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FINAL REPORT
INVESTIGATIONS PROJECTS
As Required by
FEDERAL AID IN WILDLIFE RESTORATION ACT

WORK PLAN K-71
SURVEY OF HABITAT
Pittman-Robertson Project W-15-R-28

Willard R. Barbee, Director
Nebraska Game and Parks Commission

Report for the Period
March 1, 1971 to February 29, 1972

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RECOMMENDATIONS

With today's emphasis on need to preserve the critical wetland habitat and with greater demands anticipated in the future, the cost of preserving them now may be viewed as cheap a few years hence. In view of losses that have already occurred, the prospects for wetlands to continue to diminish, and future needs increasing, it is recommended that:

1. Funds be made available to preserve through acquisition, lease or easement at earliest date possible, as much wetland habitat as is available and practical.
2. A concerted educational effort be initiated to develop a greater appreciation among all peoples for wetlands.
3. One individual be assigned the responsibility for natural wetlands in Nebraska. To maintain a surveillance of private and public agencies plans and activities, and to work with those agencies to minimize wetland destruction.
4. All sources be utilized to encourage restoration of reclaimable wetlands, and improvement of existing areas, and to seek means of prolonging their life.

WETLAND SURVEY
by M. S. McMurtrey, Robert Craig and
George Schildman

ABSTRACT

A survey of wetlands in two major wetland areas of Nebraska was completed in the 1960's. The sandhill region located in the northcentral part of the state contained 13,340 wetlands comprising 155,380 acres. The southcentral rainbasin area had 685 wetlands with 32,530 acres. In the southcentral area 82 percent of the basins and 65 percent of the wetlands acres have been destroyed. The respective percentages for drainage of wetlands in the sandhills are one percent of the basins and 15 percent of the acreage.

Data were obtained on numbers, distribution, size and type of wetland. Additional historical information and waterfowl use was obtained through landowner interviews. Amount and distribution of wetland destruction was also obtained.

WETLAND SURVEY

INTRODUCTION

The need for a complete inventory of the wetlands in the state existed for a number of years before the study was initiated. In the early 1950's a systematic, nationwide inventory was carried out by the office of River Basin Studies of the Fish and Wildlife Service. This report gave little specific information regarding Nebraska's small scattered natural water areas. The data was derived by projecting from sampling methods, and the south central rainbasin area was not represented.

In 1958 the Central Flyway Waterfowl Council and Technical Committee expressed an awareness of the need to inventory our wetlands, by recommending that the member states and Canadian Provinces each conduct such a study. The objectives were to determine, (1) the quantity, quality and distribution of waterfowl habitat, (2) habitat requirements to maintain current levels of waterfowl populations, and (3) how to attain and/or preserve the habitat needs. Because of the mobility of waterfowl and the great distances they travel, a wide distribution of habitat types are needed and hence there is the necessity for a cooperative effort extending beyond the boundaries of a single state. Each state has a responsibility to contribute to the habitat needs of migratory species. The geographical location and natural endowment of wetland habitat places Nebraska in a position of responsibility and opportunity to contribute to the needs of the waterfowl resource and to provide the recreational opportunities afforded by the resource.

Marshes are a basic wetland habitat type that have encountered accelerated destruction in the past two or three decades. Marsh habitat provides the essential elements for many forms of plants and animals. Waterfowl represents an important life form associated with this habitat. Because marsh habitat is vital to the welfare of many of the most important duck species, and is the target of destructive forces, it becomes the most critical factor in maintaining or enlarging duck populations. The inventory of wetlands referred to in this report are natural water holding depressions, exclusive of streams and associated bottomlands. The wetlands have been classified to type in accordance with United States Department of Interior, Fish and Wildlife Circular 39. Other wetlands of some value to waterfowl are treated only in a brief and more general way.

The survey involved two separate phases: the sandhills area in the northern and western part of the state and the rainwater basin area in the south central region of the state (Fig. 1). The project started in the south central area in 1959, and in the sandhills in 1962. The data gathering phases ended in 1965 and 1968 respectively.

In 1962, the U.S. Fish and Wildlife Service established an office in Hastings for the purpose of acquiring waterfowl production wetlands in the rainwater basin region.

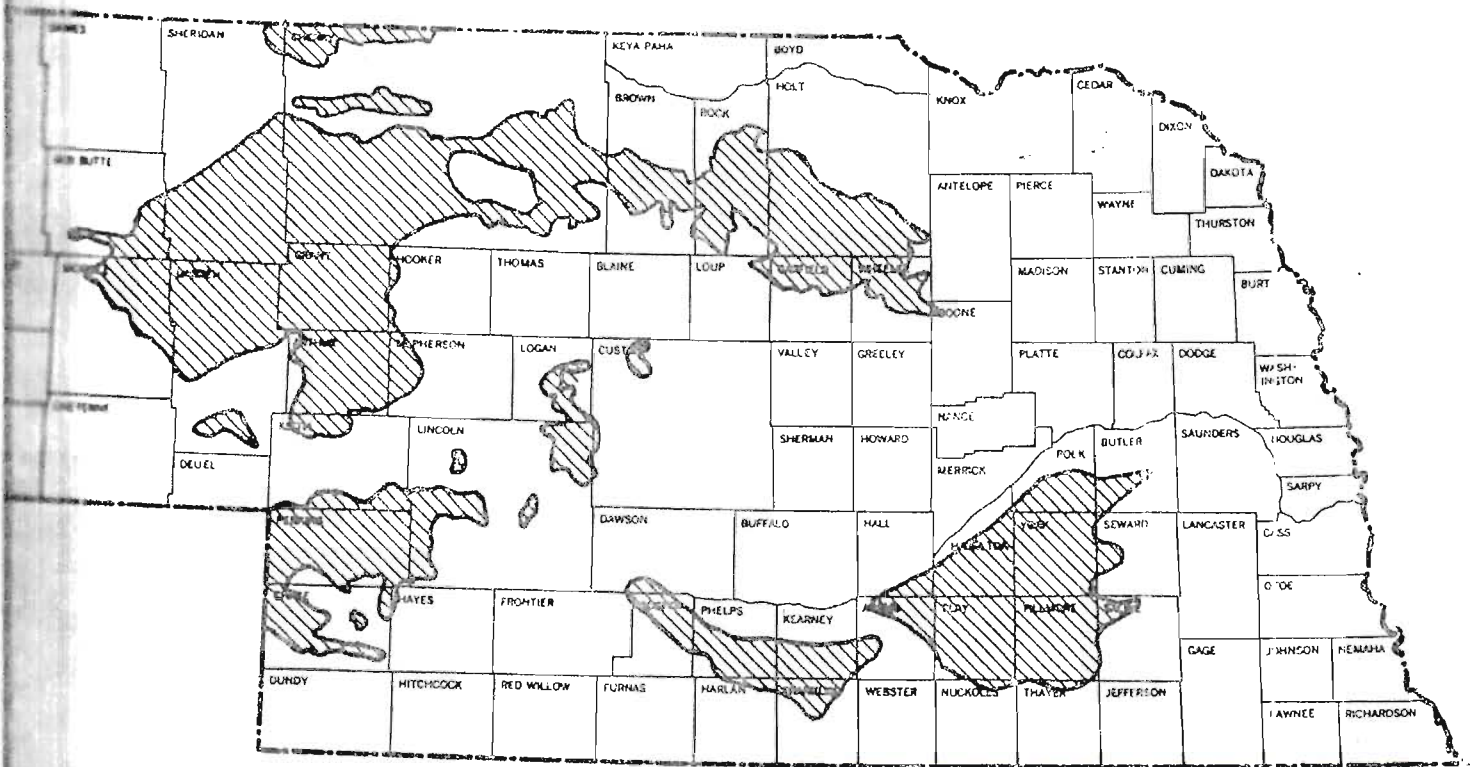


Fig. 1 Rainbasin and Sandhills Wetland Areas

STUDY AREA

Two large regions of the state, which contain nearly 97 percent of Nebraska's natural marshes, were intensively surveyed. The survey area included about 32 percent of the state's 76,612 square miles.

Rainbasin

The rainwater basin area encompasses some 4,200 square miles containing 3,907 natural, irregularly distributed fresh water wetlands. The region is characterized by flat and nearly level to gently rolling loess plains. Soils of the region are largely silt loam and silty clay loam, of the Hastings-Crete and Crete-Fillmore series. Basin soils that occur in sinklike depressions throughout the uplands is Scott silt-loam. Water accumulations in these depressions caused a leaching and concentration of clay in the subsoils ranging in thickness from six inches to six feet. When wet, the soil is tough and plastic and nearly impervious to water. Water loss is primarily due to evaporation and transpiration estimated at more than 50 inches annually in Phelps County. Two other basin phase soils that occur over most of the region are Fillmore silt loam and Butler silt loam. Both have shallow silty-clay hardpans locally called "black gumbo". The soils of the less permanent Type I wetlands are frequently of the latter two soil classifications.

Hastings silt loam and Crete silt loam comprise most of the watershed soils. These are characteristically deep and fertile and lend themselves

to leveling programs, for irrigation purposes or for filling wetland depressions. Basin soils are fertile and shallow and extremely subject to flooding and drouth due to the restricted water holding capacity of the thin layer of soil over the impervious claypan. However some are plowed and planted to row crops during drouth years, commonly resulting in crop failure. They are most profitably used for grazing or haying of the sedges and wheatgrass.

The upland is under intensive agricultural use both for dry land farming and deep well irrigation. Corn, milo, wheat and alfalfa comprise most of the crops grown on the cultivated land. The pH of the lakes range from near neutral to light alkaline. Water levels largely depend on runoff from snow melt and rainfall. Irrigation run-off from fields during the irrigation season contributes significant amounts of water to some basins. However, the severe drouth years of 1963, 1965 and 1967 nearly all of the basins were dry throughout most of the growing seasons. In wetter years, annual and perennial smartweeds grow profusely in many of the basins.

The weather is characterized by long warm summers and cold dry winters. Snowfall for the winter season averages about 35 inches. Average annual precipitation ranges from 30 inches in Fillmore County on the east to 25 inches in Phelps County on the west. Seventy to eighty percent of the annual precipitation occurs from May through August. Much of this occurs as scattered summer thunder storms occasionally accompanied by hail.

Elevation ranges from 1,500 feet to 1,700 feet in Fillmore County, to 2,500 feet in western Phelps County.



Figure 2. Aerial view of a rainwater basin in Fillmore County showing the intensive cultivation of the region. Deepened areas within the marsh provide more open water for duck hunting.



Figure 3. A Type IV rainwater basin in Clay County depicting profusion of smartweed growth that characterize wetlands in this region. Prolific seed production provide quality and quantity of duck food. Water depth is about 20 inches. Cornfield in right background approaches to the edge of the marsh.

Sandhills

The sandhill region of Nebraska is the largest continuous area of sandy soils and dune sand in the Plains states. Located in the north central and northwestern portion of the state, the sandhills encompass an area of approximately 20,000 square miles, or about one-fourth of the total state area. Natural lakes and marshes are somewhat clustered in the eastern, central and western portions, with rather large areas that are nearly devoid of these wetlands. The region is vegetated and stabilized. Sandy "blowouts" and shifting soils occur locally over much of the region, where the protective vegetation is removed. Because of its susceptibility to blowing this region is unsuited to cultivation.

Topography of the region ranges from low rolling and nearly level "hay meadows" of Holt County on the east to high steep hills and valleys to the west. Elevation grades from 1,940 feet in the east to nearly 4,000 feet in the west.

Soils are of the Valentine-Dunday series, and consist of very fine sand, fine sandy loam and very fine loamy sand. The surface has been greatly modified by wind, forming a succession of hills (sometimes 200 feet high) into ridges and valleys oriented in a northwest to southeast direction. Shallow lakes and marshes occur in the valleys as well as low depressions in areas where the hills are not patterned into ridges and valleys.

There is little runoff in this region. Sandy soils absorb most of the rainfall and it moves downward quickly to the ground water table, then moves laterally to natural drainages. Because of the stabilizing influence of underground water movement, the streams have a rather stable flow of water. Stream flows are characteristically fast moving and clear and alkaline, though they carry about 100 P.P.M. of dissolved solids.

The region contains 13,340 wetlands ranging from seasonally flooded wet meadows to permanent shallow open water lakes (up to 10 to 12 feet deep). Some are fed by seeps and springs. An accumulation of peat and muck in the lower part of the depression permits a very slow release, and in some cases no release of water downward. The loss of water in these basin type wetlands is primarily due to evaporation. Some of the lakes and marshes represent the exposed ground water level, and fluctuate with the ground water table. In general the more permanent lakes are shallow, most not exceeding six feet or eight feet. For the most part the waters are light alkaline except in the western portion. Many of the lakes occurring in Sheridan and Garden Counties and westward are extremely alkaline and submergent and emergent aquatic plants are totally lacking. The pH ranges upwards of 10.0 in many and total solids upwards of 400,000 P.P.M. Carbonates and hydroxides are predominant in the high alkaline waters. The majority of the sandhill wetlands are lightly alkaline and support aquatic plant growth. Fresh water marshes numerically dominate the wetlands of the region. Fifty-five percent are classed as Type II and III. Submerged and floating plants are abundantly produced in most lakes and marshes. The principal species are: coontail (Ceratophyllum demersum), Bladderwort (Utricularia vulgaris), watermeal (Wolffia punctata), wigeon grass (Ruppia maritima), musk grass (Chara sp), duckweed (Lemna sp), and various species of pondweed of which sago pondweed (Potamogeton pectinatus) is probably the most common. Emergent aquatic plants are common to all but the most alkaline of wetlands. Some of the shallow marshes become choked, while

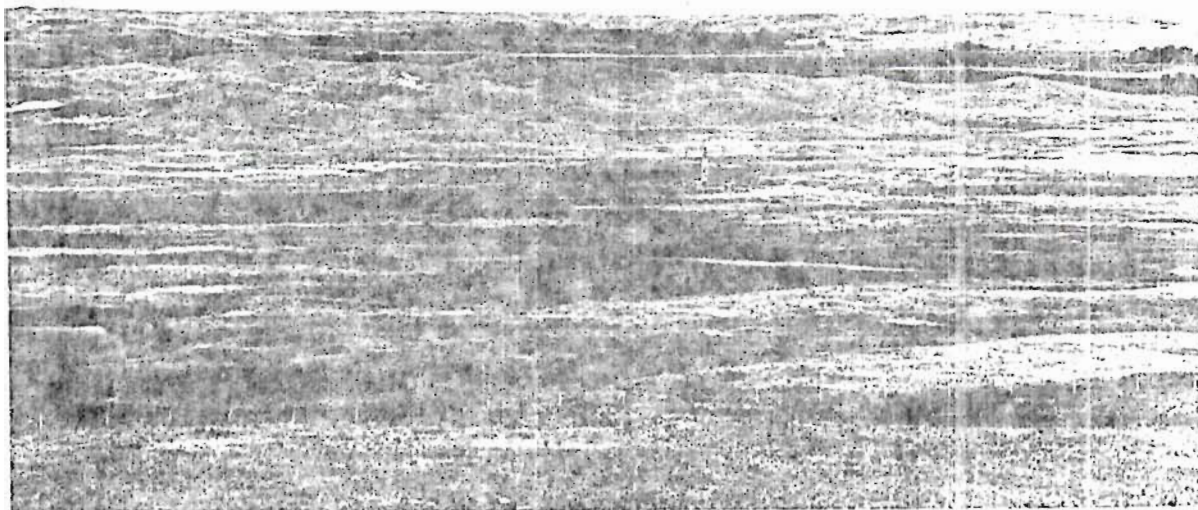


Figure 4. Aerial view of western Sandhill lake region. Sparsity of vegetation in this area is largely due to high alkalinity content.

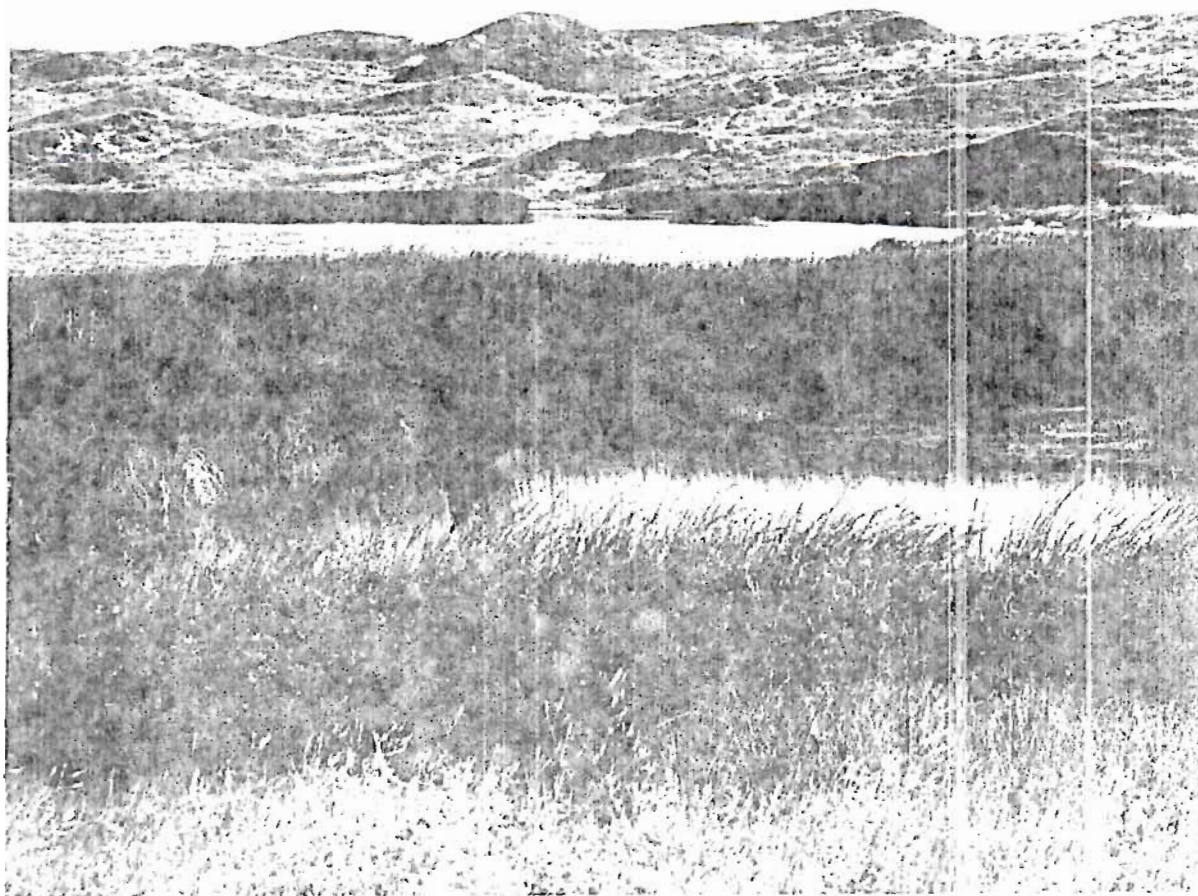


Figure 5. Dense associations of round stem bulrush occur in the shallower portions of this Sandhill lake. Grass covered sand dunes are in the background.

the deeper waters produce them as shoreline communities. Most common as extensive communities are harstem bulrush (Scirpus acutus) and three-square bulrush (Scirpus americanus). Both of these species and saltgrass (Distichlis striota) and spike rush (Eleocharis sp) are quite tolerant of alkaline conditions. Other emergents commonly found in this region are: Bur reed (Sparganium eurycarpum), cattail (Typha latifolia), smartweeds (Polygonum sp), (Phragmites sp), and sedges (Carex sp).

The region is characterized by extremes of temperature and marked seasonal variation in precipitation. The summers are warm and somewhat shorter than those of the rainwater basin area, and the winters are cold and dry. The average annual snowfall ranges from 34 inches in the east to 30 inches in the west. The average annual precipitation ranges from 21.5 inches in the east to 19.8 inches in the west. Most of the rainfall occurs during the growing season, May through September, with May and June most likely to receive dependable amounts. Summer precipitation is usually in the form of thunder storms, not infrequently accompanied by hail.

With the exception of two National Forests (Nenzel Division and Halsey Division) and two National Wildlife Refuges (Valentine and Crescent Lake), the area is nearly all privately owned. There is very little cultivation. Haying and raising beef cattle comprises nearly all of the land use. Ranches represent large land holdings, some exceeding 100,000 acres.

Human populations in the sandhills are extremely sparse. Arthur County has a population of 680 people, occupying an area of 712 square miles, and Rock County with the most people has 2,554 inhabitants in an area of 1,017 square miles.

Four major river systems occur in the sandhills flowing west to east and southeast. They are the Dismal, Elkhorn, Niobrara and North, Middle and South Loups. All but the Niobrara originate in the sandhill region. Other waterways occurring in the area include the Calamus and Snake Rivers and Blue Creek and Pine Creek.

Mid and tall climax grasses dominate this region, but some trees, primarily willows (Salix sp) are established in wet areas. Cottonwood (Populus) occurs along some streams and have been established at ranch headquarters, and as groves in the eastern portion. Sizable acreages of pines and red cedar (Juniperus) have been planted on Forest Service lands. Shrubs occur commonly as scattered plants and as thickets, but are more abundant eastward. Several species of Prunus (choke cherry, sand cherry and wild plum) and buckbrush (Symphoricarpos sp) and New Jersey tea (Ceanothus sp) are the most common. Yucca is also common throughout.

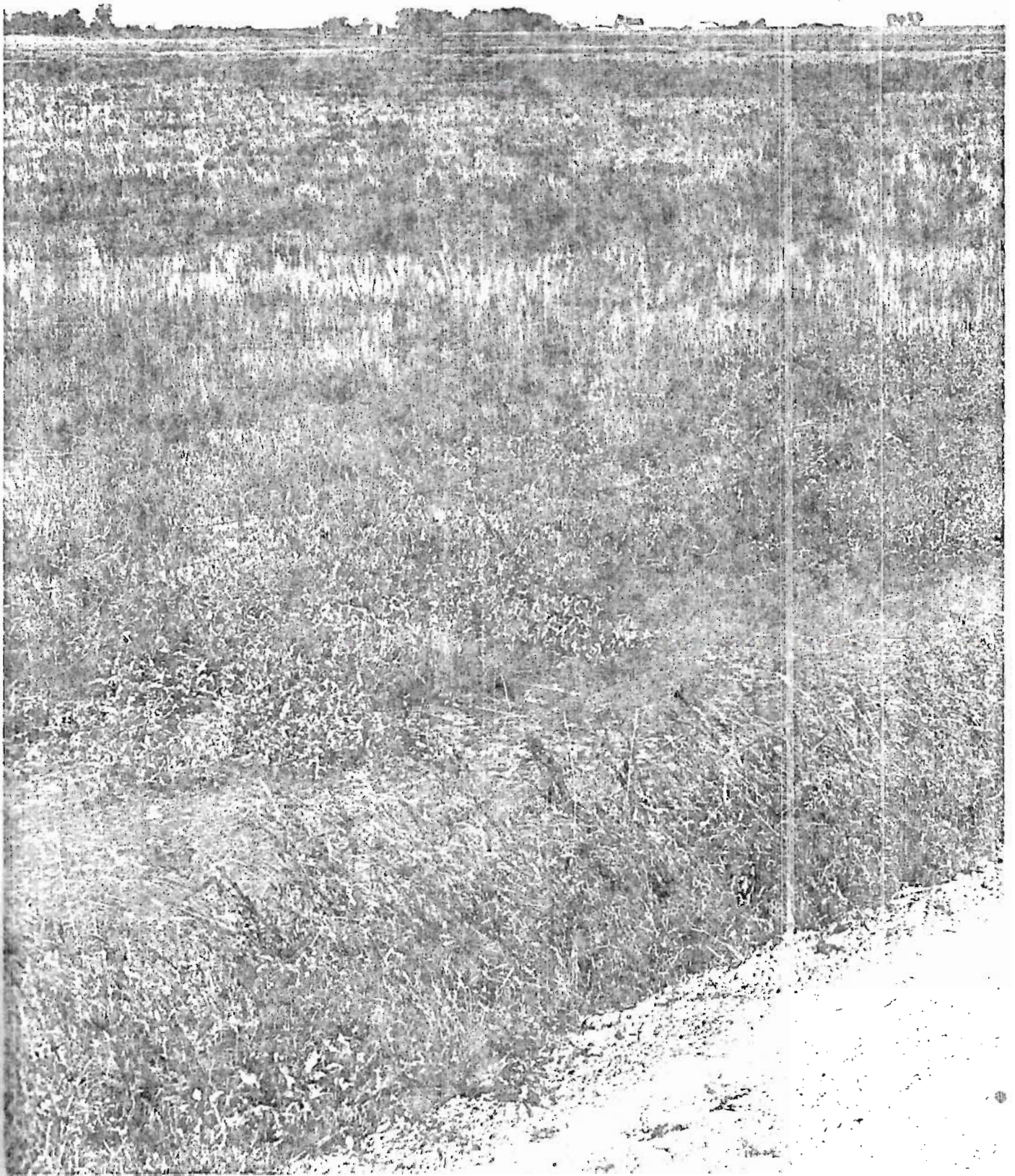


Figure 6. A Type III wetland in Kearney County.



Figure 7. Type IV; deep freshwater marshes provide the optimum in duck production habitat.

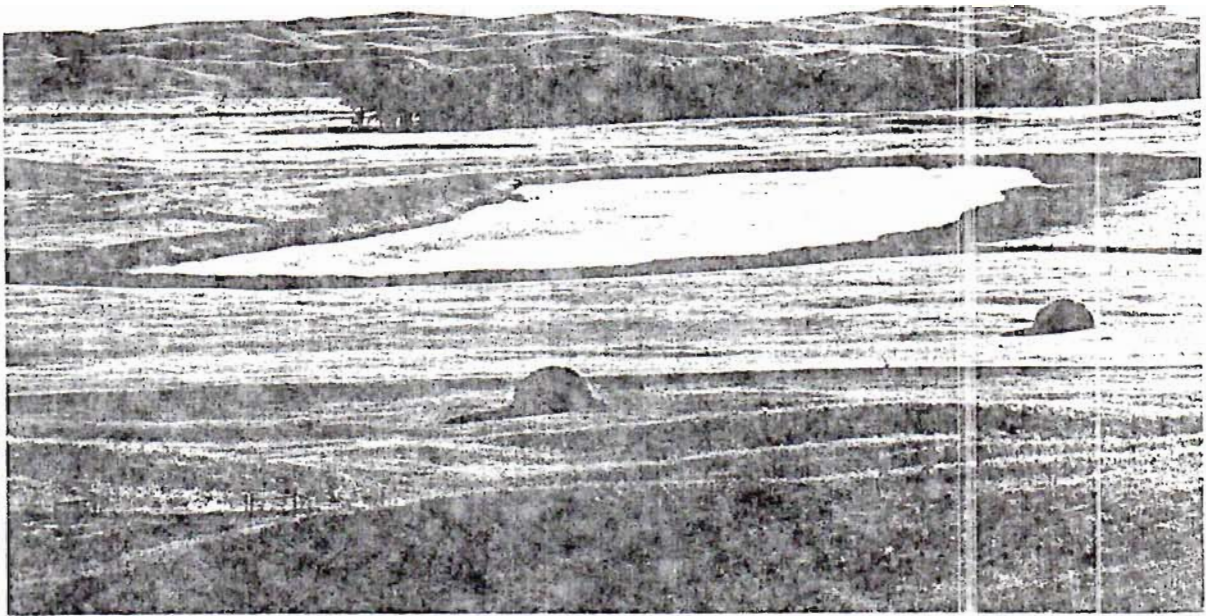


Figure 8. Type V Sandhills wetland. Haying of the denser growth of grasses and sedges surrounding wetlands is common practice.

Some of the more common upland grasses are: Sand bluestem Andropogon halli, little bluestem Andropogon scoparius, sand reed grass, Calamovilfa longifolia, sand love grass Eragrostis trichodes, needle grass Stipa comata, dropseeds Sporobolus sp., gramma, grasses Bouteloua sp.

Primary grasses on the lowlands or sub-irrigated meadows include slender wheatgrass (Agropyron trachycaulum), indian grass (Sorghastrum nutans), switchgrass (Panicum virgatum), and big bluestem (Andropogon gerardi). Lowland grasses are often cut by ranchers for forage feeding of cattle.

TECHNIQUES

Method Used

In the rainwater basin area a field survey was conducted systematically county-by-county. Information was recorded on a prepared survey form. (Appendix A).

Information collected included a coded identification, location, owners' names, general description of area, wetland type, size, depths, water source, topography, land use surrounding area, emergent vegetation, soils, historical fluctuation and waterfowl use and recreational use, and acquisition desirability. Information was obtained from a visual inspection of each wetland and interviews with persons having background knowledge of the area (owners, tenants, and county agents, and long term residents of the area). A planimeter was used to measure acreages from tracings of aerial photos supplied by county offices of the Soil Conservation Service.

Because of vastness of the area, and difficulty of access, less detailed information was obtained on individual wetlands in the sandhills. Information was obtained from aerial photos, on location, size, type of wetland, and surrounding land use. Field checks were made regularly to maintain accuracy of interpretations made from aerial photographs. Acreages were measured by planimeter and all information recorded on prepared survey forms. In some instances where pothole type wetlands were numerous and small, total number and acreage for all within a section were recorded on a single form. This portion of the survey was also conducted on a county-by-county basis.

Criteria for Classifying Wetlands

Classifying wetlands according to type was done in accord with U.S. Fish and Wildlife Service, Circular 39. A detailed description of each type is presented in this Circular. A brief description of Types I through V is as follows:

Type I - Seasonally Flooded Basins or Flats: Soil is covered with water or is waterlogged during variable seasonal periods but is usually well drained during much of the growing season. Heavy rains or melting snow may fill the basin with water.

Type II - Inland Fresh Meadows: The soil is usually without standing water during most of the growing season, but is waterlogged within a few inches of its surface. They may occur in shallow, flat basins or border shallow marshes.

Type III - Inland Shallow Fresh Marshes: Soil is usually waterlogged during the growing season; often it is covered with as much as six inches or more of water. Vegetation commonly includes grasses, bulrushes, spike rushes, smartweeds, cattails, etc. They are commonly without surface water by mid-summer.

Type IV - Inland Deep Fresh Marshes: The soil is covered with six inches to 3 feet or more of water during the growing season. Vegetation includes bulrushes, cattails, smartweeds, naiads, coontail, pondweeds, water lilies, etc.

Type V - Inland Open Fresh Water: Shallow ponds and reservoirs are included in this type. Water is usually less than 10 feet deep and fringed with a border of emergent vegetation in the shallower water.

RESULTS AND DISCUSSION

Rain Basin Wetlands

Data show that 685 wetland marshes comprising 32,529 acres were still in existence at the time of the survey. Of these, 322 containing 23,980 acres were Types III and IV wetlands. An additional 346 Type I marshes were present. (Table 3 gives a breakdown of existing acreage by wetland type.)

Of the original 3,907 wetlands, only 18 percent are in existence today, most of which have been reduced in size and quality. Many wetlands classified during the current survey as Type I were originally Type III or IV. Drainage has accounted for approximately 70 percent of the acreage

destroyed and leveling (filling) for about 25 percent.

Table 1. Number of original basins, the number destroyed, and number existing by county in south central Nebraska.

County	Number Basins	Number Destroyed	Number Existing	Percent Existing
Adams	97	81	16	16.2
Butler	327	304	23	7.1
Clay	858	641	217	25.3
Fillmore	622	504	118	19.0
Franklin	105	91	14	13.3
Gosper	156	128	28	18.0
Hall	18	7	11	61.1
Hamilton	290	270	20	6.9
Harlan	36	31	5	13.8
Kearney	133	104	29	21.8
Nuckolls	44	38	6	13.6
Polk	227	194	33	14.5
Phelps	56	16	40	71.4
Saline	78	73	5	64.1
Seward	177	165	12	6.7
Thayer	11	9	2	18.2
Webster	3	3	0	---
York	672	566	106	15.8
TOTAL	3,907	3,222	685	18.0

The destroyed basins represented 36,830 acres of wetland habitat which has been lost and in addition the remaining wetlands have been reduced in size by an additional 24,700 acres. Numerically, of the original 94,060 wetland acres, 61,530 have been destroyed. The wetland acres still in existence represent 34.6 percent of the original acreage as shown in Table 2.

About 26 percent of the remaining basins are under 10 acres and 25 percent are over 100 acres in size. Size classifications of existing basins are shown for individual counties in Table 3 and by wetland type in Table 4.

Approximately 70 percent of the destroyed wetlands were 10 acres or less in size and 93 percent were 25 acres or less in size (Table 5). These basins were well distributed and by virtue of their inter-relationship with the more permanent basins, represented very important nesting habitat for waterfowl.

Table 2. Status of Original and Existing Basins in South Central Region.

County	ORIGINAL BASINS			EXISTING BASINS		
	Total Original Acres	Acres Lost	Percent of Acres Lost	Number Basins Existing	Original Acreage	Present Acreage
Adams	2,237	1,687	75.4	16	1,772	550
Butler	3,513	2,387	67.9	23	1,897	1,126
Clay	19,411	11,157	57.5	217	14,600	9,213
Fillmore	21,038	14,475	68.8	118	11,341	5,663
Franklin	2,689	936	34.8	14	2,038	1,753
Gosper	2,536	1,110	43.8	28	1,613	1,426
Hall	801	181	22.6	11	2,587	620
Hamilton	7,768	6,843	88.1	20	767	925
Harlan	1,058	627	59.2	5	936	372
Kearney	2,961	1,250	42.2	29	2,279	1,711
Nuckolls	977	653	66.8	6	633	324
Phelps	5,966	2,515	42.1	40	5,671	3,453
Polk	4,173	3,421	72.0	38	1,468	752
Saline	1,285	1,161	90.3	5	229	124
Seward	5,316	4,646	87.4	12	1,572	670
Thayer	818	753	92.1	2	445	65
York	11,494	7,713	67.1	106	7,384	3,782
TOTAL	94,041	61,515	65.4	685	57,232	32,529

Table 3. Number, original acreage*, and present acreage, by county and wetland type, still existing in southcentral Nebraska

County	T Y P E											
	I			III			IV			V		
	Number	Original Acres	Present Acres	Number	Original Acres	Present Acres	Number	Original Acres	Present Acres	Number	Original Acres	Present Acres
Adams	9	438	166	5	923	307	--	-----	-----	2	411	77
Butler	15	580	496	6	798	347	2	519	283	--	-----	--
Clay	91	2,456	1,459	74	4,984	3,160	50	7,077	4,253	2	83	10
Fillmore	71	5,388	2,680	32	3,652	2,065	12	2,252	897	3	49	21
Franklin	6	185	163	8	1,852	1,590	--	-----	-----	--	-----	--
Gosper	17	441	290	4	133	110	7	1,039	1,026	--	-----	--
Hall	5	198	116	5	448	384	1	120	120	--	-----	--
Hamilton	9	597	84	5	824	397	5	1,163	441	1	3	3
Harlan	--	-----	-----	3	576	123	2	360	248	--	-----	--
Kearney	12	261	242	14	1,788	1,163	3	331	295	--	-----	--
Nuckolls	1	98	14	2	96	70	3	439	241	--	-----	--
Phelps	19	1,387	682	13	1,658	847	6	2,598	1,902	2	47	22
Polk	21	792	406	10	542	270	2	134	74	--	-----	--
Saline	1	25	25	2	105	39	2	99	60	--	-----	--
Seward	5	264	140	4	751	224	3	557	306	--	-----	--
Thayer	--	-----	-----	1	105	20	1	340	45	--	-----	--
York	64	2,418	1,087	26	3,000	1,879	9	1,646	801	7	319	75 707
TOTALS	346	15,528	6,916	214	22,335	12,985	108	18,674	10,993	17	912	148

*original acreage of existing basins only.

Table 4. Size Classification of all existing basins by county.

County	A C R E S				
	Under 10	10 to 25	26 to 50	50 to 100	Over 100
Adams	5	4	3	3	1
Butler	6	5	6	3	3
Clay	60	75	37	25	20
Fillmore	21	41	21	22	13
Franklin	--	6	4	1	3
Gosper	6	7	6	5	4
Hall	1	3	2	3	2
Hamilton	6	3	3	3	5
Harlan	--	2	1	1	1
Kearney	8	3	5	9	4
Nuckolls	--	3	1	1	1
Polk	10	12	7	4	--
Phelps	5	12	9	4	10
Seward	1	4	1	4	2
Saline	--	2	3	--	--
Thayer	--	1	1	--	--
York	51	20	17	8	10
TOTAL	180	203	127	96	79
Percent of Basins	26.3	29.6	18.5	14.0	11.5

Table 5. Size classification of Type III, IV, V, wetlands by County.

County	Under 15 Acres			15 to 100 Acres			Over 100 Acres		
	III	IV	V	III	IV	V	III	IV	V
Adams	--	--	1	4	--	1	1	--	--
Butler	1	--	--	2	1	--	3	1	--
Clay	20	8	2	48	30	--	6	12	--
Fillmore	8	2	3	18	7	--	6	3	--
Franklin	1	--	--	5	--	--	2	--	--
Gosper	1	--	--	3	4	--	--	3	--
Hamilton	--	--	1	3	3	--	2	2	--
Hall	--	--	--	4	--	--	1	1	--
Harlan	--	1	--	3	--	--	--	1	--
Kearney	--	--	--	10	2	--	4	1	--
Nuckolls	--	--	--	2	2	--	--	1	--
Phelps	1	--	1	6	2	1	6	4	--
Polk	4	1	--	6	1	--	--	--	--
Saline	--	--	--	2	2	--	--	--	--
Seward	1	--	--	3	1	--	--	2	--
Thayer	--	--	--	1	1	--	--	--	--
York	11	2	6	8	4	--	7	3	--
TOTAL	48	14	14	128	60	2	38	34	--

Table 6. Size Classification of destroyed south central basins by county.

County	A C R E S				
	Under 10	10 to 25	26 to 50	50 to 100	Over 100
Adams	72	9	--	--	--
Butler	249	55	--	--	--
Clay	488	124	15	11	3
Fillmore	317	130	33	11	13
Franklin	73	14	4	--	--
Gosper	114	10	2	1	1
Hall	6	1	-	-	-
Hamilton	165	74	15	10	6
Harlan	29	2	--	--	--
Kearney	82	20	2	--	--
Nuckolls	25	11	2	--	--
Polk	99	76	13	4	2
Phelps	10	5	--	--	1
Seward	65	62	23	9	6
Saline	31	32	8	2	-
Thayer	--	3	4	2	-
York	428	118	14	4	2
TOTAL	2,253	746	135	54	34
Percent of Basins	69.9	23.2	4.2	1.7	1.1

The rainwater basin region, once capable of producing large numbers of ducks and providing hunting opportunities to many thousands, has lost a considerable portion of its former values. Much of the reduction of the marsh habitat has been the result of planned destruction. A lesser amount was lost to Federal and State projects occupying the area and an additional portion due to deposition of soils in the marsh through wind and water erosion.

Approximately 82 percent of the original 3,907 wetlands have been destroyed. Most of the remaining 685 basins have been adversely affected by ditch and tile drains, leveling, concentration dugouts and siltation. Deep county road ditches located around most sections have reduced the volume of water, by intercepting part of the watershed drainage. Natural run-off is the main source of water for these wetlands except for irrigation run-off and the rain that falls directly into the basin. County authorities have contributed significantly to the volume of drainage, by providing deep road ditches that are readily accessible through ditching to the nearest road.

A majority of the wetland destruction occurs as a result of attempts to gain agricultural land. Drainage efforts date back to the early 1900s and have continued to the present time. Great sums of money have been expended by land owners and tenants to ditch, dike, level, purchase right-of-way and pay costs of court actions resulting from drainage efforts. Substantial amounts of County and Federal funds have also been expended in activities designed to bring more land into agricultural production. Most of the efforts appear to have been economically unsound, but failures are commonplace. Often times the areas have lost their wetland values, but the land has flooded or remained too wet to farm. The thin layer of tillable soil over the impervious claypan results in frequent crop failures due to drouth or flooding of crops. Frustrations resulting from these failures prompted several to comment during interviews that they wished they had their investment back.

Interviews with land owners frequently reveal that substantial duck production occurred prior to destruction. Many of the landowners have lived on or had familiar association with their wetland for 40 years or more, and their recollections provide some insight into the influence that these water areas once had on their lives. Some of the deeper ones maintained fishing and boating. Waterfowl hunting was traditional in the area and brought hunters from as far as St. Joseph and Kansas City, Missouri by train.

Sandhills

The sandhills region originally contained 13,525 wetlands and 183,391 acres of wetlands, excluding extensive acreages of wet meadows (Type II) in the eastern portion.

Results of the wetlands survey of the sandhills region indicate 13,341 wetlands encompassing 155,381 acres. Table 7 gives distribution of wetlands and wetland acres by county.

Wetland occurrence is irregularly distributed throughout the sandhills. They are most numerous on the eastern and western ends. The western end supports a greater proportion of the larger lakes while smaller pothole type

marshes occur in the east. Holt and Rock Counties on the eastern end contain 27.5 percent of the wetlands but only 13.4 percent of the wetland acreage. Garden and Sheridan Counties on the western end have 15.6 percent of the wetlands but 28.0 percent of the sandhill wetland acreage.

Wetlands data presented in the various tables pertaining to the sandhills does not accurately represent classification for Type II wetlands.

Although there is an extension of the sandhills into Chase and Perkins Counties, much of the wetlands are small water-holding areas in the hardlands outside the sandhills portion of these two counties. There are 1,988 Type II wetlands, averaging 3+ acres in size that would be more accurately classified as Type I rather than wet meadows. The wetlands are generally surrounded by cropland and the basins soils are Scott silty clay loam. In Holt, Rock and Wheeler Counties, wet meadows are quite extensive, with poorly defined boundaries. It was impractical to determine those portions that would be considered wet enough to classify as wetlands. There were 137 miles of shallow drainage ditches within these counties to better drain these areas, but was not included as destroyed wetlands.

Type II wetlands (28,109 acres) accounts for 18 percent of the wetland acreage and 31 percent (4,159) of the wetlands. Thirty percent of the Type II acres occur in the three eastern counties of Holt, Wheeler, and Garfield.

Thirty-two percent (4,232) of the wetlands were classed as Type III and accounted for 18 percent of the wetland acres. Type IV marshes made up 23 percent of the wetlands and 25 percent of the acreage. While Type V lakes were the fewest in number (14 percent), they contained nearly 60,000 acres (39 percent). Tables 2 and 3 in the appendix present the number and acres of wetlands classified by type for each county. Table 8 summarizes these data.

Eighty-four percent (11,198) of the wetlands are ten acres or less in size. Only 7.1 percent (951) of Types III, IV and V are larger than 25 acres, but account for 63.5 percent (98,635 acres) of the total wetland acreage. Size classification by county and type are shown in Tables 4 through 8 in the Appendix.

Wetland destruction in the sandhill survey reveals 28,010 acres, amounting to 15.3 percent of the original wetlands. The number, acreage and size distribution of destroyed wetlands are shown in Tables 9 and 10.

Table 7. Total Number and Acreage of Wetlands by County

County	Total Acreage	Total Number	County	Total Acreage	Total Number
Arthur	5,025	309	Hooker	298	8
Box Butte	2,526	105	Keith	1,832	408
Brown	7,601	883	Lincoln	2,642	710
Chase	2,281	605	Logan	513	59
Cherry	37,065	1,262	Loup	981	180
Custer	143	59	McPherson	2,873	63
Garden	20,600	696	Morrill	4,800	276
Garfield*	3,879	34	Perkins	6,148	1,793
Grant	8,442	283	Rock	10,504	1,706
Holt	10,288	1,966	Sheridan	22,914	1,384
-----	-----	-----	Wheeler*	4,026	552
TOTAL**	97,850	6,202		57,531	7,139

* Does not include number of Type II wetlands.

**No Type I wetlands have been included in survey.

Table 8. Percentage of Total Wetland Acreage
and Number per Type

Sandhills

Wetland Type	Acreage	Percent of Total	Number	Percent of Total
II	28,109	18.0	4,159	31.0
III	28,498	18.0	4,232	32.0
IV	38,786	25.0	3,065	23.0
V	59,988	39.0	1,885	14.0
TOTAL	155,381	100.0	13,341	100.0

Table 9. Number and Total Acreage and Percent of Destroyed Wetlands per County

County	Number	Percent	Total Acreage	Percent
Arthur	15	8.0	1,341	4.8
Box Butte	1	0.5	210	0.8
Cherry	67	36.4	12,739	45.5
Garden	3	2.0	156	0.6
Grant	64	35.0	10,654	38.0
Hooker	2	1.0	222	0.8
Keith	1	0.5	70	0.2
McPherson	1	0.5	64	0.2
Morrill	2	1.0	454	1.6
Perkins	2	1.0	36	0.1
Sheridan	26	14.1	2,064	7.4
TOTAL	184	100.0	28,010	100.0

Table 10. Size Distribution of Destroyed Wetlands by County

County	0-10.0	10.1-50.0	50.1-100.0	100.1-200.0	200.1-400.0	400±
Arthur	1	4	4	6	-	-
Box Butte	-	-	-	-	1	-
Cherry	1	15	14	10	19	8
Garden	-	2	1	-	-	-
Grant	1	5	16	17	23	2
Hooker	-	-	-	2	-	-
Keith	-	-	1	-	-	-
McPherson	-	-	1	-	-	-
Morrill	-	1	-	-	-	1
Perkins	-	2	-	-	-	-
Sheridan	5	14	3	2	-	2
TOTAL	8	43	40	37	43	13

The grassland economy of the sandhill region has not demanded gross changes in the environment that have occurred in most regions of the country. Consequently, the region and its numerous (13,342) wetlands has been less affected in the century than any other large area of comparable habitat.

Recent events may bring accelerated changes to this area that could be detrimental to wetlands. Comprehensive studies currently conducted by Nebraska's Department of Agriculture, University of Nebraska Water Resources Division, and Geological Survey Division, consider water resources as an important component of potential changes for this region. An indication of the magnitude of change that is anticipated is reflected in a recent preliminary report by The University of Nebraska. It recommends one or more sites be set aside to preserve the character of the sandhills for future generations.

Although the region has retained most of its long time character and environmental quality, there are potentially harmful activities being considered. There is a great need for comprehensive planning before experts in their individual fields apply their newly acquired knowledge and technical advances to produce profound changes without regard to the impact on environment, and on the water resources. To insure wise decisions at decision making time, community leaders, public officials and other citizens should be made aware of wetland values, and the far reaching, indirect effects, that the destruction will have on a habitat already in critical supply.

Efforts should be made to educate all persons toward developing an appreciative attitude toward all natural resources, especially those of critical status. There are dangers that programs will be fostered that produce short term benefits to relatively few at the expense of long term adversities. There are dangers of not only losing quantity but quality through abuse or contamination. Chemicals applied extensively and contaminating land in other areas, are likely to leach through the sandy soils to contaminate underground water supplies for ages to come.

The sandhills, with its 155,000 acres of wetlands contributes significantly to those many values emanating from their existence. Their contribution to waterfowl alone, extends beyond the region or state to the flyway and nation and the North American Continent. The large amount of wet meadow with its watertable close to the surface offers the potential of additional wetland development through level ditching.

Increased emphasis, nationally and internationally and in Nebraska is being placed on preserving the wetland resource.

Wetland Losses

Although improvement in public attitude towards the environment has occurred in recent years, the attitude that wetlands are waste areas to be eliminated still prevails in some sectors of society. Drainage of wetlands and the elimination of the marsh habitat which supports many forms of wildlife remain as one of the most serious problems facing federal and state conservation agencies.

Wetlands in Nebraska have been subjected to some of the same destructive forces that have eliminated so many aquatic habitats throughout the continental prairie pothole region.

Information on the number and acreage of wetlands formerly present and the current status, within the two survey areas are presented in Table 11.

Table 11. Status of wetlands - south central rainbasin and sandhills

	Original Number Wetlands	Present Number Wetlands	Number Destroyed	Percent Present
South Central	3,907	685	3,222	17.5
Sandhills	13,425	13,241	184	99.3
TOTAL	17,332	13,926	3,406	80.9

	Original Acres	Present Acres	Acres Destroyed	Percent Present
South Central	94,063	32,529	61,534	34.6
Sandhills	183,391	155,381	28,010	84.7
TOTAL	277,454	187,910	89,944	67.7

The greatest loss of wetlands has occurred in the rainbasin region, where 82 percent of the wetlands and 65 percent of the wetland acreage have been destroyed. Highway, airport, reservoir construction and refuse dumping have destroyed some, but the main cause has been for gaining additional agricultural land. Relatively level terrain and fertile soils make this an area of intensive agricultural use. All of the wetlands have been affected through direct efforts at draining and filling, or indirectly through deposition of silt. During the "dust bowl" years of the 1930s, residents estimate as much as two to three feet of wind-blown soil was deposited in some of the basins. Deep silt loam soils of the surrounding watershed make possible the practice of filling the basin and leveling the land for irrigation farming. About one-fourth of the 3,222 totally destroyed basins have been filled and leveled. Drainage and attempted drainage by tile and open ditch have continued since before 1900. Deep-well irrigation from a vast underground water supply was greatly accelerated following World War II and was accompanied by increased drainage and leveling attempts. In addition to the totally destroyed basins, the original acreage of the existing basins has been reduced by 43 percent. Quality as well as quantity has been lost. In an area where seasonal drouths are commonplace, drainage efforts may only reduce the water holding capacity and not destroy the wetland, but cause it to be dry earlier in the year. Many of the basins currently classed as Type I were Type III and IV prior to drainage attempts. Quality is also affected by deposition of silt causing muddy water that inhibits aquatic plant growth.

The smaller rainwater basins have suffered the most. Seventy percent of the destroyed basins were smaller than ten acres, and 93 percent were 25 acres or less, Table 4.

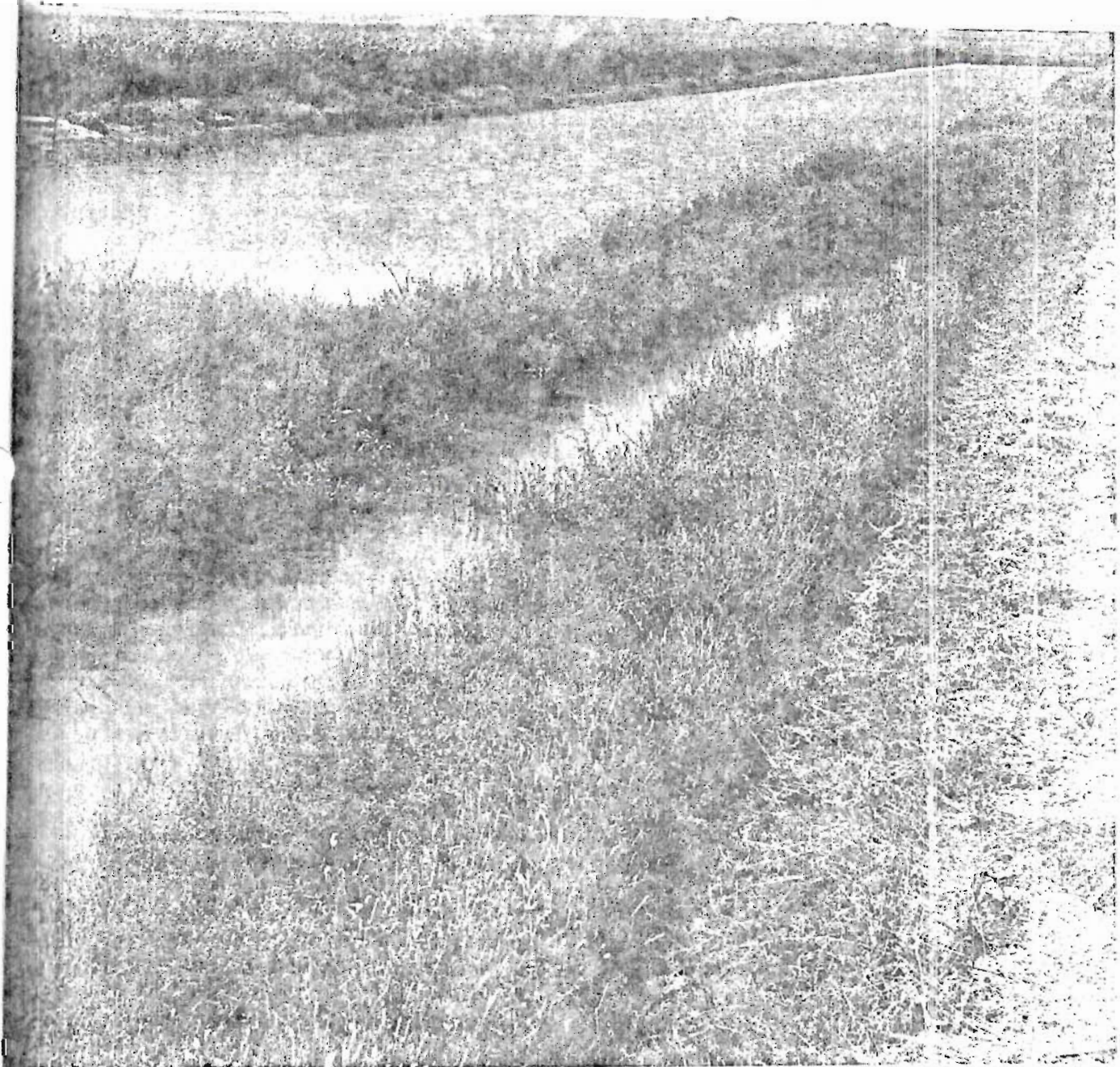


Figure 9. This 20 foot deep dugout, 550 feet by 50 feet destroyed most of the waterfowl value of this marsh. This is a common practice in the rainwater basin area.

Causes of Destruction

To counteract forces that result in wetland destruction, it is important to know the factors influencing the decision to destroy.

Three over-riding factors are: (1) lack of knowledge of the worth of a natural wetland; (2) dollars--both those involved in removal of the wetland and those resulting from their removal; and (3) failure to recognize and exercise one's responsibility to natural resources.

All too often, the basis for judging the worth of a wetland is the dollar value or dollar return. This is because of failure to recognize ones responsibilities and because other values are less specific than numerical denominations expressed as dollars. Yet life's enriching components are less precisely defined, in fact, we frequently are not cognizant of what it was that "made our day".

The factors that precipitate the final decision to invest effort and money to get rid of a marsh by an individual land owner have the greatest immediate importance.

About 70 percent of the destroyed basins were ten acres or less and were destroyed because of a nuisance factor. Irrigated farming became a way of life, and level fields were essential. Marshes within fields to be irrigated were filled and leveled from the deep loess soils of the upland. Nineteen percent of the wetland acreage destroyed was due to leveling.

National recognition of wealth gained through exploitation of natural resources developed a philosophy that this was not only acceptable but represented a resourceful individual. The popular view that a natural marsh constitutes some horrible swamp hazard, and therefore a menace to humans, helped place the marsh in low regard if not undesirable. In this light, some individuals sought removal of wetlands.

Mechanization made it possible and economic demands made it desirable to farm more acres. Some landowners sought additional acreage by draining their wetlands.

Many wetlands did not lend themselves to drainage or leveling unless extensive and expensive measures were taken. Some County Governments accommodated farmers by providing deepened road ditches that created a drainage way. This practice resulted in the drainage or partial drainage of large numbers of wetlands.

Federal programs administered by agricultural agencies provided technical and financial assistance to remove wetlands. Individuals within these agencies advocated and promoted wetland destruction when contacting land owners with wetlands.

Private contractors with heavy earth moving equipment solicited contracts with farmers owning wetlands for off-season jobs when their equipment was not in use. This practice destroyed a substantial number of wetlands until curbs on federal participation and objections from state and

federal wildlife agencies caused this to be unproductive.

Public works programs (highway construction, military installations, airports and urban development) contribute to additional wetland losses. Public official's indifference to public works programs, as well as industrial development requests, that result in permanent loss of this natural environment helps perpetuate an attitude that these areas are of little or no importance. Until public and community leaders recognize their values, little progress can be made toward changing the public attitude.

Those leaders delegated and entrusted with authority to make decisions that are in the best interest of the community must make decisions that preserve the environmental qualities or minimizes undesirable effects on that environment. These persons have the greatest influence on the decisions that result in preservation or destruction of our natural assets. They should lead the way in promoting public appreciation and desirability of preserving natural wetlands. Prevailing public sentiments are the result of their attitudes and actions.

Quality of Wetlands

Each wetland type has some value to waterfowl and other forms of aquatic life. Some are in more critical supply than others, and therefore, are of greater concern to those responsible for the waterfowl resource. This report is primarily concerned with prairie inland fresh water marshes that provide the primary waterfowl production habitat as well as providing migrational and harvest areas.

When Types I and II have water, they have great attraction for ducks. Due to the lack of permanency of water, they are not considered to be as valuable as Types III, IV and V. However, in association with the more permanent types they increase breeding pair capacity by enlarging territorial space and enhancing attraction to the wetlands complex.

Type III which are shallow fresh water marshes and Type IV classified as deep fresh water marshes are the most important breeding habitat for the prairie regions of North America. Type V which are open fresh water lakes in addition to providing important breeding habitat are used extensively as brood rearing areas, especially during drouthy summers. Breeding habitat has been the target of wetlands destructive forces. It is the most critical of the wetlands needs for ducks.

Table 12. Number and Acreage of Wetlands by Type. *

Wetland Type	Number	Percent	Acres	Percent
I	349	2.5	7,221	3.9
II	4,159	29.7	28,109	15.1
III	4,444	31.7	41,183	22.1
IV	3,173	22.6	50,109	26.8
V	1,902	13.6	60,132	32.2
TOTAL	14,027	100.1	186,754	100.1

*sandhill and rainbasin surveys combined.

Table 13. Size classification of wetlands by type.

Wetland Type	1-10 acres	10-25 acres	25-50 acres	50-100 acres	Over 100 acres
III	3,722	401	158	91	72
IV	2,493	269	163	132	116
V	1,264	224	137	128	149
TOTAL	7,479	894	458	351	337

*sandhill and rainbasin surveys combined.

Public Ownership

The majority of wetlands are in private ownership. Of the 187,910 acres of wetlands in the two survey areas, 13.3 percent representing ~~325,265~~ 24,992 acres are under state or federal ownership. Two large National Wildlife Refuges account for 14,980 acres or 59 percent of the public-owned wetland acreage. The Game and Parks Commission owns all or parts of 17 wetlands totaling 4,011 wetland acres. Eleven of these are in the sandhills and five in the rain-basin region. Three thousand six hundred acres of upland surrounding the 17 wetlands are also owned by the Game Commission. These data are presented in Table 14.

Table 14. State-owned wetlands within survey areas.

County	Area Name	Acres State-owned Wetland	Upland	Percent of Wetland Owned	Survey Code Number
Phelps	Sacramento	1,053	1,260	100	69-32
Phelps	West Sac.	120	200	85	69-8
Harlan	South Sac.	82	85	31	42-1
Harlan	Southeast Sac.	120	54	72	42-2
Nuckolls	Smartweed Marsh	34	6	54	65-2
Brown	Long Lake	50	30	32	C-1-22
Brown	South Twin	53	107	100	C-1-16
Brown	AGA	120	40	100	C-1-13
Cherry	Big Alkali	842	47	100	G-13-28
Cherry	Ballards	600	960	73	F-13-1
Cherry	Willow Lake	270	170	87	F-13-22
Cherry	Cottonwood Lake	60	100	100	K-5-21
Cherry	Rat & Beaver Lakes	38	204	9	E-12-25
Holt	Goose Lake	300	49	95	A-6-26
Sheridan	Smith Lake	220	200	100	E-3-15
Sheridan	Walgren Lake	50	80	60	H-2-29
<i>Holt</i>	<i>Painted Marsh</i>	<i>200</i>	<i>83</i>		
TOTAL	17	4,011	3,592		

All or parts of 38 rainwater basins have been purchased by the U.S. Bureau of Sport Fisheries and Wildlife to safeguard production habitat. These acquisitions encompass 6,274 wetland acres and 6,000 acres of upland.

Numerous other waters are under state ownership throughout the state. These are primarily man-made impoundments and small segments of streams. Lease arrangements associated with several large reservoirs provide public access and use of these waters.

Forty-three or about 6 percent of the rainwater basins are at least partially in public trust. Only seven are totally controlled and the remainder are still in jeopardy of destruction, however dangers have been reduced. Public ownership in this area accounts for 7,723 of the wetland acres which represents nearly 24 percent of the total in the area.

Other Wetlands

An estimated three percent of the natural upland marshes occur outside the survey areas. Nearly all are Type I and III wetlands, occurring in scattered isolated situations. They receive heavy spring use by ducks and in some instances geese, and shore birds. They provide duck hunting opportunities when water is present in the fall. Most are located in Platte, Merrick, Lancaster and Saunders Counties in the east and Antelope County in the northeast and Scotts Bluff County in the west.

Figure 10 and Tables 15 and 16 provide distribution and statistical data relating to major stream courses and impoundments.

Table 15. Linear miles and acreage of water of major streams.

Name	Miles	Acres
Missouri River	377	28,290
Platte River	556	22,450
Republican River	333	3,480
Niobrara River	390	6,995
Loup River System*	1,034	9,600
Elkhorn River	284	4,230
Blue River System**	634	1,380
Cedar River	147	1,480
TOTAL	3,755	77,905

* includes Calamus and Dismal Rivers

**includes Turkey Creek, North and West forks of Big Blue River and the Little Blue River.

All rivers provide habitat utilized by waterfowl during one or more seasons of the year. Each river except the Republican produces a few duck broods. The river systems provide spring and fall migrational habitat and harvest opportunities. Various locations throughout the length of the Platte River support a total of 100,000 to 250,000 wintering mallards; up to 7,000 Canada geese over winter on the western Platte River and as many as 700 Canadas remain at locations between Lexington and Columbus. (Fig. 11).

The 16 more important impoundments and the complex of 13 Salt Valley watershed lakes contain 113,000 surface acres of water. All accommodate large numbers of waterfowl sometime during the year primarily spring and

fall migration and about half of them accommodate over-wintering populations of mallards, mergansers, goldeneyes, and some Canada geese. Merritt reservoir located on the Snake River in Cherry County provides habitat for a small number of duck broods each year. All provide waterfowl hunting opportunities either directly or indirectly by holding birds in an area. Lakes Minatare, Babcock and Burchard and some of the Salt Valley lakes are waterfowl refuges.

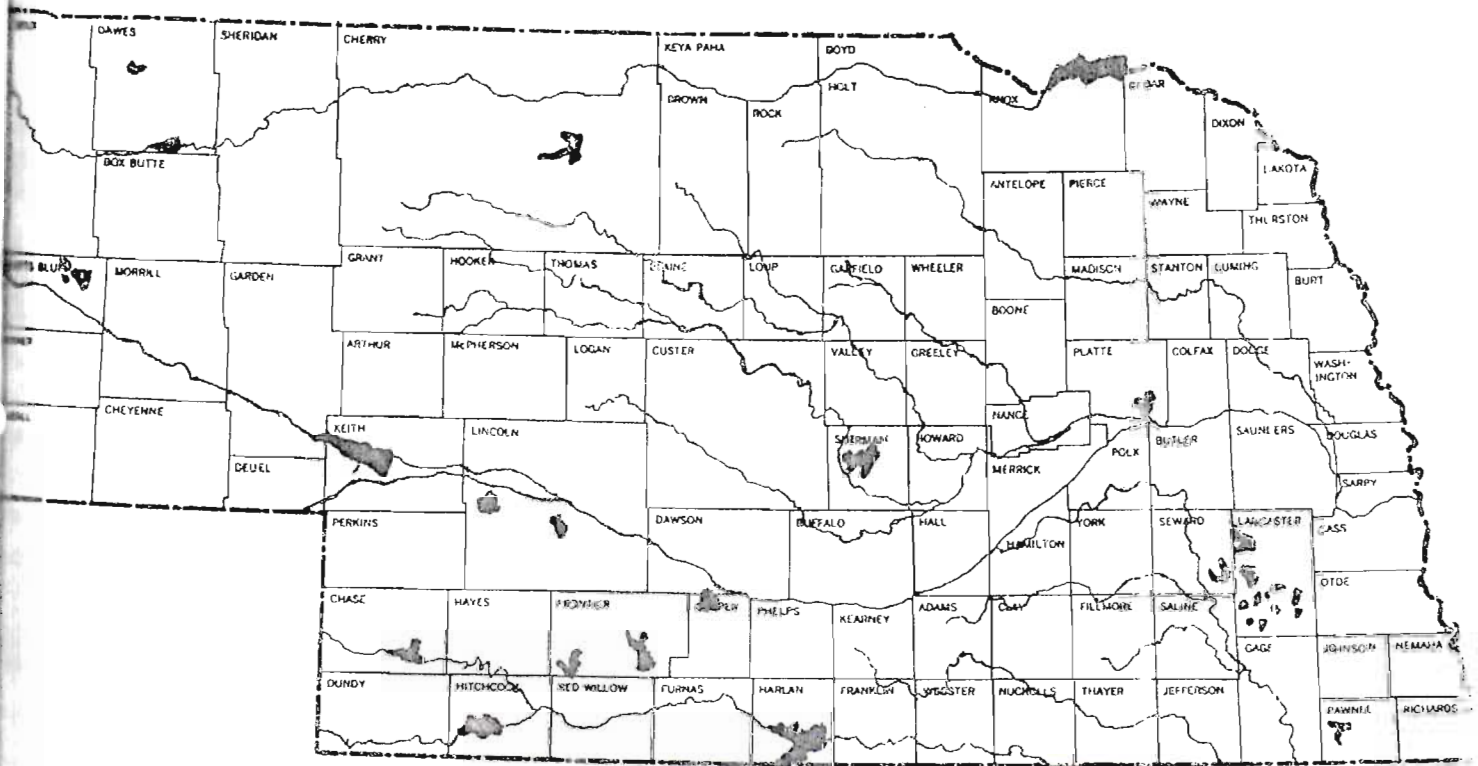


Figure 10.
Location and distribution of major lakes
and
river systems in Nebraska

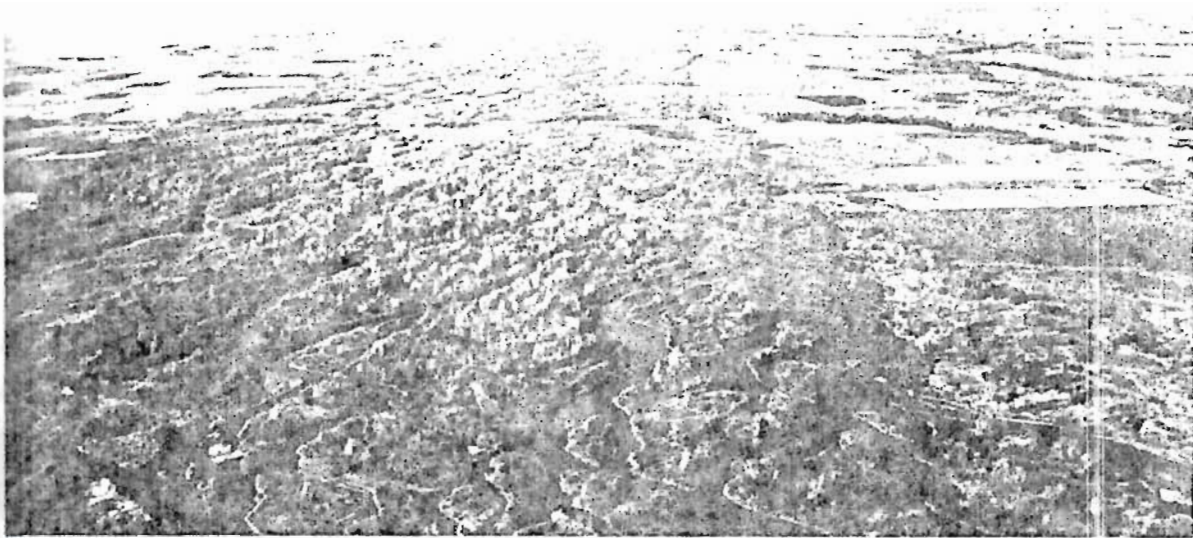


Figure 11. The Platte River near Kearney in the South Central part of the state showing its numerous channels and sandy towheads.

Table 16. Major impoundments and surface acres.

Name	Surface Acres	Name	Surface Acres
McConaughy	35,000	Enders	1,710
Gavins Point	31,000	Red Willow	1,630
Harlan County	13,460	Maloney	1,650
Swanson	4,975	Box Butte	1,600
Minatare and Alice	3,140	Babcock & L. North	1,100
Sutherland	3,020	Merritt	2,900
Johnson	2,800	Whitney	920
Sherman	2,680	Burchard	163
Medicine Creek	1,850	13 Salt-Wahoo	4,363
		TOTAL	113,963

A survey of farm ponds compiled by the soil conservation service indicates 40,270 ponds and 980 sand pits were present in 1968, with a combined surface area of 64,630 acres. Their value to waterfowl is primarily limited to providing resting areas during migration and as harvest areas in the fall. Because of their large number and wide distribution they provide occasional harvest opportunities for several thousand persons who do not have access to primary waterfowl harvest areas. Probably no more than one percent of the farm ponds contribute to duck production in a given year. With the exception of 172 ponds (480 surface acres) in the Oglala National Grasslands of northern Sioux and Dawes Counties, nearly all farm pond type impoundments are privately owned. Most of the Grassland ponds have emergent aquatic vegetation that attracts nesting ducks in fair numbers. They are subject to reduction in numbers and quality during drouth years.

A wetland type which is in very limited supply is the warm water seeps, drainage ditches and return irrigation ditches which are confined to the Platte River Valley. These areas rarely freeze even in the coldest winters and accommodate large numbers of wintering mallards. These are located principally in the following counties: Scotts Bluff, Lincoln, Gosper and Phelps, Polk, Dodge, Douglas and Saunders.

SUMMARY

1. Wetlands inventory objectives were to: determine the quantity, quality and distribution of wetlands in Nebraska, and to determine a priority of wetlands for acquisition.
2. Soil survey maps of counties, visual inspection, and landowner interviews and aerial photos, were sources of information.
3. There are 685 wetlands, containing 32,530 acres, remaining of an original 3,907 rainwater basins and 94,040 acres.
4. Eighty-two percent of the basins and 65 percent of wetland acres have been destroyed.
5. Drainage has accounted for most of the destruction, but leveling of basins for irrigation purposes has been substantial.
6. Seventy percent of destroyed basins were 10 acres or less.
7. Three hundred forty-six basins comprising 6,916 acres are Type I wetlands, 214 with 12,935 acres are Type III, and 108 Type IV have 10,993 acres.
8. Twenty-six percent of the basins are less than 20 acres, 56 percent are 25 acres or less, and 25.5 percent are over 50 acres.
9. Forty-three basins are at least partially in public ownership, accounting for 23.7 percent (7,723) of the wetland acres.
10. There are 13,340 wetlands, encompassing 155,380 acres in 23 Sandhill counties surveyed.
11. One hundred eighty-five wetlands comprising 28,018 acres have been destroyed in the Sandhills.
12. Drainage by ditching and pumping out of the lake account for nearly all of the destruction in the Sandhills.
13. Fifty percent of the destroyed Sandhill wetlands were over 100 acres in size.
14. Thirty-one percent (4,159) of the wetlands comprising 28,100 acres (18 percent) are Type II wetlands, 32 percent are Type III comprising 18 percent of the acres. Type IV accounts for 23 percent of the wetlands and 25 percent of the wetland acreage, 1,885 (14 percent) are Type V and they contain 60,000 acres (59 percent).
15. Eighty-four percent (11,200) of the wetlands are 10 acres or less.
16. Only seven percent (951) of types III, IV, and V are larger than 25 acres, but account for 63.5 percent (98,600) of the wetland acreage.

APPENDIX A

RAINWATER BASINS WETLANDS

Table 1. Number and acreage of destroyed basins in south central Nebraska.

County	Number Basins	Total Acres	Acres Drained	Acres Leveled
Adams	81	465	327	138
Butler	304	1,616	1,324	292
Clay	641	5,625	3,859	1,766
Fillmore	504	8,797	6,911	1,886
Franklin	91	651	627	17
Gosper	128	923	334	278
Hamilton	270	5,181	3,986	1,195
Hall	7	34	9	12
Harlan	31	122	63	56
Kearney	104	657	527	130
Nuckolls	38	344	314	30
Phelps	16	295	295	-----
Polk	194	2,705	1,977	728
Saline	73	1,056	958	308
Seward	165	3,744	2,910	834
Thayer	9	373	268	105
York	566	4,243	2,585	1,505
TOTAL	3,222	36,831	27,274	9,280

74%) 25%

Good
 50%
 at 50%

ADAMS COUNTY

Located about midway east to west in the rainwater basins region, Adams County divides the eastern wetlands from the western group. The Little Blue River and tributaries drain most of the county, leaving an area pretty much devoid of basins that separates the eastern from the western groups. Most of the basins in the county are located east and north and northwest of Hastings. Basins with Fillmore silt loam soils were formerly numerous northwest from Hastings, but nearly all have been eliminated as wetlands today.

Sixteen of the original 97 wetlands inspected are still in existence. Most of these have been altered by drainage, leveling and diking. These originally contained 1,772 acres of wetland, but are now confined to 550 acres. Destruction was due to 148 acres leveled and 1,073 drained. The two largest basins are on the southeast edge of Hastings (77 acres) and about five miles southeast (155 acres). The Schutte basin (four miles north and three west of Hastings) has 52 of the remaining 82 acres enclosed by dike and is used for a commercial fish hatchery. The Glenvil Basin is included in the Clay County writeup although it straddles the Clay-Adams County line. Of the sixteen existing basins, five are under 10 acres and nine are under 25 acres. One basin is over 100 acres. Five of the basins are now classed as Type I wetland, originally comprising 410 acres and now containing 138 acres. Only five Type III basins remain, containing 307 acres of an original 923 acres. There are two Type V basins, and no Type IV basins. All are privately owned.

Eighty-one visited basins were destroyed. All of these were under 25 acres, and 72 were under 10 acres. An additional 55 small basins are shown on the soil map of Adams County that were not visited. All were Fillmore soils (less permanent than Scott soils) and all but two appear to be less than 10 acres. Thirty-five of these were scattered through the southern two tiers of townships in the level uplands between natural drainages. The 81 basins destroyed comprised 465 acres. Of the 1,687 acres destroyed, 286 have been leveled.

In addition to the natural wetlands, there are 302 farm ponds, with 450 acres of water, and six sand pits.

BUTLER COUNTY

Butler County is situated in the extreme northeast corner of the rainwater basin region. The level uplands containing numerous shallow basinlike depressions extend into the county from the west and southwest to just east of David City in the center of the county. Polk County borders on the west and Seward County on the south. The Platte River forms the northern boundary.

Slightly less than one-fourth of the county embraces the flat upland portion containing rainwater basins. All but 12 of the original 327 wetlands were less than 25 acres in size; three were over 100 acres and six

over 50 acres. The basin soils are Scott silt clay loam and Butler silt loam. The Scott soil basins are commonly a little deeper and covered with water longer than Butler soils. The soil survey of Butler County (1927) gives the acreage of Scott soils as 5,690 acres and Butler soils as 8,000 acres (about 3½% of county total).

Only 23 of the original 327 wetlands are still in existence. Of the 304 destroyed basins, all were under 25 acres, and 249 were less than 10 acres. They totaled 1,616 acres, of which 1,324 have been drained or concentrated in ditches and 292 acres have been leveled.

Although this part of the rainbasin area receives somewhat greater rainfall than the more westerly counties, most of the basins are small and shallow with small watersheds. Twelve of the 23 existing basins are Type I, comprising 417 acres; three are Type II with 79 acres. Eight of the remaining basins are Type III and IV. Six Type III originally contained 798 acres and presently have 347 acres, and range in size from 14 to 126 acres. Two Type IV basins (Code Nos. 12-9, 12-10) have been reduced in size from 48 acres to 33 and from 471 acres to 245 acres. Both of these wetlands merit consideration for acquisition. There are no public wetlands in Butler County, which enhances the desirability of acquiring. Both have duck production, which could be increased with development. Four other basins in the vicinity of these two (12-1, 12-7, 12-11, 12-15) could also be considered in this same complex, for wetland preservation and public recreation. They are all situated between Rising City and Surprise.

Every basin has had some work (diking, ditching, dugouts, etc.), but several could have their value to waterfowl increased with G-2 practices. Two landowners expressed desire to develop their wetland for fish and wildlife.

Butler County has 349 man-made ponds and sandpits, in addition to the natural wetlands totaling 334 acres.

CLAY COUNTY

Clay County is located in the heart of the rainwater basin region. It contains the greatest number of wetlands and more wetland acreage than any of the south central counties. Only Fillmore County originally had more wetland acreage (21,040 to 19,410) than Clay County, but has had less wetlands destroyed than Fillmore.

Crete and Hastings silt loams are the predominant soils in the county and are intensively cultivated. Basin soils are Scott silty clay loam, Fillmore and Butler silt loam. Thick gravel and sand deposits from 60 to 120 feet below the surface supplies water for extensive well irrigation in the county. Heavy withdrawals for irrigation have caused ground water levels to decline more than five feet over most of the northern half of the county. The decline has been most pronounced in the northeastern portion. Surface drainage is effected through the west fork of the Big Blue River in the northwest and the Little Blue River in the southwest. School Creek and

Sandy Creek headwaters near the western boundary and leave the county on the east. These are dry intermittent streams except near the eastern boundary. Numerous shallow wetland basins occur on the level upland plain between these natural drainages. Although they occur generally throughout most of the county, they are most numerous in the eastern half, and particularly in the southeast quarter. The Hastings Naval Ammunition Storage Depot occupies approximately 68 square miles of the west central part of the county. Many of the basins were leveled when the area was developed for ammunition storage during World War II. In 1969 the area was transferred to the U. S. Department of Agriculture for a meat animal research center. One large wetland (McMurtrey Marsh) and adjoining upland containing 1,059 acres was transferred to the U. S. Fish and Wildlife Service for protection against destruction. There are nine man-made impoundments on the area ranging from 2 to 42 acres. Numerous dugouts and borrow pits remain as a result of earth removal to cover the storage magazines. These provide attractive production sites for blue-winged teal during wet years.

Clay County ranks as the top duck producing county among the 17 south central rainwater basin counties. Nearly one-fourth of the natural wetland acreage is located within its boundaries. The interaction of associated wetlands is greatest here, providing a high duck producing and duck harvest capability.

Two hundred and seventeen natural wetland marshes comprising 9,200 acres are still in existence. Of these, 124 containing 7,744 acres are Type III and Type IV marshes. An additional 91 Type I marshes are present. Table 12 gives a breakdown of existing acreage by wetland type.

More than 600 (641) wetlands comprising 5,625 acres have been destroyed. Nearly all of the 217 existing basins have been adversely affected by reduction in size and quality. The original wetland acreage of these basins has been reduced from 14,600 to 9,200 acres. Many of those now classified as Type I were originally Types III and IV. Several factors account for this: deposition of silt by wind and runoff water, leveling of portions of the marsh, incomplete drainage, reducing watershed due to deep road ditches intercepting runoff. Drainage (primarily by ditch) was the most conspicuous means of eliminating the wetlands. About two-thirds of the wetland acreage has been destroyed by this means. Filling and leveling accounted for 16 percent (3,118) of the 11,012 acres of wetlands destroyed. Three-fourths of the destroyed basins were ten acres or less and 95 percent were 25 acres or less. Only three of the 641 destroyed basins were over 100 acres.

Sixty (27%) of the 217 basins in existence are ten acres or less and nearly 62 percent (135) are 25 acres or less. Forty-five are larger than 50 acres and 20 of these are over 100 acres, and seven over 200 acres. The two largest are the Massey Basin (545 acres) and the Harvard basin (487 acres). Massey is located three miles south and one mile east of Clay Center and Harvard is three miles west of Harvard.

Farm ponds and grade stabilization structures number 398 in Clay County, comprising 990 surface acres. There are no large reservoirs in the county.

All or parts of 12 wetlands have been acquired by the U. S. Fish and Wildlife Service as part of a program to preserve waterfowl production areas, as of June, 1970.

Excluding the 1,059 acres (345 acres of marsh) transferred from the Hastings Ammunition Depot to the U.S. Fish and Wildlife Service, the acquired areas (wetland and adjoining upland) range in size from 35 acres (Albreeding Lagoon) to 669 acres (Massey Lagoon). The area acquired in Clay County totals 3,435 acres of which 1,531 are wetland acres. There are no state or publicly owned natural wetlands in the county. Many of the remaining wetlands exist under threat of destruction and there is a need to preserve these through acquisition, or other means that would insure their continued existence.

Developing a priority list in descending order of priorities encompasses many considerations that rearrange their values in various programs with different objectives. Therefore, the following list of wetlands that are recommended for purchase considerations are not in exact order of priority, but relates to its general position in the list.

Wetlands for Acquisition Consideration - CLAY COUNTY

Code No.	Location	Size (acres)		Comments
		Original	Present	
18-10	6 S., 3.5 E. Clay Center	364	190	Good production area - owner has 2 quarters with most of water.
30	6 E., 4 S. Clay Center	121	113	one of best production areas in 2 sections - drainage not likely
22	4 W. Edgar	342	254	IV - large, flat basin - silting - big watershed
27	2 E., 1 S. Clay Center	41	41	One of best production areas 4 owners - for production area only
34	3 E., .5 N. Edgar	89	40	Excellent production area
29	6 E., 3 S. Clay Center	35	35	IV - now has dugout in it. DeJung one of better basins
80	5 N. Ong	55	55	IV - excellent basin - good one of best marshes
97	2 E., 4 N. Edgar	119	88	IV - excellent basin - good production area
5	1 N., 3 E. Harvard	495	282	III - large - good production drainage would be expensive - leveling possible
19 & 20	2 E., 3 S. Clay Center	144	31.1 63 17.1	III & IV .5 SE of Massey - 2 sides of road. High use - fair production
42 & 43	6 N., .5 W. Edgar	47	24	IV - 2 small but excellent production areas might be preserved with 60 acre tract
26	3 S., 3 E. Clay Center	41	11	IV excellent - 1 S. of U.S. Fish & Wildlife Service Moger
77	4 N. Ong	117	71	III on county line - is part of #20 in Fillmore - reported good production
70	2.5 S., .5 W. Sutton	134	71	IV excellent production area somewhat isolated
74	7 N. Ong	117	117	IV - fish stocked - manageable production area - First Trust Co. York has NE 1/4
95	2.5 N. Ong	110	72	IV one of best - on county line #1.8 in Fillmore
35	1 E., 4.5 N., Edgar	145	93	IV - overland - owner values for hunting - good production area
111	.5 N. Fairfield	220	82	IV - Fairfield basin - good basin but involved - Kissingers'
3	4 E., 1 N. Fairfield	49	49	IV - excellent production area - merits consideration
75	4 N. Ong	177	148	IV - less than mile NE of U.S. Fish & Wildlife Service Hansen - attractive veg. good production marsh
79	5.5 N., .5 E. Ong	94	94	III - reportedly good production area

Wetlands for Acquisition Consideration - CLAY COUNTY (continued)

Code No.	Location	Size (acres)		Comments
		Original	Present	
32	3 S., 4.5 E. Clay Center	145	87	IV - lots of open water heavy duck use other than production
33	4.5 S., 5 E. Clay Center	41	38	IV - drainage not likely might consider emergents W. of road E. side open
18-34	3.5 S., 5 E. Clay Center	62	42	IV - 1 S. of #33 - drainage not likely soon-should consider
46	6 N. Edgar	41	19	IV - excellent basin
110	2 E., 3 N. Edgar	76	46	III - Should be considered if others in area are considered
117	4 S. Clay Center	90		Might consider along with 116 with Massey complex
120	3 S., 1.5 E. Fairfield	174	170	IV somewhat isolated but quality basin
85	3 W., 2.5 N. Ong	69	69	IV - Andersons - not for sale - nor endangered as long as present owner
100	1.5 N. Ong	112	74	IV - merits consideration
107	4 E., 4 N. Edgar	24	22	III - consider for preservation
94	3 W., 4 N. Ong	55	55	IV - to be considered
123	4 W., 1 N. Fairfield	276	201	IV - large - somewhat isolated good production - part of 3 sec
109	3 E., 4.5 N. Edgar	155	155	III - should be considered 3 other basins nearby
52	2 E., 3 N. Edgar	77	46	III - good production - owner found 22 BW Teal nests in 1960 while killing weeds
64	5 S., 2.5 E. Sutton	19	19	Small - somewhat isolated but excellent production area

FILLMORE COUNTY

Located in the east central heart of the rainbasin region, Fillmore County is one of the highest duck producing counties. Numerous fingers of natural drainageways have cut back into the nearly level loess uplands until a large proportion of the basins are within relatively short distances of one of these extensions. Turkey Creek headwaters near the western boundary and crosses the central part of the county west to east. The south fork of the Big Blue River in the northwest and Sandy Creek and tributaries in the south and Indian Creek in the northeast provide the major drainages for disposal of water from these eroded extensions into the loess mantle, that form the uplands where the basins occur. Silt loam and silty clay loam of the Hastings and Crete series are the predominant soils of the county. These are excellent ag soils accounting for the intensive agriculture occurring throughout the county. Basin soils are Scott silty clay loam, Scott silt loam and Fillmore silt loam.

Although Fillmore County, once capable of producing large numbers of ducks, has lost much of its original potential, it ranks second in duck producing capabilities among rainbasin counties. Only Clay County has more wetland habitat.

More than 500 wetlands have been destroyed and most of the 118 existing have been adversely affected by ditch and tile drainage, leveling, concentration dugouts, and siltation. County authorities have contributed significantly to volume of drainage, by creating deep road ditches around sections where drainage ditches to natural drainages are not economically feasible and/or legal obstacles prevent access across private lands. Many of the Type I wetlands included as existing basins have been reduced from Type III or IV to a wet meadow and a dugout or road ditch with deeper more permanent water. Some of the 504 wetlands classed as destroyed are imperfectly drained and during wet periods provide small wet areas in association with permanent road ditch water. There is a limited but unmeasured amount of duck production occurs at these sites.

Nearly all of the wetland destruction is the result of attempts to gain more agricultural land. Drainage efforts date back as far as the early 1900s. Great sums have been spent in the county to ditch, dike, level, purchase right of way, and to pay costs of court actions resulting from drainage efforts. Most appear to have been economically sound, but the failures are commonplace. Many areas have lost their wetland value, but the land remains too wet to farm, or if farmed, crop losses due to flooding or drying up have provoked such comments as "wish we had our money back and the water was still there". One man who has successfully farmed part of his former wetland expressed his view as being "for bigger and better ditches".

The 504 destroyed wetlands originally contained 8,797 acres, of which drainage accounted for 6,911 acres and leveling 1,886 acres. Eight hundred acres of the original acreage of existing basins has also been leveled, making a total of 2,686 acres leveled and the total acreage destroyed by drainage is 12,601 acres. As is true throughout the rainbasin area, most of the destroyed basins are the smaller ones. Sixty-four per cent (317) were less than 10 acres, 447 were under 25 acres. Eleven ranged from 50 to 100 acres in size, and 13 were over 100 acres.

One hundred-eighteen existing basins originally comprising 17,005 acres of wetland, presently contain 11,340 acres. Of the 5,663 acres destroyed, 4,878 acres were lost to drainage and 800 acres to land leveling. Twelve of the wetlands are over 100 acres, five are over 200 acres. The largest is located about two miles northwest of Shickley and is 436 acres. These twelve basins account for 21 percent of the total existing wetland acreage in Fillmore County. Twenty-two basins range in size from 50 to 100 acres, and 64 are less than 25 acres. Twenty-seven basins presently classed Type I and 44 Type II contain 2,680 acres, slightly less than one-half their original acreage. Many of these were originally Type III and IV. Thirty-two Type III wetlands contain 2,066 acres, 1,586 less than their former acreage. Twelve Type IV basins have been reduced in acreage from 2,252 to 896 acres. There are three Type V with 21 acres.

All or parts of seven wetlands in Fillmore County have been acquired by U. S. Fish and Wildlife Service, as waterfowl production areas. A basin on the York-Fillmore County line is included with York County although 168 acres on the Fillmore side have been purchased. Acquisition of the seven wetlands totals 2,074 acres (1,434 acres of wetland - 640 acres of upland).

Federal Waterfowl Production Areas, Fillmore County

Name	Location	Wetland Acres	Total Acres
Rauscher Lagoon	2 S, 2.5 W Grafton	99	250
Wilkins Lagoon	1 E, 1 S Grafton	474	529
Krause Lagoon	4 W, 3.5 N Shickley	159	277
Weis Lagoon	2 S N Shickley	117	160
Mallard Haven	2 N Shickley	468	665
Rolland	2 E, 1.5 S Sutton	58	128
Murphy		58	62

There are no other publicly owned wetlands in Fillmore County. There is a need to acquire additional areas, as well as complete the purchase of those individual basins not entirely controlled at this time. Preservation of additional wetlands through acquisition is not likely to include all of the comparatively small number of remaining areas. Developing a priority list in descending order of priorities encompasses many considerations that rearrange their values in various programs with different objectives. Therefore, the following list of wetlands that are recommended for purchase consideration are not in exact order of priority, but relative to their general position in the list.

Wetlands for Acquisition Consideration - FILLMORE COUNTY

Code No.	Location	Size (acres)		Comments
		Original	Present	
30-5	4 W., 1.5 N. Shickley	332	298	ditch drained ineffectively 3 dugouts - close to other basins need small develop- ment
30-2	2 S. Shickley	412	5	Would make excellent area if drain plugged - difficult to farm now
30-1	2.5 S. Shickley	235	36	6" tile drain - could be ex- cellent production and hunt area - near by basins
30-3	3.5 S., 1 W. Shickley	85	64	one of better basins - land locked Type IV - farmer interested
30-56	.5 NW Grafton	247	101	Type III - Good production somewhat isolated, large, may be for sale
30-41	1 W., 4.5 S., Geneva	222		destruction threatened - Type IV excellent area
30-82	1 W., 1.5 S. Grafton	81	17	Both largely within NW 1/4 of Sec. good production and hunt area need ditch plugged. Much potential
30-83		92	58	
30-7	1 S. Shickley	156	98	Type III, has produced "hundreds of ducks" - con- sider with other basin near- by. Purchase possible
30-91	4 S., 3 E. Shickley	400±	43	Owner giving up trying to farm - large, potentially good area. Would need south 80 of NW 1/4 Sec. 27 to plug drain to Hamilton drain ditch
30-18	5 W., 2 N. Shickley	66	57	Most of basin in Clay Co. (110 Ac) Fillmore Co. only: Quality and location near other areas makes this rate high priority
30-53	2 N. Fairmont	314	228	merits check - large area
30-54	3 N. Fairmont	159	48	merits check - large area
30-52	4 E. Geneva	142	0	excellent if reclaimed - drained
30-8	3 W. Shickley	88	13	Tile drain not very successful
30-69	1 E. Grafton	94	61	1 N. Wilkins - good quality area
30-11	3 N., 2 W. Shickley	147	85	potentially good - wetlands near
30-20	5 W., 2.5 N. Shickley	40	22	1 N. #18 consider if others obtained
30-15 & 16				Have potential. Need some development east and west of No. 11

FRANKLIN COUNTY

Franklin County is located between Kearney County on the north and the Kansas-Nebraska State Line on the south. The Republican River crosses the county west to east a few miles north of the Kansas line.

Most of the wetlands occur in the northwest quarter of the county and a small area in the northeastern corner.

None of the basin soils in Franklin County are of the Scott series. Only Fillmore silty clay loam soils were included in this survey. Butler silt loam occurs in numerous shallow depressions. Due to a thicker layer of topsoil, these areas are generally farmed. The clay pan subsoil zones are similar to Fillmore silty clay loam, and in dry years the topsoil becomes too dry and too wet in wet years for successful crop growth. Originally there were 105 basins with Fillmore soils and all but four are 50 acres or less - 93 are less than 25 acres. Although most of the wetlands are small, the second largest basin in the rainbasin region is Macon Lake just south of the town of Macon. Although there is a large drainage ditch that drains east to a natural drainage, the area is large enough with several deeper pools within the confines of the basin, that drainage is incomplete. There are three islands of upland within the basin boundary. Four hundred-sixty-five wetland acres and 326 of upland have been purchased as a waterfowl production area. Should federal acquisition not acquire the remainder of this marsh the area merits State consideration for acquisition. The Quadhamer marsh three miles west and one mile south of Hildreth is a 301 acre basin that is good duck production area, and is under federal ownership. Fifty-four acres of the 128 acre Rittebush basin five miles south of Hildreth has been federally purchased for a waterfowl production area. An additional 27 acres of upland goes with the wetland. Should State funds become available for preserving small wetlands, basins 31-10 and 31-11 would be worthy of consideration. G-2 practices would provide a practical means of enhancing 31-8.

Fourteen basins representing 1,753 acres of wetlands are still in existence. These basins formerly comprised 1,930 acres of wetlands. Seven of the 14 are 10 to 25 acres in size, four are between 25 and 50 acres, one is 92 acres and two large basins already described. There is one basin of 50 acres classed as Type I wetland, five Type II with 113 acres, and 8 Type III with 1,590 acres.

Ninety-one (87 percent) of the basins have been destroyed, representing 651 acres. Owing to the small size of these and the 177 acre reduction in size of existing basins, the total area of destroyed wetlands represents only 32 percent of the original acreage. Of the 91 destroyed basins, 73 were under 10 acres and 14 were in the 10 to 25 acres size class.

Based on a 1968 SCS survey, there were 200 grade stabilization structures and three sandpits in Franklin County. Nearly 700 (683) farm ponds contained 925 surface acres.

GOSPER COUNTY

Gosper County represents the western edge of the south central rainwater basin region. The nearly level uplands, where basins occur, occupies about

50 sections in the east central part adjoining Phelps County. Limited areas containing basins also occur near Elwood, the northwest corner, and southeast of Johnson Reservoir. Most of the county is rough, broken canyon land. The Platte River forms about three miles of the county boundary in the northeast corner. Johnson Reservoir, containing 2,800 surface acres, occupies one of the county's larger original wetlands of about 300 acres.

One basin (Code No. 37-16, 100 acres Type IV) is included in this county, although it occurs in Frontier and Dawson Counties on the west side of the northwestern most section of Gosper County.

Butler silt loam, is the most common basin soil. The more permanent basins have Scott silt loam soils. Most of the survey in this county occurred in 1963. The spring was quite low on precipitation, and most of the wetlands were dry or contained water only in the deepened areas. During visitations with the landowners or tenants, nearly all recalled duck production in the past. However, only those familiar with the most permanent water had seen broods of ducks in the drought years, just preceding the interviews.

Originally, there were 156 wetlands in Gosper County, 28 of these are at least partially in existence today. Of the 128 destroyed, 57 containing 267 acres were leveled. Two were partially leveled and partially drained. One was destroyed by Johnson Lake and one by the irrigation canal. Silt deposits have reduced some to wet pasture type. Deep road ditches have contributed to much of the drainage.

In addition to the acreage of destroyed basins, the existing basins have been reduced by 187 acres. They originally totalled 1,613 acres, and now have 1,426 acres. The smaller wetlands have suffered the most destruction. Of 120 less than 10 acres, 114 have been destroyed; 10 of 17 basins 10 acres to 25 acres in size; 2 of 8 that were 26 to 50 acres are gone; one of 6 that was 50 to 100 acres, and one of 5 that was over 100 acres, no longer exist. Surface water has been reduced 44 percent from 2,536 acres to 1,426 acres. One-fourth (1/4) of the existing basins, are Type IV and comprise 62 percent of the wetland acreage (1,026 acres). There were 4 Type III (110 acres), 11 Type II (176 acres), and 6 Type I (114 acres).

There are three areas federally controlled through the wetland habitat acquisition program. (1) Victor Lake, one mile west and four north of Bertrand is a 256 acre Type IV marsh. (2) Peterson Basin, one mile west and four miles south of Bertrand, is a 485 acre basin with 554 acres of upland acquired with it. (3) Elley Lagoon, one mile west of the Peterson Basin is 50 acres Type IV marsh. Thirty one acres of wetland and 29 acres of upland have been acquired. In addition to the natural wetlands, there are 30 farm pond with 20 acres of water.

HALL COUNTY

Hall County is situated on the north central edge of the rain basin region. Natural wetlands occur in a small portion in the southeast corner. The major surface water feature of the county is the Platte River which enters at the southeast corner and leaves at the middle of the eastern edge.

The north channel parallels the main two to four channels by two to three miles. Since the completion of Kingsley Dam in Keith County in 1941, the river is dry most of the summer and early fall. The South Loup River invades three sections in the extreme northwest corner.

Of the original 18 well defined wetlands, all or part of 11 are still existing. Two basins originally containing 30 and 43 acres respectively have been reduced by leveling to present size of 15 and 4 acres. Another 12 acre basin was destroyed by leveling. Seven basins totaling 34 acres have been destroyed. All existing basins have considerably less depth due to siltation. G-2 practices could be adapted readily to some to enhance their value to waterfowl.

Although only 11 wetlands occur in a small part of the southeastern corner, all are threatened with destruction by the Hall County Work Unit Conservationist. He views wetlands contemptuously and promotes drainage during contacts with landowners. Some of the landowners have learned to live with their wetlands and are not inclined to get rid of them. Repeated exposure to the idea of drainage could change those inclinations.

Three areas would merit purchase consideration. One area, originally 111 acres and presently 72 acres of Type III, is 5 miles southwest of Doniphan. The other two areas are four to five miles east and northeast of Doniphan and contain 57 acres and 120 acres. Acquisition of these may reduce the threat of formation of a drainage district in this area. Basin 40-3, 2 miles southeast of Doniphan has a G-2 west of the road and the landowner east of the road desires wildlife. The basin would lend itself well to G-2 enhancement. The presence of deep roadside ditches, so prevalent in other counties, is of much less importance in Hall County. Eleven existing wetlands originally contained 767 acres and presently total 620 acres. Four are Type I and range in size from four acres to 34 acres. One Type II contains 44 acres. Five Type III and one Type IV comprise 504 acres, ranging in size from 23 acres to 147 acres. All but one are over 50 acres and two are more than 100 acres.

In addition to the wetlands previously discussed, Hall County has 71 sandpits, 49 grade stabilization structures and 33 farm ponds, totaling 254 acres.

HAMILTON COUNTY

Hamilton County is situated in the north central portion of the rain-water basin region. The county is irregular shaped and the Platte River forms about 30 miles of the northwestern boundary. There is slight slope from the Platte River bluffs to the southeast. Headwaters of the west branch of Big Blue River begin in the southwest corner and drain eastward across the southern boundary. Headwaters of Beaver Creek begin about 4 miles north of the Big Blue headwaters and parallel that stream to the eastern boundary. The Big Blue River headwaters begin as an intermittent stream in the northeast.

Wetlands occur mainly in three areas: southeast between the Beaver Creek and Big Blue River drainages; in the west central between Phillips

and Gilmer, and in the northeast. None of the wetlands are publicly owned.

Drainage has been prevalent in Hamilton County. Much of this has been numerous natural drainages that finger out into the level uplands from the three streams referred to earlier. Deepened road ditches have provided the means for some of the more spectacular drainage efforts of large basins. Sixty-three basins totaling 642 acres have been leveled and an additional six basins with 880 acres have been destroyed by a combination of leveling and draining--339 acres leveled and 541 drained. Drainage has also reduced the size of the twenty existing basins from an original acreage of 2,587 acres to 925 acres. Of the 290 original basins, 270 (93%) have been destroyed, and 88 percent of the original acreage destroyed. Some of these could be reclaimed by plugging the drainage ditch or tile. Most of the basins are Fillmore soils with lesser amounts of Butler and Scott soils.

Twenty basins, nine of which are Type I and II, are still in existence at the time of survey, 1963. Since the survey, Interstate Highway 80 has destroyed a 32-acre Type III basin. Four Type III basins with an original acreage of 824 acres now comprise 365 acres. Five Type IV wetlands have been reduced from 1,163 acres to 441. One Type V is a three acre area at headwaters of Lincoln Creek that was deepened when earth was removed to level field. The land owner stated that it has one to three broods of bluewings a year. Size classification of the 20 basins presently has five over 100 acres with the largest being 178 acres. Six are under 10 acres and 12 under 50 acres.

If wetland acquisition should be considered in this county, the most desirable would be Code number 41-1, 41-2, 41-3, 41-4. Bergson Lake (41-2) is a 486-acre basin drained by a 36 inch tile that could be reclaimed as a Type IV. The Phillips Lagoon (41-6) is in no danger of being destroyed as it is controlled by hunters from Grand Island. One mile north of Phillips Lagoon a Scott soil basin (41-5), originally 98 acres and presently 26 acres, is a good Type IV that would merit consideration for purchase also. Five miles north and one east of Hampton (41-17) is a good production basin of 75 acres (originally 145 acres). Owners of basin are receptive to getting the wetland removed from their taxes.

Hamilton County has 300 farm ponds and grade stabilization structures, comprising 532 surface acres.

HARLAN COUNTY

Harlan County is located in the western portion of the rainbasin area, and is bordered on the north by Phelps County and the Kansas State Line on the south. The Republican River enters the county in the west central and leaves in the southeast. Numerous north to south drainages have eroded the top mantle, creating a rough, broken terrain over most of the county. Nearly level uplands occur in a small area of northeast and north central parts of the county. Natural wetlands other than streams, are confined to this area. A large Republican River impoundment (Harlan County Reservoir) with 13,468 surface acres, is located in the southeastern and south-central part of the country.

Only five of the original 36 basins are still in existence. These five originally contained 936 acres, and now total 372 acres. Four range in size from 12 to 65 acres and the largest is 236 acres. Three are Type III and two are Type IV wetlands, with 123 acres and 248 acres respectively. There were 122 acres in the 31 destroyed basins - 63 lost to drainage, 56 by leveling and 3 acres are still wet. All but two were less than 10 acres in size.

Parts of two large wetlands are owned by the Game and Parks Commission. Code No. 42-1 referred to a southeast Sac (formerly Lindsay Lagoon) was acquired in 1969. That portion of the basin (about one-half) in section 3 is state-owned. The whole basin is 237 acres. The Game and Parks Commission have 174 acres which is mostly marsh, but includes some uplands. South Sac area is a 263 acre marsh of which the Nebraska Game and Parks Department own 82 acres of marsh and 85 acres of upland. This area is located two miles south and one-half west of Southeast Sac.

Wetlands 42-3 and 42-4 warrant consideration for preservation if such a program should become a full scale project.

Harlan County has 913 farm ponds with a total 1,031 surface acres. Nearly all of these occur outside the level terrain containing natural marshes.

NUCKOLLS COUNTY

Nuckolls County is located south of Clay County and west of Thayer County, and is bordered on the south by Kansas.

The basin portion of the county surveyed occurs in about 60 sections of the northeast corner. A few depression areas with Butler soils are scattered in the central and southeastern parts. Because most of these have little value to waterfowl and because the topsoil is thicker than Fillmore and Scott soils, enabling the growing of crops most years, these were not included in the survey.

Within the survey area, 38 of 44 original wetlands have been destroyed. All were less than 50 acres and 25 were less than 10 acres. Thirty of the 344 acres contained in these 38 basins have been leveled and 314 acres drained.

The six existing basins originally contained 633 acres, but presently comprise 324 acres. They consist of one 14-acre Type I that originally was an excellent 98-acre duck producing marsh; two Type III wetlands totaling 70 acres, reduced in size by 26 acres of drainage, siltation and few leveled acres. Three are classed as Type IV. Their present sizes are 24, 63 and 153 acres, and originally they were 65, 81 and 292 acres respectively. The middle one, known as Smartweed Marsh (65-2 Wennersteen), is partially owned by the Nebraska Game and Parks Commission (40 acres: 6 acres of upland, 34 acres of marsh). An additional 40 acres in the southeast quarter of section 8 and 25 acres in section 9 would finish acquisition of this wetland. It is recommended the remainder of this marsh located 2.5 miles south and 2 miles west of Edgar, be acquired. Also recommended for consideration of acquisition are 65-3 and 65-6. The first is a 98-acre basin drained to 13

acres, but formerly was an excellent waterfowl basin. Code No. 65-6 is a large basin of 292 acres reduced to 153 acres, located 2 miles west of Davenport, and is an excellent waterfowl marsh that can be drained. Present owners are not interested in destroying it.

KEARNEY COUNTY

The county is located in the middle of the western half of the rain-basin area. Generally, the south half of the county is flat to gently rolling, with silt loam soils, Holdrege series prevailing. The Platte River forms the west half of the north boundary, and the south channel of the Platte, the eastern half. A narrow belt of dune sand comprising about 32 sections crosses the county between the Platte Plain and the uplands to the south. There is relatively little developed stream drainage containing permanent water within the county boundaries. Most of the northern half of the county drains north and east into the Platte River or into the south channel through Lost and Dry Creeks. The headwaters of Thompson Creek drain a small portion of the southwest into the Republican River. The east central portion is drained by the headwaters of Sand and Cottonwood Creeks into the Little Blue River in Adams County.

Except for a few basins north of Minden and three small ones near Heartwell, all the Scott soils occur in the southern half of the county. A soil survey of Kearney County printed in 1928, indicates 3,584 acres of Scott silt loam soils. The present survey indicates an original acreage of 2,826 acres. This was obtained from aerial surveys and outlines of former basin perimeters that have been leveled. The difference of 750 acres may represent discrepancies of measurements and/or a reduction in size due to siltation and farming operations. Some insight into the extent of siltation might be obtained from comments obtained by interviews with landowners. Code number 50-12 "--during the dust storm days (1930's) about a foot of silt was deposited in the basin." Code No. 50-14, Mr. Hansen said his father reported the basin about 6 feet deep in 1903,--- six inches to a foot of silt was moved in by wind in the early 1930's. About 30 percent of the perimeter is now farmed and depth of the basin is one to two feet. There has been no drainage or concentration dugouts in this basin. Through the years, additional silt has been deposited by runoff from the watershed, reducing the original acreage from 118 acres to 69 acres.

Field surveys of Kearney County were conducted in late 1961 and early 1962, during a very dry period, when most of the wetlands were dry. Of the original 133 wetlands, 28 are in existence today. Eight of these have been incompletely drained, resulting in Type I temporary wetlands. Original acreage of the 28 existing basins has been reduced from 2,154 acres to 1,457 acres. Four are Type I and 10 are Type II, comprising 44 acres and 436 acres respectively. Eleven are Type III, with 726 acres presently. Originally, there was 1,180 acres and seven were over 100 acres, now two are over 100 acres. Size classification of Type III formerly ranged from 29 to 186 acres, and presently range from 24 to 124. Acreage of three Type IV wetlands has been reduced from 326 acres to 252 acres.

Less than half (11) existing basins are under 25 acres, in contrast to all but 2 of 105 destroyed basins which are under 25 acres, 82 of which are less than 10⁴ acres. Of the 672 acres in the 10 destroyed basins, 542 acres were drained, and 130 were leveled. Of the original 2,961 acres of wetlands in Kearney County (wetland survey data) 43 percent have been destroyed.

All or parts of 8 wetlands have been acquired by the U. S. Fish and Wildlife Service for waterfowl production areas. The total area acquired is 2,638 acres--1374 acres of wetland and 1,264 acres of upland

Kearney County also has 211 farm ponds with 185 surface acres of water.

PHELPS COUNTY

Except for a small portion of Gosper County on the west, Phelps County occupies the western end of the rainwater basin region. The loess plain extends from northwest to southeast through the county. The southwest corner is canyon area cut by deep ravines. The sandhill area comprising about 27 sections in the northeastern part has more broken topography. The Platte River borders the county on the north.

Basins occur in the broad plain of Holdrege silt loam soils. This is an area of intensive agriculture, much of it irrigated with water from wells in the central and southeast. North of the ridge that separates the Republican drainage from the Platte drainage irrigation water is furnished by canal from Johnson Reservoir. In this region a concentration of clay particles in the subsoil by percolation has developed a soil that permits little downward movement of water. The result is a high ground water level that recently has become exposed in some depressions. The Johnson basin 8 miles north and two east of Holdrege is the most prominent example. The water began rising late in the summer of 1969 and by the spring of 1970, approximately forty acres of water was a lake of nearly 300 acres. Solutions to the problem are being sought by local, state and federal agencies and private landowners.

Most of the basins in this county are above the average size of those in the eastern rainwater basin counties. These large, flat-bottom basins frequently have large watershed drainages, but are in a lower precipitation belt and a higher evaporation zone than those to the east. Consequently, they are more frequently dry by late summer.

In the sandhills, 15 miles north and 3 east of Holdrege, are seven small natural lakes totaling 38 acres. At high water, all but one are connected by narrow necks of water and are included as one wetland in the summary tables. These are not the typical Scott soil wetlands of the rainbasin region, but are more typical of sandhill lakes. Although dry in the 1930s, they held permanent water prior to installation of a by-pass ditch in 1955. These lakes were fed by a natural drainage. The bypass ditch was constructed to protect about 50 acres of poor farm land.

A gate similar to those used on irrigation canals could divert the water through the lakes again and be opened to utilize the bypass during flood threats. The area formerly produced mallards and blue-winged teal and was considered "good" hunting in the fall.

The largest wetland in the rainwater basin region is Sacramento Lake, eight miles southeast of Holdrege, and is under state ownership. The 1,053 acre marsh has been developed with series of dikes within the marsh and bench leveling on the surrounding upland. Four irrigation wells can be used to supplement the water supply. A portion of the marsh is set aside as waterfowl refuge. The area has good duck production and intensive use during migrations. The second largest wetland in Phelps County is Moses Hill Lake, six miles northeast of Holdrege. Its present size of 456 acres has been reduced by draining of 388 acres. It is privately owned, but has been considered for Federal or State acquisition. The CNPPID Tri-County Irrigation District Canal is within 1/8 mile and could be a source of supplemental water during dry periods. The area is an important resting place for ducks and geese during the spring migration and provides excellent hunting in the fall if there is water in it.

Two other wetlands of high waterfowl values have been partially purchased by the U.S. Fish and Wildlife Service for waterfowl production areas. These are the Atlanta Basin (133 acres - originally 371 acres) and the Jones Basin (90 acres). Of the original Atlanta Basin; 117 acres have been acquired and all 90 acres of the Jones Basin plus an additional 76 acres of upland have also been acquired.

A large depression area northeast of Funk, containing three Scott soil wetlands, has received preliminary discussion as an area for acquisition. CNPPID Tri-County needs an area to spill excess irrigation water. A joint effort was suggested with the Game Commission to acquire the area, and with adequate water supply from the excess irrigation water, there is potential for a large wetland development. The main canal passes a short distance from the southern end of this area.

Of the 56 original basins in Phelps County, 40 are still in existence. Original acreage of these has been reduced from 5,691 acres to 3,433 acres. All but 46 of the destroyed acres was due to drainage. Eleven were classed as Type I and eight as Type II, with a combined acreage of 682 acres, a 51 percent reduction. Thirteen Type III, and six Type IV wetlands presently total 827 acres and 1,902 acres respectively, about 65 percent of the original acreage. Two Type V basins have been reduced from 47 acres to 22 acres.

Ten of the existing basins are over 100 acres, and 17 are under 25 acres.

Sixteen destroyed basins contained 295 acres, all of which were lost to drainage. Total acreage lost to drainage in Phelps County was 2,500 acres, and an additional 46 acres were leveled.

In addition to the natural wetlands occurring in the county, there are 194 farm ponds with 349 acres of water, and six sand or gravel pits.

POLK COUNTY

Polk County is located in the northeast portion of the rainbasin area. It is bordered by Butler County on the east, York on the south and Hamilton on the west. The Platte River, which flows on a northeasterly direction, forms the northern boundary. The western boundary line is nine miles in length and the eastern boundary, 24 miles.

The level upland plain, where the rainbasins occur, occupies the southern two-thirds of the county, varying in width from seven miles on the west to 16 miles on the east. The Big Blue River enters the county from the south, three miles from the western boundary, and travels north-easterly and leaves the county five miles north of the southern boundary.

That portion of the upland plain north of the Blue River is comprised mostly of Holdrege silt loam and south of the river is Hastings silt loam. Both are highly productive agricultural soils. Intensive farming practices make up nearly all the land use surrounding the basins. Basin soils are Scott silty clay loam.

Wetland areas were numerous (227) in Polk County, but every one has been affected by some type of alteration: drainage ditches, dikes, dugouts and leveling. Deepened road ditches have frequently provided means of drainage, as well as cutting off runoff from watersheds. Eighty-five per cent (194) have been destroyed, originally comprising 2,705 acres, (1,977 by drainage and 728 by leveling). Most of the destroyed basins were small -99 were under 10 acres, and 175 under 25 acres. Two were over 100 acres. One of these is 196 acres one mile west of Shelby that could be reclaimed by plugging drainage ditch to the northwest.

Thirty-three basins originally containing 1,468 acres of wetland are still in existence, but acreage of wetland has been reduced to 752 acres. The largest is 70 acres and four are over 50 acres. Ten are less than 10 acres in size, and 22 are 25 acres or less. Nearly half (16) are Type I originally comprising 677 acres and now have 324 acres. Five are Type II with a total of 84 acres and 10 are Type III with 270 acres remaining of an original size of 542 acres. Two Type IV wetlands have been reduced from 134 to 74 acres.

None of the basins merit serious acquisition consideration. Four would warrant checking, should it be desirable to acquire wetlands in Polk County: Code 72-4, 5 miles north and ½ west of Polk; 72-7, a 70 acre marsh 5 north and 2½ east of Polk; 72-15, 4 miles north of Shelby; and 72-16, a drained basin one west of Shelby, that could be reclaimed. Several offer potential for "G" practices. Landowners with basins 72-2, 3 and 18 expressed interest during interviews of desiring some fish or waterfowl development.

Within Polk County there are 353 man-made ponds and sandpits totaling 331 surface acres.

SALINE COUNTY

Saline County is located on the eastern fringe of the rainbasin area. It is bordered on the north by Seward County and the west by Fillmore County.

The relatively few wetlands are found in the four northern tiers of townships. A few Fillmore soil basins occur in the extreme southwest corner, south of Tobias. A number of small shallow depressions between Turkey Creek and Swan Creek have developed Butler silt loam basin soils that were not surveyed, due to their negligible value to waterfowl.

Basin soils in the northern portion of the County are Scott silty clay loam and Fillmore silty clay loam.

Seventy-three basins totaling 1,056 acres have been destroyed, mostly by drainage. Fifty-three have been lost to drainage and 16 by leveling and four by a combination of both. Drainage accounted for 748 acres and leveling 308 acres. Sixty-three of the destroyed basins were 25 acres or less, eight were 25 to 50 acres in size and two were 50 to 100 acres.

Five existing basins originally containing 229 acres now have 124 acres with the basins, ranging in size from 15 acres to 38 acres. One temporary Type I basin of 25 acres is the only one of the five that hasn't been altered. Two type III wetlands have been reduced from 105 acres to 39 acres, and two Type IV from 99 acres to 60 acres. Although some of these were reportedly good duck producing wetlands in their original state, all would be low priority in present condition. In the whole of Seward County, there are 607 man-created ponds and sandpits totaling 1,143 surface acres.

SEWARD COUNTY

Western Seward County encompasses the eastern extension of the rain-water basin region. An area about five miles wide along the eastern border are drift hills with no basin wetlands. Nearly all the basins occur west of the Big Blue River amounting to about one-half of the county area.

The extensive level silt loam soils are conducive to intensive cultivation, which makes up nearly all the land use surrounding the wetlands.

Of the original 177 wetlands, 165 have been destroyed mostly by drainage ditch and tile. These formerly totaled 3,744 acres, of which 2,910 acres have been drained and 834 leveled. In addition to the 3,744 acres of wetlands destroyed, the existing basins have been reduced by 902 acres. The total destroyed acreage (4,646) represents 87 percent of the original basin type wetland acreage. Nearly all small basins have been eliminated. All but one of 128 basins originally under 25 acres have been destroyed. Six of 13 basins originally over 100 acres in size have been destroyed, and six of the remaining seven have been reduced in size.

Twelve existing basins totaling 670 acres, originally contained 1,572 acres. The largest was 405 acres reduced to 14 acres. Three are now classified as Type I wetland with 65 acres; two as Type II with 75 acres; four Type III have been reduced from 750 acres to 224 acres; three Type IV contain 306 acres, a reduction of 251 acres. The largest basin in Seward County is the Utica basin, a 178 acre Type IV wetland. Six of the remaining basins are over 50 acres, with two being over 100 acres. The one

drainage district in Seward County was formed many years ago to enable drainage of the basin one mile southeast of Utica. A drainage ditch takes the water to the south graded road ditch and a 36 inch tile buried as much as 30 feet takes the water southwest to a natural drainage of the Blue River. The effort incompletely drained this marsh and 66 acres of type III still remain. This area might merit consideration for purchase. Two other wetlands also merit acquisition potential. They are 80-2 one mile southeast of Tamora, and 80-4 one mile west and 3 north of Goehner. The Utica basin is an excellent basin with considerable development for enhancing waterfowl values. Several concrete blinds have been constructed and hunting leases total \$600 per year. The northern portion of the basin in section 17 would warrant consideration for preserving. Another basin on the York County line, known as the Volzke Basin, is an excellent basin, but is included in the York County data since most of it occurs on the other side of the county line.

Man-made impoundments number 605 in Seward County totaling 930 surface acres.

THAYER COUNTY

Thayer County is situated on the southeast fringe of the rainwater basins region. It is bordered on the north by Fillmore County and on the west by Nuckolls County.

All the basin type wetlands in Thayer County are north of the Little Blue River in the north one-half of the county. The north four townships have most of the wetlands. There are no basins or wet areas in the county where drainage has not been attempted. One reason for the drainage is that a shallow drainage heading in the area and continuing to the Big Sandy Creek or Little Blue River is generally accessible within one or two miles.

Most of the basin-like areas in the county have Butler soil. It is much better drained as a whole than Scott soil and is more productive. Most of the areas lying in the lower depressions having Butler soil are artificially drained and practically all are under cultivation.

Due to the fact that the waterfowl potential had been destroyed, these areas lying in the lower depressions ranging in size from a few acres to three hundred acres were not individually recorded as wetlands.

Nine areas with Scott soils that were surveyed have been recorded as destroyed. These nine ranged in size from 10 to 80 acres. Six of the nine were in the 25 to 50 acres size. The total acreage amounted to 373 acres. Seven were destroyed by drainage and two (25 acres and 80 acres) have been leveled.

The two partial basins existing have been nearly eliminated. Twenty acres of Type III are all that is remaining of an 105 acre wetland two miles southwest of Carleton. Sixty acres have been leveled and 25 acres drained. Two miles west of Bruning is the largest basin in the country. It was originally 340 acres with Scott soil and was one of the outstanding wetlands in south central Nebraska. It is an area worth reclaiming.

The owner would be willing to sell the flooded portion and ditches. The large drainage ditch was established in the early nineteen hundreds. He is in the pure-bred cattle business and would like to keep his grass.

YORK COUNTY

York County is located in the northeastern heart of the rainwater basin region. It ranks third among counties in number and acreage of wetland habitat. It is bordered by Polk County on the north, Fillmore on the south and Hamilton on the west.

Hastings and Crete silt loam are the principal soils. They form a thick layer of loessial silt on nearly level to rolling uplands. These are excellent agricultural lands accounting for the intensive cultivation that occurs over most of the county. A thick layer of sand and gravel provides water to over 1,600 irrigation wells in York County in 1969. Ground water levels show a declining trend over much of the county during the past 10 years due to heavy irrigation demands.

Scott silty clay loam, Fillmore silt loam and Butler silt loam comprise the basin soils. Scott soils occupy the most permanent wetlands soils, and Fillmore and Butler the less permanent.

Lincoln Creek, Beaver Creek and the west fork of Big Blue River and their tributaries provide natural drainageways to most parts of the county.

Of the rainbasin counties, York County formerly ranked third behind Clay and Fillmore Counties for amount of wetlands within the county. Although it still ranks third in number and acres of existing wetland habitat, two-thirds of the surface acres and 85 percent of the wetland areas have been destroyed. Another dimension of destruction that is unmeasured, but possibly the most significant, is the loss of quality of habitat. Virtually every existing wetland has been altered to some extent. Two examples illustrate what has happened to this habitat. Three miles south and one-and-one-half east of Arborville in the northwestern corner of the county is an 80 acre wetland presently classed as Type I. It was formerly 180 acres. It was reported by relatives of owners that it once produced "lots of ducks" and was a good hunting area most falls. A drainage ditch to a natural drainageway has reduced the size and quality of what was an excellent marsh to a wet pasture. The second example is a 132 acre wetland that is now 25 acres of Type I. It was formerly a Type III or IV duck producing marsh. Deep county road ditches have cut off some of the watershed runoff. Eighty-seven acres have been leveled and a drainage ditch reduced the size another 20 acres, and reduced quality of the remaining 25 acres of wetland.

Five hundred and sixty-six of the original 672 wetlands have been destroyed, accounting for 4,243 acres. Twenty-six of the 106 basins considered as wetlands still in existence have for most practical purposes also been destroyed. Eight of these presently classified as Type III, IV or V have been reduced from 463 acres to 17 acres. Five currently listed as Type V consist mostly of dugouts or concentration ditches totaling 8 acres in basins that originally totaled 289 acres. Twelve wetlands that formerly

had 1,012 acres (an unknown proportion of which were Type III and IV) now has 258 acres of Type I wetland. Six that are now classified as Type II, originally totaled 287 acres compared to 80 acres today. In addition to the 4,243 acres contained in the destroyed basins, the existing ones have lost 3,563 acres to destructive practices. Of the original 11,627 wetland acres in the county, 67 percent (7,806) have been destroyed. Some of this loss could be reclaimed by plugging drainage systems but 2,130 acres had been leveled at the time of the survey with some additional leveling being planned. As is the case throughout this region, the preponderance of basins destroyed were small. Ninety-six percent of the destroyed wetlands (546) were 25 acres or less - 428 were under 10 acres. Six were over 30 acres, two of which were over 100 acres. However, ten large existing wetlands have each been reduced in size 100 acres or more. These 10 originally totaled 3,090 acres, and now contain 817 acres, a loss of 2,270 acres.

One hundred five existing basins contain 3,780 acres of wetlands. They formerly totaled 7,250 acres. Seventy percent of the total acres (2,680) is comprised of Type III and IV wetlands, 266 are classified as Type III and 9 as Type IV. Thirty-one basins with 538 acres are classed as Type II and 33 as Type I comprising 549 acres. Seventy are under 25 acres and 50 are under 10 acres. Ten are over 100 acres, with four being over 200 acres. The largest existing wetland in the county (331 acres) is a Type III located six miles south and one east of Bradshaw. A 309 acre Type IV is the County Line marsh. Eleven Type III, two Type IV and all six Type V wetlands are less than 15 acres in size.

The only publicly controlled wetlands in York County are two areas acquired by the U. S. Fish and Wildlife Service as waterfowl production areas.

The County Line marsh is four miles north and three east of Fairmont and is comprised of 211 acres of wetland and 197 acres of upland. Forty-six acres of wetland and 75 acres of upland are in Fillmore County. All but a small portion of the southeast and northeast corners of the basin have been acquired. The other area acquired is the southwest quarter of section 27, McFadden township, known as the Sinninger Lagoon, and has parts of two wetlands within the quarter section. There are 199 acres of wetland in the two basins. The area purchased contains 46 acres of wetland. Priority of wetlands acquisition in York County should be the completion of the purchase of these two wetlands. Several other good duck production areas occur within a few miles of these two Fish and Wildlife Service owned wetlands that would merit consideration for preservation of a complex of associated production areas. The second choice of acquisition priority would fall among the Prohaska Basin (331 acres, Type III) located four miles south and six west of York; Volzke Basin straddling the Seward-York County line north-east of Waco; and one or more of the wetlands in the northwest corner of the county between Benedict and Arborville. The following list is suggested for consideration to acquire or protect from destruction by other means.

Wetlands for Acquisition Consideration - YORK COUNTY

Code No.	Location	Size (acres)		Comments
		Original	Present	
21-22	5 N., 3 E. Fairmont			Complete purchase of Sinniger area.
1	4 S., 6 W. York	331	331	Type II - one of best production areas in York County. 4 owners. 115 acres III and remainder II.
58	2 N., 5 E. Waco	978	178	Type IV Volzke Basin-part in Seward County-could be one of best
61	2 N., ½ W. Benedict	105	50	Type III - a good marsh.
62	1 N., 2 W. Benedict	154	136	Type III - a large basin need some development, good location. 5 other basins within 2 miles - some dikes and dugouts.
65	2 N., 5 W. Benedict	186	27	III - with some development as part of production complex-Renquist.
64	5 W. Benedict	83	27	III - in conjunction with others.
66	1 N., 5 W. Benedict	207	99	III - probably difficult to get much development - 20 acres 15 Ft. deep - Harrington
67	6 W. Benedict	53	53	III - ½ S. Harrington - one of best production basins.
50	1 NW Waco	492	292	III - has large concentration dugout. Excellent production area - large to accommodate hunting. Might be available.
68	2.5 S. Arborville	398	112	Large shallow with ditches and dikes. Partly in 3 sec. 1.5 miles long separated into two by levelings.
116	3 S., ½ E. Arborville	180	80	in conjunction with 68 - Type III formerly good production area.
23	1 S., 4 E. McCool	37	3	Possible as part of area development. ½ mile NE Sinniger basin
25	1 S. 6 E. McCool	43	43	Fair production area - not threatened - Type IV
26	2 S. 5 E. McCool	44		Tile drained could be reclaimed close to County line Basin.

Wetlands for Acquisition Consideration--Continued

Code No.	Location	Size (acres)		Comments
		Original	Present	
27	3 S., 4 E. McCool	27	27	Type IV-excellent production area - probably most production for size of all basins in county. In conjunction with others.
29 & 34	2-3 S. 3-4 E. McCool			In conjunction with others SE of McCool.
73	All in four adjoining sections - 3 E., 3 S. Waco	118	118	Type II and III only in conjunction with others in a fair production area. Some development needed.
74		108	108	
77		15	9	
78		73	65	
79		94	94	

APPENDIX B

SANDHILL WETLANDS

Table 2. Total Number and Acres of Wetlands in Type II and III Classification

County	TYPE II*		TYPE III	
	Number Acres	Number Wetlands	Number Acres	Number Wetlands
Arthur	1,131	33	1,367	130
Box Butte	1,064	52	476	29
Brown	468	53	2,037	260
Chase*	1,956	520	162	73
Cherry	1,672	70	3,928	344
Custer	125	42	18	17
Garden	-----	-----	696	87
Garfield	3,325	-----	128	22
Grant	146	2	1,624	77
Holt	2,366	362	3,683	1,017
Hooker	-----	-----	25	1
Keith	1,324	376	178	12
Lincoln	1,965	492	510	170
Logan	106	26	276	19
Loup	915	138	43	40
McPherson	264	2	1,338	26
Morrill	1,032	82	1,646	92
Perkins*	4,630	1,468	1,518	326
Rock	1,991	301	3,643	807
Sheridan	739	140	4,327	350
Wheeler	2,890	-----	875	334
TOTAL	28,109	4,159	28,498	4,232

*Most of these data for Type II wetlands in Chase and Perkins Counties should be classified as Type I.

Table 3. Total Number and Acres of Wetlands in Type IV and V Classification

County	TYPE IV		TYPE V	
	Number Acres	Number Wetlands	Number Acres	Number Wetlands
Arthur	2,071	111	456	35
Box Butte	328	10	658	14
Brown	2,393	298	2,703	272
Chase	29	8	134	4
Cherry	10,397	497	21,068	351
Custer	-----	---	-----	---
Garden	7,329	378	12,575	231
Garfield	390	9	36	3
Grant	3,153	121	3,519	83
Holt	1,511	413	2,728	174
Hooker	48	4	225	3
Keith	312	10	18	10
Lincoln	135	31	32	17
Logan	150	12	1	2
Loup	23	2	-----	---
McPherson	469	29	502	6
Morrill	1,055	50	1,067	52
Perkins	-----	---	-----	---
Rock	1,463	407	3,407	191
Sheridan	7,001	463	10,847	431
Wheeler	249	212	12	6
TOTAL	38,786	3,065	59,988	1,835

Table 4. Classification of Wetlands according to Size.

County	0-1.0	1.1-3.0	3.1-5.0	5.1-10.0	10.1-25.0	25+
Arthur	109	57	28	35	34	46
Box Butte	22	15	15	11	14	28
Brown	497	204	53	38	46	45
Chase	213	175	107	67	35	8
Cherry	334	218	93	123	226	268
Custer	26	19	7	4	3	---
Garden	192	139	72	57	73	158
Garfield*	13	11	3	1	2	4
Grant	21	63	19	35	68	77
Holt	818	652	189	165	86	56
Hooker	1	1	---	---	3	3
Keith	111	150	73	42	23	9
Lincoln	313	190	94	67	30	16
Logan	24	9	5	7	6	8
Loup	56	46	25	39	11	3
McPherson	20	7	3	8	9	16
Morrill	85	58	30	35	31	37
Perkins	691	505	277	201	93	21
Rock	743	505	144	153	94	67
Sheridan	501	274	125	127	150	207
Wheeler*	369	112	34	18	15	4
TOTAL	5,159	3,410	1,396	1,233	1,062	1,081

*Does not include data for Type II.

Table 5. Size Classification of Type III Wetlands per County.

County	<u>SIZE IN ACRES</u>				
	<u>0-10.0</u>	<u>10.1-25.0</u>	<u>25.1-50.0</u>	<u>50.1-100.0</u>	<u>100+</u>
Arthur	95	19	12	3	1
Box Butte	22	3	1	2	1
Brown	226	21	6	2	5
Chase	68	5	--	--	--
Cherry	234	71	21	16	2
Custer	17	--	--	--	--
Garden	76	5	5	1	1
Garfield	20	--	1	1	--
Grant	43	17	9	4	4
Holt	964	36	12	2	3
Hocker	--	1	--	--	--
Keith	7	3	1	--	1
Lincoln	163	5	1	--	1
Logan	10	4	5	--	--
Loup	39	1	--	--	--
McPherson	15	6	1	1	3
Merrill	70	9	2	6	5
Perkins	294	22	9	--	--
Rock	749	44	9	3	2
Sheridan	265	49	20	7	9
Wheeler	318	12	3	--	1
TOTAL	3,695	333	118	48	39

Table 6. Size Classification of Type IV Wetlands per County

<u>County</u>	<u>SIZE IN ACRES</u>				
	<u>0-10.0</u>	<u>10.1-25.0</u>	<u>25.1-50.0</u>	<u>50.1-100.0</u>	<u>100+</u>
Arthur	95	4	4	4	4
Box Butte	3	2	3	1	1
Brown	273	10	3	6	6
Chase	7	1	--	--	-
Cherry	332	74	38	27	26
Custer	--	--	--	--	--
Garden	270	39	26	26	18
Garfield	6	2	--	--	1
Grant	66	29	10	9	7
Holt	390	14	7	1	1
Hooker	2	1	1	--	-
Keith	6	1	2	--	1
Lincoln	28	1	1	1	-
Logan	8	2	2	--	--
Loup	1	1	--	--	--
McPherson	23	2	--	1	3
Morrill	39	5	1	2	3
Perkins	--	--	--	--	--
Rock	384	13	5	4	1
Sheridan	336	50	37	26	14
Wheeler	209	3	--	--	--
TOTAL	2,478	254	140	108	86

Table 7. Size Classification of Type V Wetlands per County

<u>County</u>	<u>SIZE IN ACRES</u>				
	<u>0-10.0</u>	<u>10.1-25.0</u>	<u>25.1-50.0</u>	<u>50.1-100.0</u>	<u>100+</u>
Arthur	28	3	1	2	1
Box Butte	3	2	4	4	1
Brown	249	10	1	4	8
Chase	2	1	--	--	1
Cherry	155	76	39	32	50
Custer	--	--	--	--	--
Garden	116	34	28	21	32
Garfield	2	--	1	--	--
Grant	29	22	11	14	7
Holt	143	13	8	1	9
Hooker	--	1	--	1	1
Keith	10	--	--	--	--
Lincoln	16	1	--	--	--
Logan	2	--	--	--	--
Loup	--	--	--	--	--
McPherson	--	1	1	3	1
Morrill	36	7	4	2	3
Perkins	--	--	--	--	--
Rock	154	9	5	14	9
Sheridan	302	41	34	28	26
Wheeler	6	--	--	--	--
TOTAL	1,253	221	137	126	149

Table 8. Acreage by size and type - Sandhills

Type	25.1-50 Acres	50.1-100 Acres	Over 100 Acres
III	4,219.9	3,526.9	7,671.2
IV	5,016.4	7,590.2	16,889.4
V	4,973.6	9,033.3	39,714.7
TOTAL	14,210	20,150	64,275

Arthur County

Located in the southwestern portion of the sandhills, Arthur County encompasses 309 wetlands comprising 5,025 acres. Approximately half of the county's wetland acreage (2,498 acres) consists of Types II and III and 63 percent of the total number (194) are five acres in size or smaller. The county contains 80 wetlands larger than 10 acres.

Wetland destruction has been significant in the county with a loss of 15 areas totaling 1,341 acres. Ditching and pumping were the methods used. All of the wetlands in the county are privately owned and are totally unprotected against future destruction which is anticipated.

Haying and/or grazing comprise all of the surrounding land use of the wetlands.

Three Mile Lake, located in the northeastern corner of the county, is the county's largest lake with 1,024 acres. It is also one of the four largest lakes in the sandhills. Arthur County has seven farm ponds comprising approximately seven acres. The county contains no reservoirs and no productive rivers or streams.

Box Butte County

Although only a small area in the southeast corner of Box Butte County is classed as sandhills, 105 wetlands totaling 2,526 acres are located in the region. Approximately 61 percent of the wetland acreage (1,540) is made up of Types II and III. Types IV and V constitute 24 wetlands totaling 986 acres. Of the total number of wetlands, 63 are 10 acres and under in size and 42 are larger than 10 acres.

No direct wetland destruction has taken place in the county although one body of water, Bronco Lake, totaling 210 acres, has been lost. Reasons for the loss are unknown or unsubstantiated. It is the writer's opinion that the lake was lost primarily because of a lowered ground water level brought on by intense pumping of ground water for the purpose of irrigation.

Haying and/or grazing make up over 95 percent of the surrounding land use of the county's wetlands although a few shallow basins are located on cropland south and west of the town of Alliance.

All wetlands in Box Butte County are privately owned and because of this, future destruction is anticipated. This destruction will probably occur in the extreme southeastern corner of the county where approximately 60 percent of the permanent water is located and where the water tends to be highly alkaline.

There are 41 farm ponds in the county comprising 77.5 acres. Other water in Box Butte County consists of the Niobrara River which crosses the extreme northeastern corner of the county for 19 miles and comprises approximately 14 acres, and Snake Creek which flows for 27 miles in the southern portion of the area and contains approximately 16 acres.

Brown County

While the topography of Brown County consists chiefly of sandhills the majority of wetlands are located in the central portion of the county. The survey results show 883 wetlands in the county comprising 7,601 acres. Approximately 67 percent (5,096 acres) of the total acreage is made up of permanent water (Types IV and V). The survey also shows 792 wetlands 10 acres and smaller and 91 wetlands larger than 10 acres.

No wetland destruction was evident in the county. Haying and/or grazing comprise more than 99 percent of the surrounding land use of the wetlands. Cropland, near the town of Ainsworth, encompasses the remaining wetlands.

There are approximately 354 acres of public wetlands in Brown County which includes Long and Upper Twin lakes. Other water consists of 95 farm ponds totaling 158 acres, the Niobrara River which makes up the county's entire northern border and the Calamus River which originates near the western county line and leaves the county at the southeast corner. The rivers and streams of Brown County are 250 miles in total length and comprise 1,616 acres of water.

Chase County

Chase County, located in the extreme southwestern portion of Nebraska, is not normally considered to be a sandhill region. Cropland, basically wheat, comprises 95 percent of the surrounding land use of its wetlands while scattered haying and/or grazing areas make up the remaining portion. However, because of the county's proximity with the sandhill counties and because of the number of wetlands involved its inclusion is deemed necessary.

The survey results of Chase County show the existence of 605 wetlands comprising 2,281 acres. Only 7.5 percent (163 acres) of the county's basins are permanent (Types IV and V). Approximately 86 percent of the total wetland acreage (1,956 acres) consists of Type II basins which number 520. Only 18 percent (43) of the county's wetlands are over 10 acres in size. The permanent water is found primarily in the "hilly" portion of the county while the temporary basins are located chiefly in the cropland regions. No wetland destruction has occurred.

The Frenchman River enters Chase County at its western border and flows out the southeastern corner. The river, along with several small creeks, courses through the county for 92 miles comprising 96 acres of water. Two reservoirs, formed by the Frenchman River, hold approximately 1,725 acres. There are no natural wetlands under public ownership in the county. Farm ponds number 86 and comprise 362 acres of water. The Frenchman River and Reservoirs in the county are a major wintering area for mallards, averaging about 16,000 over a 10-year period.

Cherry County

The largest county in Nebraska, Cherry County covers 6,013 square miles and contains the most wetland acreage and the largest amount of wetland destruction of any county in the sandhills. Practically all of the

county is classified as sandhills, but its wetlands are not evenly distributed. The primary wetland densities are located in the east-central and southwestern portions of the county.

The survey results show 1,262 wetlands in Cherry County comprising 37,065 acres. Permanent water (Types IV and V) makes up approximately 85 percent (31,465 acres) of the total acreage. Type II wetlands are relatively scarce, numbering only 70 and totaling 1,672 acres. Type III wetlands number 344 and comprise 3,928 acres. Approximately 91 percent of the county's wetland acreage is made up of areas over 10 acres in size while only 40 percent of the total number (494) is placed in this size category. Haying and/or grazing make up all of the surrounding land use of the wetlands.

Wetland areas destroyed in Cherry County number 67 and total 12,739 acres. Ditching has accounted for more than 90 percent of the wetland loss while pumping makes up the remaining portion. The greatest destruction of wetlands occurred around 1918 in the northwest corner of the county. There are approximately 11,580 acres of water under public ownership in the county which is removed from the threat of destruction. Future destruction is anticipated.

The lakes and basins of western Cherry County are generally shallow and moderately alkaline while the wetlands in the eastern portion tend to be deeper with lighter alkaline content. The lakes of greatest depth are located primarily on the Valentine National Wildlife Refuge in extreme eastern Cherry County. Dads Lake, the second largest body of water in the sandhills (1,044 acres), is also on the refuge.

The Niobrara River crosses the northern portion and extends the entire width of Cherry County. The Niobrara, along with the Snake and North Loup rivers, and a portion of the Middle Loup River combine with several smaller creeks to make up 843 miles of productive streams comprising 1,368 acres. Additional water in Cherry County includes 36 farm ponds totaling 81 acres and two reservoirs comprising 2,930 acres.

Custer County

The wetland survey of Custer County reveals 59 wetlands comprising 143 acres. No permanent water (Types IV and V) is located in the county and only 18 acres of Type III wetlands have been recorded. There are no wetlands larger than 25 acres and only three larger than 10 acres. There are no publicly owned wetlands in the sandhills portion of Custer County although there are five areas comprising 110 acres elsewhere in the county. Only a small area in the northwest corner of the county is considered sandhills. Haying and/or grazing make up all of the surrounding land use of the wetlands.

Other water in Custer County consists of 1,803 farm ponds and other small structures comprising 960 acres. The Middle Loup and South Loup rivers along with several small creeks form 220 miles of productive streams totaling 1,026 acres. There are no large reservoirs in the county.

Garden County

There are 696 wetlands in Garden County comprising 20,600 acres. This places the county third in total wetland acreage. Permanent water (Types IV and V) makes up approximately 97 percent (19,904 acres) of the entire wetland acreage and 87.5 percent (609) of the total number. No Type II wetlands appear in the county. Approximately 34 percent of the county's wetlands (236) are larger than 10 acres.

Wetland destruction in the county has been relatively light with the loss of three wetlands totaling 156 acres. Ditching was the primary method used. There are approximately 3,980 acres of wetland under public ownership and therefore removed from the threat of destruction.

The wetlands of Garden County are generally more highly alkaline than wetlands of the central and eastern sandhills, and are usually quite shallow. Blue Lake, however, has the distinction of being the deepest natural wetland in the sandhills (13.8 feet). The largest lake in the county is Crescent Lake, located just south of the Crescent Lake National Wildlife Refuge, with 1,024 acres. There are 18 farm ponds and eight sand and gravel pits in Garden County comprising 43 acres of water. Rivers and creeks course through 114 miles of the county and comprise about 1,988 acres of productive water. The North Platte River and Blue Creek make up 66 percent of the county's stream mileage and 99 percent of the total acreage. There are no reservoirs in the county.

Haying and grazing combinations comprise all of the surrounding land use of wetlands in the northern half of the county while 44 wetlands are located on cropland in the extreme southern portion.

Garfield County

There are 34 wetlands of Types III, IV and V in Garfield County along with numerous Type II basins. The Type II wetlands were not recorded individually in all cases but were grouped and assigned a total acreage figure per section. The total acreage of all types is 3,879, approximately 86 percent (3,325 acres) of which is Type II. Type IV and V comprise only 11 percent (429 acres) of the total acreage. Six of the 34 wetlands are larger than 10 acres.

No wetland destruction has occurred in the county although 19 miles of drainage ditches were recorded during the survey. Haying and/or grazing make up all of the surrounding land use of the wetlands.

The North Loup and Calamus rivers flow through the extreme southwestern corner of the county. The two rivers, along with several smaller creeks, form 83 miles and 415 acres of running water. Farm ponds number 253 and make up 440 acres of water. There are no public lakes and no reservoirs of any consequence in Garfield County.

Grant County

The wetland survey of Grant County indicates the presence of 283 wetlands comprising 8,442 acres. Permanent water (Types IV and V) makes up

approximately 79 percent (6,672 acres) of the total wetland acreage and 72 percent (204) of the total number. Two Type II wetlands totaling 146 acres and 77 Type III wetlands comprising 1,624 acres complete the total. Wetlands in Grant County larger than 10 acres equal 145, or 51 percent of the total number.

The most outstanding feature Grant County possesses regarding wetlands is the great amount of destruction that has occurred. Survey results show that approximately 56 percent (10,654 acres) of the county's wetland acreage and about 18 percent (64) of the total wetland number have been destroyed. The frequency of drainage in Grant County is greater than that of any other county in the sandhills. Larger Type IV and V wetlands have been the chief targets. Ditching has been the principal method used although pumping methods have been employed in areas where ditching is not feasible. Although drainage by pumping is usually not permanent it often destroys the wetland's value to waterfowl and other wildlife. Few landowners use the pumped water for irrigation purposes. The popular method is to pump the water into a sandy pocket in the surrounding hills where it is taken into the ground and does not accumulate. Future wetland destruction is expected.

Haying and/or grazing comprise all of the surrounding land use of the wetlands. Grant County lakes tend to be shallow, and for the most part have a light alkaline content.

There are seven farm ponds in the county making up 22 acres of water. No reservoirs, streams or public waters are contained in Grant County.

Holt County

There are 1,966 wetlands in Holt County containing 10,288 acres. The wetlands of the county tend to be smaller on the average than most other sandhill counties as is evident by the fact that it ranks first in number of wetlands but only fifth in total wetland acreage. The average size of all Holt County wetlands is approximately 5.2 acres. The survey shows that 93 percent (1,824) of the wetlands are under 10 acres in size while only about 3 percent (56) reach sizes larger than 25 acres. Slightly over 41 percent (4,239 acres) of the total acreage is made up of Types IV and V.

No complete wetland destruction has been recorded in Holt County although 14 Type IV and V lakes have been reduced to types of less permanence. A total of 102 miles of drainage ditches has been recorded in the county with 75 percent (77 miles) occurring in the grassland-meadows of the southern half. There is evidence that some wetland destruction did occur prior to 1939. There are two areas of public ownership in the county which removes 530 acres from the threat of destruction. Haying and/or grazing make up approximately 90 percent of the surrounding land use of the wetlands.

The Niobrara River marks the entire northern boundary of Holt County. The Elkhorn River begins in the northwest corner of the county at the edge of the sandhills, and tends to follow the eastern edge of the hills until it flows out of the southeast corner of the county. The two major rivers combined with several smaller streams form 610 miles and 2,613 acres of productive water.

Additional water in Holt County included 796 farm ponds, flood control structures and other structures which comprise 1,278 acres. There is one reservoir in the county which holds approximately 20 acres.

Hooker County

The survey results show eight wetlands in Hooker County containing 298 acres of water. Of the eight wetlands, seven are permanent (Types IV and V) and one is to Type III. No Type II wetlands were detected in the county. Permanent water makes up approximately 90 percent (273 acres) of the wetland acreage. Six of the county's wetlands are larger than 10 acres while the remaining two are 3 acres or smaller.

Two wetlands totaling 222 acres have been destroyed by ditching. There are no wetlands under public ownership in Hooker County. Haying and/or grazing make up all of the surrounding land use of wetlands. The Middle Loup River flows through the northeastern corner of the county and is the only major stream in the area. Other water in Hooker County consists of eight farm ponds totaling 13 acres.

Keith County

There are 408 wetlands in Keith County comprising 1,832 acres. Eighteen percent (330 acres) of the total acreage is permanent water while 72 percent (1,324 acres) is temporary acreage of Type II classification. Only about 5 percent (20) of the total number consists of permanent water. The survey shows that approximately 82 percent (334) of the county's wetlands are 5 acres and under in size. One wetland totaling 70 acres has been destroyed by ditching.

Haying and grazing combinations make up all of the surrounding land use of the wetlands north of the North Platte River while cropland (small grains) surrounds all but a trace of the wetlands in the southern portion of the county. Only about one-third of Keith County is classed as sand-hills but it is here that all of the larger, permanent water bodies are located.

The North and South Platte rivers make up most of the county's flowing water which consists of 120 miles and 1,758 acres. The North Platte River, together with Kingsley Dam, makes up Lake McConaughy, consisting of 35,000 acres of water. The river also contributes to a smaller reservoir in the county. Supplementary water in Keith County consists of 214 farm ponds comprising 1.4 acres.

Lincoln County

While Lincoln County is the second largest county in the survey it encompasses only 50 wetlands totaling 2,642 acres. Only about 6 percent (167 acres) of the wetland acreage and approximately 7 percent (48) of the total number are permanent. Type II wetlands are dominant in both acreage and number with 1,965 (74 percent) and 492 (69 percent) respectively. Only 46 of the county's wetlands are larger than 10 acres while 503, or 78 percent are 3 acres or smaller. No wetland destruction has occurred in the county.

Haying and/or grazing make up the surrounding land use of only 23 percent of the wetlands in the county while cropland encompasses the remaining portion. There are no natural wetlands under public ownership in Lincoln County although three reservoirs along with 14 gravel pits, on Interstate #80, comprise 5,903 acres of water. The North and South Platte Rivers meet in Lincoln County to form the Platte River. These rivers coupled with several smaller creeks comprise 261 miles and 3,046 acres of flowing water. Farm ponds in Lincoln County number 159 and comprise 665 acres of water.

Logan County

There are 59 wetlands in Logan County comprising 513 acres. Approximately 26 percent (132) of the county's wetland acreage is permanent (Types IV and V). About 24 percent (14) of the total number are permanent wetlands. Fourteen wetlands in Logan County are larger than 10 acres while 38 measure 5 acres or less.

Haying and/or grazing comprise 51 percent of the surrounding land use of the wetlands while a portion of cropland, south of the South Loup River, surrounds the remaining basins. No wetland destruction was detected in the county.

Supplemental water in Logan County includes 59 miles of streams totaling 30 acres of water. These figures are made up almost entirely by the South Loup River. There are 126 farm ponds in the county totaling 72 acres. Logan County has no wetlands in public ownership and no reservoirs.

Loup County

Loup County's wetlands number 180 and comprise 980 acres. Approximately 98 percent (958 acres) of the total wetland acreage is temporary (Types II and III) and the remaining 2 percent consists of Type IV. No Type V wetlands exist in Loup County. Only two of the county's wetlands are permanent. The survey results show 8 percent (14) of the wetlands are larger than 10 acres while approximately 71 percent (127) are 5 acres or smaller. Nearly all of the wetlands are located in the northeastern corner of the county.

Haying and grazing combinations comprise all of the surrounding land use of the wetlands. No wetland destruction was detected in the county.

The North Loup and Calamus rivers flow through Loup County from northwest to southeast, for 80 miles, forming 458 acres of water. Additional water in the county includes 109 farm ponds comprising 192 acres. No reservoirs or areas of public ownership exist in Loup County.

McPherson County

There are 63 wetlands in McPherson County comprising 2,873 acres. Approximately 44 percent (1,271 acres) of the total acreage and 56 percent (35) of the total number is permanent water (Types IV and V). Type

III wetlands make up 47 percent (1,338 acres) of the total acreage and about 41 percent (26) of the total number. Wetlands over 10 acres in size number 25, or 40 percent of the total while 30, or 48 percent, are 5 acres or smaller. Practically all existing wetlands are confined in the extreme western portion of the county.

Drainage by ditching was attempted on two lakes in the county. Complete destruction was the result on one of the wetlands (64 acres) while only partial loss was recorded on the second. All wetlands in McPherson County are privately owned and are therefore vulnerable to future destruction.

Haying and/or grazing comprise all of the surrounding land use of the wetlands. No reservoirs exist in the county. Two farm ponds comprising 1 acre of water and 14 miles of small creeks comprising 7 acres of water make up the remaining portion of the water in McPherson County.

Morrill County

Although only the northeast corner of Morrill County is considered a sandhill region the area encompasses 276 wetlands comprising 4,800 acres. Survey results show 44 percent (2,122 acres) of the total acreage and 37 percent (102) of the total number to be permanent (Types IV and V). Type III wetlands make up 34 percent (1,646 acres) of the total acreage and 33 percent (92) of the total number. Approximately 25 percent (68) of the county's wetlands are larger than 10 acres while 63 percent (173) measure 5 acres or less. More than 95 percent of the wetlands are located in the northeastern one-fourth of the county. Wetlands of Morrill County tend to be quite shallow and are frequently highly alkaline.

Wetland destruction in the county has been relatively light with the loss of two wetlands totaling 454 acres. Ditching was the method used in each case. All sandhill wetlands in Morrill County are privately owned.

Haying and/or grazing make up 99 percent of the surrounding land use of the wetlands while the remaining basins are located on cropland on the southern fringe of the sandhills.

Additional water in Morrill County consists of 161 farm ponds and gravel and sand pits totaling 437 acres and approximately 109 miles of rivers and creeks comprising 5,815 acres. The North Platte River is the main contributor to the stream acreage as it comprises approximately 5,733 acres. No reservoirs exist in Morrill County.

Perkins County

Although Perkins County is practically devoid of sandhills the number of wetlands involved makes its inclusion into the survey necessary. There are 1,793 wetlands in the county comprising 6,148 acres. All of the wetlands are temporary (Types II and III). Approximately 75 percent (4,630 acres) of the total acreage and 82 percent (1,468) of the total number is Type II. Seven percent (119) of the wetlands are larger than 10 acres while 82 percent (1,475) are 5 acres and smaller.

Ditching has accounted for the destruction of two wetlands totaling 36 acres.

Cropland, primarily wheat, comprises all of the surrounding land use of the wetlands. There are no rivers, creeks, or reservoirs in Perkins County and no wetlands under public ownership. Farm ponds number 37 and comprise 18 acres of water.

Rock County

There are 1,706 wetlands in Rock County comprising 10,504 acres. Survey results show 46 percent (4,870 acres) of the wetland acreage and 35 percent (598) of the total number to be permanent (Types IV and V). Type III wetlands comprise 35 percent (3,643 acres) of the total acreage and 47 percent (807) of the total number. Approximately 9 percent (161) of the wetlands are larger than 10 acres while 82 percent (1,392) are 5 acres or smaller.

No actual wetland destruction has been recorded in the county although 47 miles of drainage ditches do exist. One wetland totaling 210 acres is currently under public ownership and is therefore removed from the threat of destruction.

Haying and/or grazing comprise all of the surrounding land use of the wetlands.

There are 65 farm ponds in Rock County which hold 128 acres of water. Additional water includes the Niobrara River, which forms the county's northern border, and several small creeks. The river and creeks flow for approximately 100 miles through the county and make up 855 acres of water. No reservoirs exist in the county.

Sheridan County

There are 1,384 wetlands in Sheridan County comprising 22,914 acres. Survey results show that approximately 78 percent (17,848 acres) of the total acreage and 65 percent (894) of the total number is permanent water (Types IV and V). Type III wetlands make up 19 percent (4,327 acres) of the total acreage and 25 percent (350) of the total number. Twenty-six percent (357) of the wetlands are larger than 10 acres while 65 percent (900) are 5 acres or smaller.

Approximately 81 percent of Sheridan County wetlands are concentrated in the southern one-third and extreme northeastern corner of the county. The lakes in the northeastern region tend to be low in alkaline content while the lakes in the southern third are, for the most part, moderately to highly alkaline. Although some lakes in Sheridan County reach depths of 7 to 8 feet most of the lakes tend to be quite shallow, some not exceeding 3.5 feet at the deepest point. Twin Lake, located in the south-central portion of the county, is the largest lake in the sandhills with 1,208 acres.

Wetland destruction has resulted in the loss of 26 wetlands totaling 2,064 acres. Ditching has accounted for all of the destruction. Five of the destroyed basins were smaller than 10 acres while the largest area drained once contained 650 acres of water. Only two areas, Smith and Walgren lakes, comprising 403 acres of water are presently under public ownership and are removed from the threat of destruction. Future wetland destruction in Sheridan County is anticipated.

Haying and/or grazing comprise slightly over 96 percent of the surrounding land use of the county's wetlands while several small basins are located on cropland near the town of Gordon.

Sheridan County has one reservoir comprising 26 acres, 604 farm ponds comprising 1,215 acres and three watershed dams holding 38 acres of water. The Niobrara River is the largest stream in the county flowing 59 miles and containing approximately 644 acres of water. Seven smaller rivers and creeks course through the northern portion of the county for an additional 166 miles and 91 acres of water.

Wheeler County

There are 552 wetlands of Types III, IV and V in Wheeler County along with numerous Type II basins. Type II wetlands were not recorded individually, in some cases, but instead were grouped and assigned a total acreage figure per section.

The total acreage figure for all types of wetlands in 4,026 acres. Approximately 72 percent (2,890 acres) of the total acreage is Type II while only 6 percent (261 acres) of the total acreage is permanent water (Type IV and V). Survey results show only 3 percent (18) of the included number of wetlands to be larger than 10 acres while 93 percent (515) are 5 acres or smaller. More than 93 percent of the wetlands are located in the northern one-half of the county.

No wetland destruction was detected in the county although 13 miles of drainage ditches were recorded. No wetlands, under public ownership, exist in Wheeler County. Haying and/or grazing make up all of the surrounding land use of the wetlands.

Supplementary water in Wheeler County consists of 181 farm ponds and similar structures forming 273 acres, two reservoirs comprising 125 acres and 113 miles of small streams containing 455 acres.