$ ).

The Game and Fish lands that were drained are being maintained as winter cover. A total of 708.7 acres of wetland winter cover remained after the completion of Judicial Ditch 21. The number of pheasants wintering in the remaining wetland cover is estimated to be between 1,984 ( $708.7 \text{ acres} \times 2.8 \text{ pheasants per wetland acre}$ ) and 2,622 pheasants ( $708.7 \text{ acres} \times 3.7 \text{ pheasants per wetland acre}$ ). The actual number of pheasants wintering in wetland cover during any given year would depend upon other factors in the environment such as weather during the nesting season, available safe nesting cover, and water levels in the marsh. I have estimated that the drainage of wetlands in the Stony Run Watershed will result in the loss of approximately 73 percent of the pheasants dependent on wetlands as winter cover.

Using the data I obtained from seven Wildlife Management Units containing wetlands similar to those originally found in the Stony Run Watershed, I have estimated that during the winters of 1961-62 and 1963-64 the wetlands in the watershed could have been supporting approximately 88 deer ( $2,578 \text{ acres} \times .034 \text{ deer per wetland acre}$ ).



After drainage, a total of 708.7 acres of wetland winter cover remained in the watershed. The removal of 1,869.3 acres of potential winter cover is expected to reduce the number of deer dependent on wetlands as winter cover by approximately 73 percent.

## CONCLUSIONS

The loss of wildlife habitat due to the construction of Judicial Ditch 21 was highly significant. Possibly even more important is the probability that large, private drainage projects appear to be draining more permanent wetlands than federally subsidized drainage projects and are not readily controlled by legislation.

The loss of 2,151.8 acres (83.4 percent) of permanent wetlands eliminated the Stony Run Watershed as a major waterfowl producing area. There is little likelihood of ever restoring the wetland areas drained. Costs of drained wetlands, once in crops, prohibit their acquisition and restoration by public agencies.

Wetland drainage adversely affects pheasant populations in certain areas (Midwest Pheasant Council, 1963). The loss of 73 percent of the pheasants dependent on wetlands for winter cover is expected to have a profound affect on pheasant hunting not only from the standpoint of pheasant numbers but also from the standpoint of hunting opportunities. Some hope remains in the possibility of devoting portions of the land in federal land conversion programs to the establishment of winter cover for pheasants.

The drainage of 1,869.3 acres of potential winter cover will leave only a remnant deer population in the Stony Run Watershed since no wooded river bottoms exist. Deer hunting as a sport, although limited prior to the construction of Judicial Ditch 21, is expected to be practically nonexistent in the future.

## SUMMARY

Legislation to curtail federally subsidized drainage has not solved the problem of wetland drainage. Judicial Ditch 21, a locally-financed and sponsored drainage system eliminated 2,151.8 acres of the 2,578 acres of permanent wetlands in the Stony Run Watershed. In addition an estimated 2,500 acres of seasonally-flooded wetlands were drained.

Wildlife data, obtained from similar wetlands outside the watershed, indicated that 0.76 ducklings per acre of water (Bue, 1950) could have been produced in the Stony Run Watershed. Pheasant densities in wetland cover were estimated to be 2.8 to 3.7 pheasants per wetland acre during the winter of 1961-62. Deer counted on seven Wildlife Management Units during the winters of 1961-62 and 1963-64 averaged .035 deer per wetland acre.

The loss of wetlands due to drainage in the Stony Run Watershed is expected to result in an estimated loss of 1,635 ducks annually, depending on water conditions. The number of pheasants and deer dependent on wetlands for winter cover are expected to be reduced by 73 percent.

An accelerated program to bring as many of the remaining wetlands into public ownership is the only positive means of preserving wetland habitat for wildlife.

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Table 1. Numbers and acreages of wetland types in the Stony Run Watershed, Lac qui Parle and Yellow Medicine Counties, Minnesota before and after the construction of Judicial Ditch 21.

Wetland type (Shaw and Fredine, 1957)	Numbers of areas		Numbers of acres	
	Before	After	Before	After
Seasonally flooded basin (Type I)	80	0	2,500.0	0.0
Meadows (Type II)	16	0	304.0	0.0
Shallow Marshes (Type III)	44	0	1,341.0	0.0
Deep marshes (Type IV)	26	3	933.0	426.2
Totals	166	3	5,078.0	426.2



Table 2. Total Wildlife Management Unit wetland acreages before and after construction of Judicial Ditch 21 and percentage of wetland acres drained in the Stony Run Watershed, Lac qui Parle and Yellow Medicine Counties, Minnesota.

Wildlife Management Unit	Acres	Wetland acreages		Percentage of wetlands drained
		Before	After	
Christopherson	140.0	87.5	82.0	6.3
Church	95.0	69.8	69.8	0.0
Clawson	78.9	70.1	0.0	100.0
Flinks	291.5	235.0	235.0	0.0
Stony Run	274.9	206.9	0.0	100.0
Totals	880.3	669.3	386.8	42.2

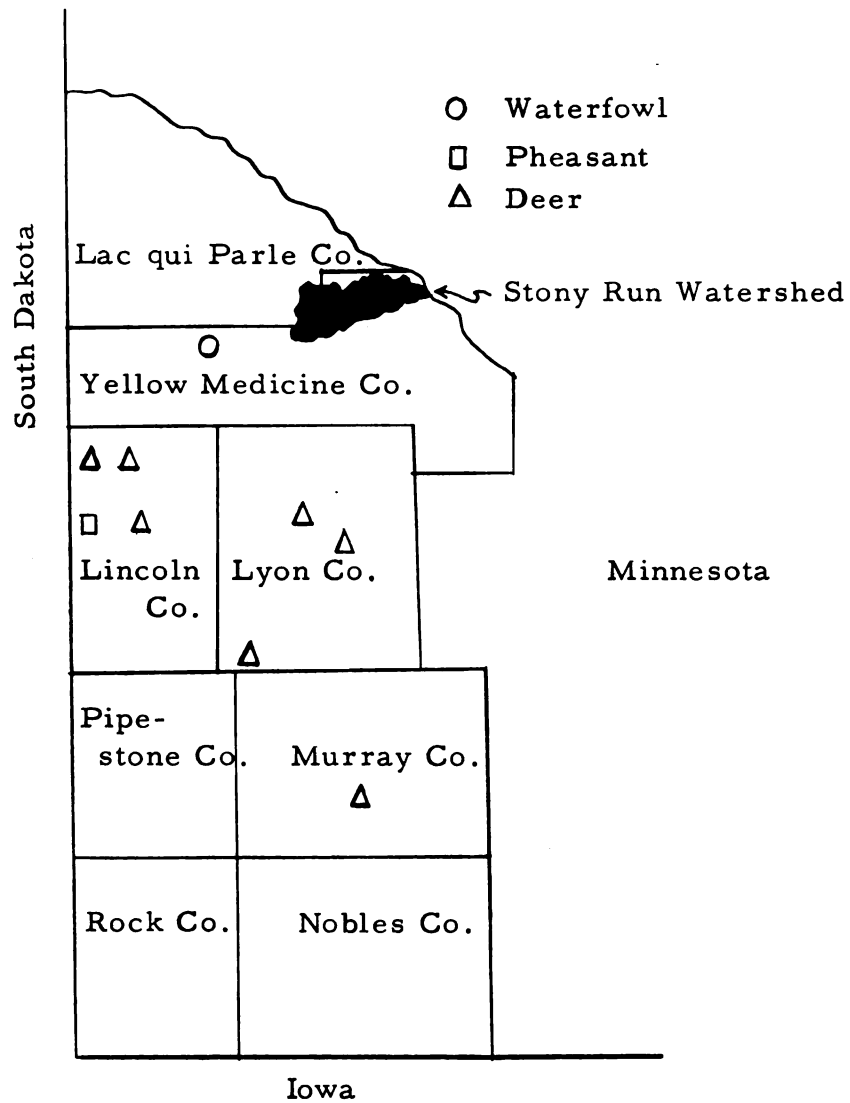


Figure 1. County locations of areas censused to determine waterfowl, pheasant, and deer population densities in wetland cover and the census areas' relationship to the Stony Run Watershed, Lac qui Parle and Yellow Medicine Counties, Minnesota.

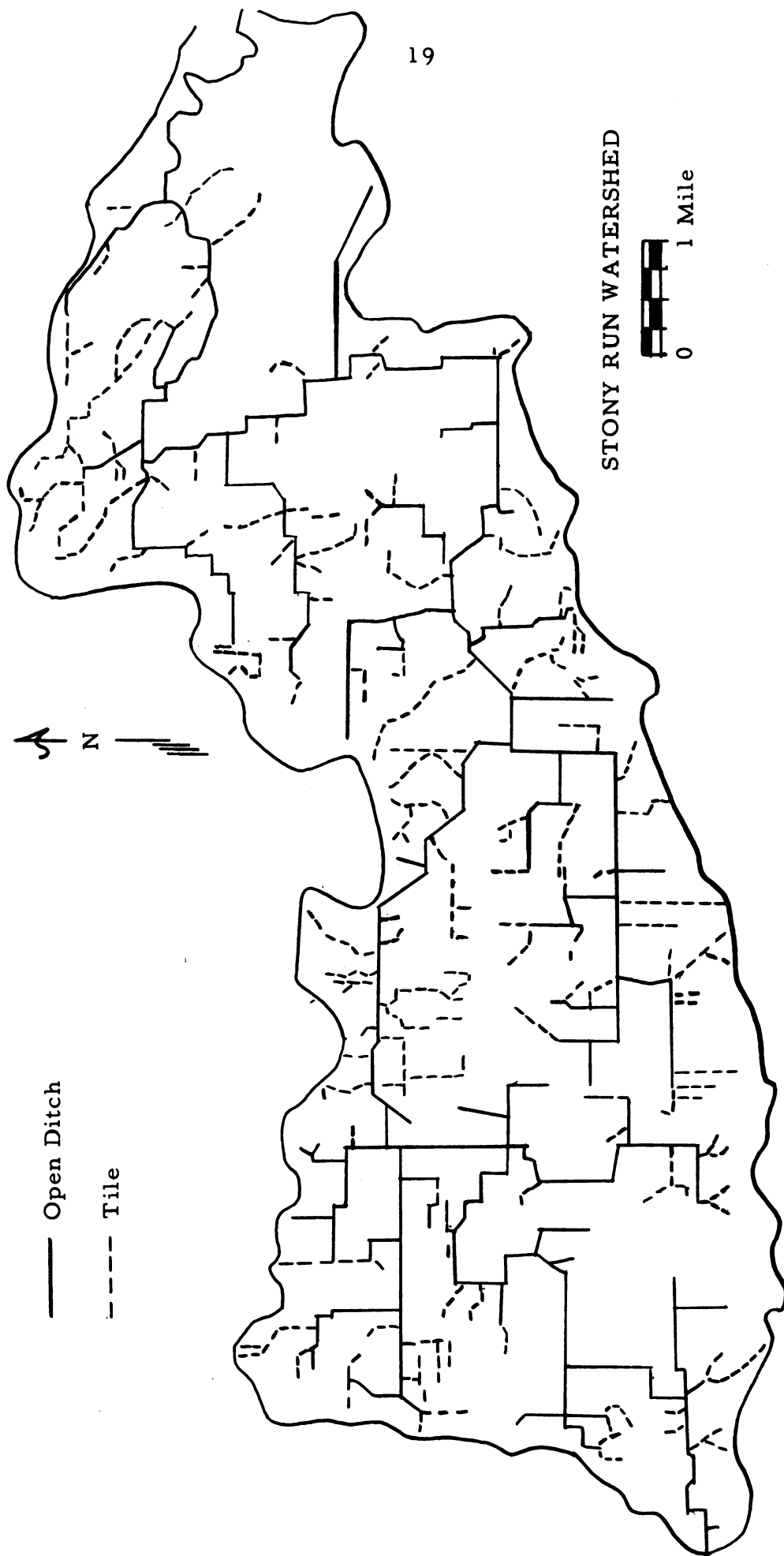


Figure 2. Judicial Ditch 21 - 1963. Lac qui Parle and Yellow Medicine Counties, Minnesota.

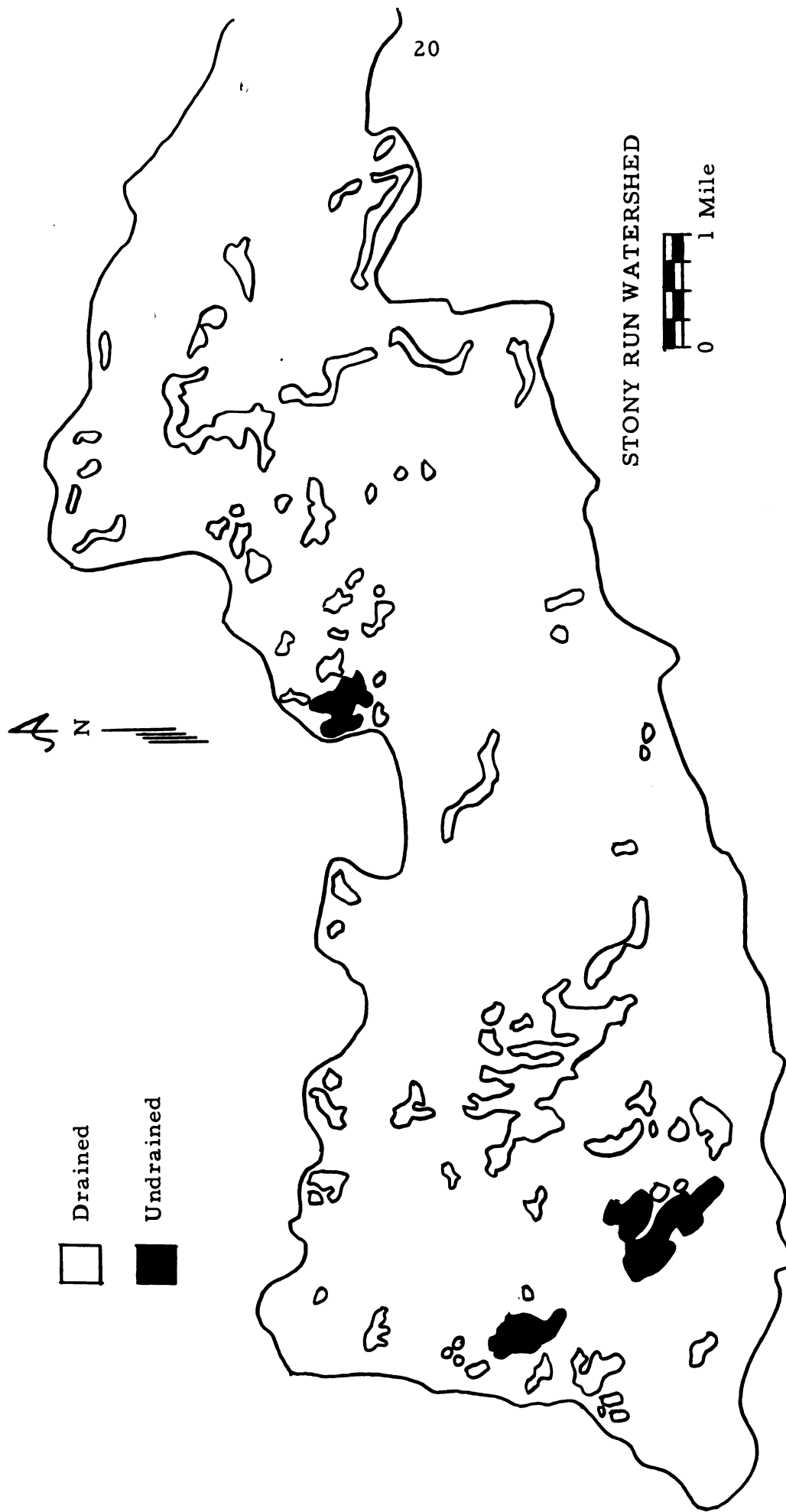


Figure 3. Major wetland areas and their status after the construction of Judicial Ditch 21 - Yellow Medicine and Lac qui Parle Counties, Minnesota.



Figure 4. Photo station is southeast of the center of section 30, T116N., R41W. The land shown in the lower portion of the photograph is owned by the Minnesota Division of Game and Fish. The land in the upper portion is privately owned. August 18, 1958. Photo by Les Koopmann, Minnesota Division of Game and Fish.



Figure 5. Photo station is the same as in Figure 4. The line (arrow) is the spoil bank of Judicial Ditch 21. The ditch lies along the north property line of the Minnesota Division of Game and Fish land. April 7, 1964. Photo by Keith Harmon, Minnesota Division of Game and Fish.





Figure 6. Photo station is on the north line of the NW $\frac{1}{4}$ , section 31, T116N., R41W., looking south. This marsh is privately owned. The area had a history of heavy waterfowl use as a migration area and a reproduction area. August 18, 1958. Photo by Les Koopmann, Minnesota Division of Game and Fish.



Figure 7. Photo station is the same as in Figure 6. At the time this photograph was taken the area had been cropped one year. Waterfowl value was completely eliminated. The value as a wintering area for pheasants was also destroyed. April 7, 1964. Photo by Keith Harmon, Minnesota Division of Game and Fish.



Figure 8. Photo station is on the section line between sections 12 and 13, T116N., R41W., looking west. A type IV wetland area prior to the construction of Judicial Ditch 21. August 18, 1958. Photo by Les Koopmann, Minnesota Division of Game and Fish.



Figure 9. Photo station is the same as in Figure 8. Judicial Ditch 21 (arrow) lies along the right hand side of the improved county road. April 7, 1964. Photo by Keith Harmon, Minnesota Division of Game and Fish.

## APPENDIX

Wetland classification from Shaw and Fredine, 1956

- Type I - Seasonally flooded basins or flats - Shallow depressions that contain standing water for only a few days in the spring or after a heavy rain. Areas are usually farmed.
- Type II - Meadows - Shallow depressions that contain standing water for a few days in the spring or after heavy rains. Soils may be waterlogged within at least a few inches of the surface. Vegetation is primarily sedges (Carex sp.), smartweeds (Polygonum spp.), rushes, docks (Rumex spp.), and beggarticks (Bidens spp.).
- Type III - Shallow marshes - Marshy depressions which may have variable water depths up to 30 inches. The area is usually covered with heavy stalked emergents. The emergents may form a dense cover or have scattered open water areas.
- Type IV - Deep marshes - Water depths to four or five feet. Emergent vegetation, if present, is either confined to a fringe or to scattered plants or clumps of bulrush or cattail. Submerged aquatic vegetation may be present.

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