Ditching of Wetlands in the Nebraska Sandhills: A Case Study of Grant County

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DITCHING OF WETLANDS IN THE NEBRASKA SANDHILLS:
A CASE STUDY OF GRANT COUNTY

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Ditching of wetlands in the Nebraska Sandhills is shown by a case study of Grant County, where ditching can be traced back more than fifty years. Drainage activity shown on recent soil and topographic maps shows more than 55 sites in the county where ditching has occurred. Many lakes and marshes have been completely drained and are now hay meadows. In a section of southeastern Grant County, eight lakes comprising more than 3,500 acres are shown as drained. The wetland valleys in the Sandhills Natural Landmark south of Hyannis have been ditched. The regulatory role of the Army Corps of Engineers is also briefly discussed.

Wetlands are a unique facet of the Nebraska Sandhills. The lakes, marshes and meadows are an important natural resource, providing fish and wildlife habitat, hay production, and groundwater recharge for the "Ogallala Aquifer," to mention three prominent natural values. In the 100 years since settlement of the Sandhills, many meadows and even lakes have been ditched to provide areas where prairie grass is cut to provide hay for cattle. Drainage in Grant County illustrates the extent of ditching activity in one area of the Sandhills.

DITCHING AND DRAINAGE OF LAKES AND WETLANDS

Hay from subirrigated wetland meadows provides a reliable crop each summer for the Sandhills rancher. Wetlands in the valleys between the dunes have changing water conditions that influence the amount of ground that can be hayed. Areas with wet meadows and readily available water were among the first places claimed by ranchers in the Sandhills (McIntosh, 1974, 1976). Settlement of the areas occurred first where water for herds of livestock could be naturally provided. Ranchers and others realized the winter cattle feed that wetlands could provide. Once wetlands were claimed, the pressure increased to develop them for increased hay production. Ditches were dug in the wet meadows and lakes to alter the water regime and improve conditions for getting grass-cutting equipment into the meadows. Sometimes the grass is cut from hay meadows early in the growing season and the regrowth provides forage later in the year.

Ditching activity has occurred in the Sandhills during the past 75 years. Extensive ditching done around 1918 in the northwest part of Cherry County was described as the "greatest destruction of wetlands" in this county (McMurtrey et al., 1972). Elsewhere before 1920, most ditching had occurred among the lakes at the headwaters of the North Loup River and in Morrill and Garden counties (Oberholser and McAtee, 1920). There was "apparently no danger that this will be carried to a much greater extent than at present, nor is it likely to be extended to the lakes of eastern Cherry County or the lakes of Brown County" (Oberholser and McAtee, 1920: 6).

Some of the first ditching activity was done by ranch hands using a sharp spade. A ditch two feet wide, two feet deep and three-fourths of a mile long was dug in this manner on the Monahan Circle-Dot Ranch in Grant, Cherry, and Hooker counties. Later this ranch used a piece of equipment shaped
like a snow plow and pulled by horses. Smaller ditches were dug using dynamite (Monahan, 1987: 206-210).

One site, Foley Lake was ditched and the ground planted with reed canary grass. The area then provided 500 tons of hay each year. Collins Lake two miles northwest of Whitman was drained in the fall of 1939. "It took just six weeks to do the job" (Monahan, 1987: 208). This drainage ditch included using a crane and dragline to dig a 53-foot cut through a hill. A bed of quicksand caused some difficulty and meant that the tile put in place had to be replaced years later. "The water from this lake bed goes north of Whitman and joins at the railroad with water from the west that starts about three miles southeast of Hyannis to just west of Hecla, some 15 miles east of Whitman and continues through Whitman by way of both tile and an open ditch" (Monahan, 1987: 209). The distance the water travels apparently varies. "In the spring of the years 1983 and 1986, this water got within a mile or so of Hecla—the furthest east I ever saw it except one other time, probably 1915, the wet year" (Monahan, 1987: 209).

The Lawrence Valley north of Whitman was another valley ditched by the Monahan Ranch. The drainage was to a stream called the Middle Prong that empties into the Middle Loup River. Removing enough water in this valley required an electric pump and gate to force the water from the valley since there was an insufficient drop in ground elevation. The account written by Monahan mentions ditching activity that occurred at the Gudmundsen Sandhills Laboratory, now owned by the University of Nebraska. Along the Burlington Railroad right-of-way between Hyannis and Whitman, the first ditches were dug in the 1930s (material on file, Regulatory Division, Omaha District, Corps of Engineers). These ditches are typically cleaned regularly to maintain adequate drainage.

Ditching by ranchers in Grant County was noted before 1940 by Motl (1939) who wrote: "Quite commonly, a water table is so high as to keep large parts of hay meadows marshy or under water. Wild rice, bulrushes, flags, and the coarse grasses of low food value grow on these wet soils of the Gannett series. Several ranchers have constructed ditches to drain the marshes and decrease the lake areas. This makes available the grasses on the edges of the former marshes and supplants the coarse marsh vegetation with timothy or other nutritious grasses. The rancher and the conservationist do not agree on the advisability of such drainage. To the one, a high water table means less hay; to the other there is in the lowered water table a threat of future water shortages." A photo shows a section of a drained wetland five miles south of Whitman. Other studies have noted ditching and drainage work in Grant County (McMurtrey et al., 1972) and in other Sandhills counties (Oberholser and McAtee, 1920).

**METHODS**

Two relatively current maps show where ditching has occurred and were used to evaluate the extent of ditching in Grant County: maps are from the soil survey for Grant County issued in 1977 by the Soil Conservation Service and 7.5-minute topographical maps released from 1985 through 1987 by the United States Geological Survey. The 15-minute topographical maps were also used when needed.

The locations of ditches were marked on a county map. Indications of ditching activity were shown on topographical maps as a thin blue line through a wetland area. In some cases, a topographic map showed ditches in lakes and areas with standing water whereas the soils map did not show any ditching activity. Hay meadows were evident since hay stacks are prominent dots on the aerial photos used as base maps to delineate areas of different soil types.

Information on activities related to ditching and placing fill in wetlands, regulated by Section 404 of the Clean Water Act, along the Burlington Northern right-of-way near Hyannis, was provided by the Regulatory office of the Army Corps of Engineers in Omaha and Kearney, Nebraska.

The size of areas ditched was estimated by using squares of known area (i.e. 40 acres) to measure the acreage shown on the topographic maps. The soil survey maps were the source for the traced figures of the lakes and meadows. This tracing was digitized using a scanner connected to a microcomputer. The digitized bitmap was redrawn using Corel Draw graphics software to create the figures.

**WETLAND SOILS OF GRANT COUNTY**

The soil maps of Grant County include descriptions of the soil moisture characteristics and suitability for providing hay (Soil Conservation Service, 1977). Soils follow a general gradient, with the moist Valentine-Gannett-Elsmore Association in the valley lowlands between the dunes. Most of the wetland areas and lakes in the county are in this association.
EcB: loamy fine sands; subirrigated; may be too wet for haying operations during the wettest seasons or following heavy rains. 
EfB: loamy fine sand; subirrigated; water table at a depth of two to five feet. 
Ga: fine sandy loams; wetland; wetness from the high water table is the characteristic that most limits the use of these soils. During the wettest seasons they are commonly too wet for haying operations. Runoff is very slow, or the surface is ponded. 
Gb: fine sandy loams; subirrigated; in some places the water table is above the surface early in spring. 
Ld: loamy fine sands; wetland; in most years the water table is above the surface early in spring, but recedes to a depth of about two feet early in fall. These soils are commonly too wet for haying operations during wet seasons or after heavy rains. Runoff is ponded or very slow. 
Lf: loamy fine sands; subirrigated; during some seasons the areas are too wet for timely haying operations. 
Ma: marsh; marsh areas have a water table above the surface in spring and early in summer; it commonly recedes to a depth of one or two feet below the surface late in summer and early in fall. Nearly all the acreage of marsh is in native vegetation, mainly cattails, rushes, arrowhead and burreed. 
Sa: saline-alkali land; saline subirrigated; the soil is strongly or very strongly alkaline in the upper 12 inches of the horizon. Nearly all areas of this unit are in native grass and are mowed for hay. 
Tk: loamy fine sand; wetland; in most years the water table ranges from about one foot above the surface early in spring to a depth of one foot below it early in fall. The soil is used mainly as hayland. It is commonly too wet for timely haying operations during wet seasons and following heavy rains. 
Tn: loamy fine sand; subirrigated; in most years the water table ranges from a depth of one to two feet early in spring to a depth of about two feet early in fall. During wet seasons the soil is too wet for timely haying operations.

Figure 1. A map of Grant County showing where ditching has taken place. Ditches are shown by a heavy black line. Other land features, especially wetlands and hay meadows, are also shown.
Soils that are permanently wet, such as lakes, cattail marshes, sedge meadows, and immediately adjacent wet meadows, typically are not hayed if the soil is inundated. Changes in plant composition occur with changes in rainfall and water levels and influence wetland floristic communities. In wet years, lakes and marshes increase in area since moisture conditions support wet-meadow grasses farther up the lower slopes of the hills.

**EXTENT OF DITCHING ACTIVITY**

There has been extensive ditching in Grant County (Fig. 1), mostly in the eastern half of the county, where at least 55 sites show ditching. The areas with the most extensive ditching are near the Loup River, along the Burlington Railroad right-of-way, and the Spring Valley Lake area. Each line shown on the map was considered a single occurrence although the ditch may be miles long and have several lateral ditches. A short ditch is obviously not comparable to one that is many miles long such as those along the railroad right-of-way and the branches of the Middle Loup River. The longest is a 15-mile network of ditches along the railroad tracks near Whitman, which continues into western Hooker County where it ends. The ditch work through the valley at the University of Nebraska Gudmundsen Field Laboratory area is 8.5 miles long. The ditch through the meadow there continues into Hooker County and eventually connects to the south branch of the Middle Loup River. Other lengthy ditch networks are those that also drain wetlands and then connect with other branches of the Loup River in Cherry County. There are apparently several lakes, including what were once Moran, Egan, Haney, and Rothwell lakes that are ditched (Table I) and are now hay meadows, not lakes (Fig. 2). The Dismal River Forks ditches in the southeast part of the county also continue into Hooker County and eventually empty into the North Fork of the Dismal River. Any more recent ditching activity would not be included in this total since it was not shown on the sources reviewed.

The southwestern portion of the county has had extensive localized ditching. The specific extent of ditching is represented by the approximately 3,760 wetland acres that have been ditched in just this region (Table I). Not all lowlands are completely dry but water may still occur to a limited extent in places where the ground level is the lowest and the water table is exposed. For example, Egan Lake has about 220 acres of wet conditions. Spring Valley has about 380 acres, and Middle Valley has about 160 acres.

**Table I. Ditched areas in southeast Grant County that show the extent of drained wetland areas.**

<table>
<thead>
<tr>
<th>Location</th>
<th>Approximate acres of wetland soils</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egan Lakebed</td>
<td>480</td>
</tr>
<tr>
<td>Handlin Valley</td>
<td>200</td>
</tr>
<tr>
<td>Haney Lakebed</td>
<td>600</td>
</tr>
<tr>
<td>Middle Valley</td>
<td>220</td>
</tr>
<tr>
<td>Rothwell Lakebed</td>
<td>240</td>
</tr>
<tr>
<td>Snyder Valley</td>
<td>820</td>
</tr>
<tr>
<td>Spring Valley</td>
<td>900</td>
</tr>
<tr>
<td>Vinton Valley</td>
<td>300</td>
</tr>
</tbody>
</table>

Ditching activity has occurred in lakes and wetlands (Ga, Ld and Ma soil types) and most extensively in subirrigated meadows (EcB, EfB, Gb, LF, Tk and Th soil types). Despite the ditching, in some places, according to the soil characteristics, sites may have standing water during the spring and after heavy rains. The water level would drop through the summer and fall seasons.

The type of ditching varies. One type is a short ditch to drain the meadow area of a lake or simply to lower the water level so the area can be hayed. A second type is to drain a lake or meadow into a nearby intermittent lake that may be in another valley. This also would provide for an overflow if the water in the lake was high. The third category is a network of ditches to transport water so it can be drained into a river. Two examples of this type of ditch are along the branch of the South Loup and at the meadow at Gudmundsen Field Laboratory. In a few cases a pipeline (a culvert) and pump lowered the water level so the lake edge can be hayed. These items were used at the meadow north of Big Buckboard Lake (Fig. 3).

Because of ditch work, there are fewer wetlands associated with the Ga, Ld and Ma soil sites in Grant County and elsewhere in the Sandhills. Most of the wetlands or marsh sites that remain are associated with some lakes in remote localities. There has been less ditching in the western part of the county and several large valleys apparently remain unaltered. One larger site with an open water, wetland, and meadow complex is Long Valley (Fig. 3). The Farm Valley to the northwest also has wetland areas that are not ditched although they are hayed. Others include wetlands near Wild Horse Hill and Pleasant Valley.
Figure 2. Two lakes in the Sandhills of Grant County illustrating the network of ditches used to drain water from the wetland soils of the lakes.
Figure 3. Two valleys in Grant County, comparing an unditched and a ditched valley. The upper figure indicates the wetlands. Note the network of ditches in the lower figure that were used to drain the wetlands in this valley in the Sandhills Natinal Landmark. This valley is now a hay meadow. Abbreviations are for the soil types given in the text.

Table II. Size distribution of destroyed wetlands of select counties in the Sandhills (from McMurtrey et al., 1972).

<table>
<thead>
<tr>
<th>Locality</th>
<th>0-10 ac.</th>
<th>10.1-50</th>
<th>50.1-100</th>
<th>100.1-200</th>
<th>200.1-400</th>
<th>400±</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grant C.</td>
<td>1 (1.6%)</td>
<td>5 (7.8%)</td>
<td>16 (25%)</td>
<td>17 (27%)</td>
<td>23 (36%)</td>
<td>2 (3%)</td>
</tr>
<tr>
<td>Cherry C.</td>
<td>1 (1%)</td>
<td>15 (23%)</td>
<td>14 (21%)</td>
<td>10 (15%)</td>
<td>19 (28%)</td>
<td>8 (12%)</td>
</tr>
<tr>
<td>Overall</td>
<td>8 (5%)</td>
<td>43 (23%)</td>
<td>40 (22%)</td>
<td>37 (20%)</td>
<td>43 (23%)</td>
<td>13 (7%)</td>
</tr>
</tbody>
</table>
Ditching has caused less loss of lakes than of meadows. Many lakes that remain are northeast of Ashby, where there are several of various sizes such as Calkin, Hibbler, and Knox lakes. Others along the western boundary of the county include Alkali and Graves lakes. Smaller lakes are scattered throughout the county. Some of the larger, more prominent lakes are shown on the map of Grant County (Fig. 1).

A previous study has noted the extent of ditching activity in Grant County (McMurtrey et al., 1972). That survey for the Sandhills region took place from 1962 through 1968. The survey did not include Type I wetlands that are seasonally-flooded basins or flats. Grant County was noted to have the most extensive wetland destruction of any Sandhills county. About "56% (10,564 acres) of the county's wetland acres and about 18% (64) of the total" number of wetlands have been destroyed (McMurtrey et al., 1972:73). Most of the wetlands destroyed in Grant County were the deeper water Type IV wetlands that are inland deep-water marshes and Type V wetlands that are inland open fresh-water lakes. More than 90% were 50.1 acres or larger in size (Table II). This percentage is higher than adjacent Cherry County, where there has also been extensive destruction of wetlands (67 sites comprising 12,739 acres).

The percentage of larger wetlands destroyed in Grant County would be greater if other sites were included, especially the larger valleys and lakes that have been ditched and drained (Table I).

Ditching activity is not limited to Grant County. Similar work has occurred throughout the Sandhills. Examples include:

Arthur County: Cheyenne Lake is ditched to lower water levels to allow hay to be cut. In 1989 this lake had standing water through early July, with several species of waterfowl occurring on the lake. By mid-August there was only a small amount of standing water in the ditches and the hay had already been cut. Three other sites are to the east of Swan Lake, Baldy Valley and the valley to the north of Box Lake. The meadow north of Box Lake has a ditch more than five miles long with one Ga soil area having twelve lateral ditches (SCS soil map).

Cherry County: the Middle Branch of the Middle Loup and Green Lake sites just north of Grant County (USGS topographic map).

Cherry: numerous places along Boardman Creek. This creek has several areas of Cutcomb wetland soils, including one about two miles in length along the creek valley (SCS soil map). Few areas in Cherry County have this soil type. Other sites with the same soil type are recognized as fens by the Natural Heritage Program of the Nebraska Game and Parks Commission.

Cherry: North Fork of Plum Creek and origin of Goose Creek (USGS topographic map). Goose Creek has been mostly straightened between creek miles 40 to 60 (Bleed and Flowerday, 1989).

Cherry: Snake River headlands straightened to drain wetlands and ponds; Plum Creek in the region of mile 60 mostly straightened; Gordon Creek mostly straightened in two five-mile portions between miles 80 to 100 (Bleed and Flowerday, 1989).

Garden County: Anderson Valley just west of central Grant County (USGS topographic map).

Other sites where ditching has occurred are also visible from highways and vehicle trails elsewhere in Cherry County. In each case the wetlands affected the most are subirrigated meadows and shallow water wetlands. The result of this ditching on wildlife and other natural resources associated with these wetlands has not been studied. It is obvious that many wetlands no longer provide the wildlife values that would be associated with an undisturbed wetland.

The extent of ditching in wetlands in eastern Sandhills counties was also noted in the 1960s survey (McMurtrey et al., 1972). Although the number of acres of wetlands loss was not designated, the miles of ditches were measured in Garfield (19 miles), Holt (102 miles with 75% of these in the grassland meadows of the southern half of the county), Rock (47 miles), and Wheeler (13 miles) counties.

The cutting of hay throughout the Sandhills would result in almost no undisturbed native meadows with extensive grass growth. Wherever possi-
Ditching of sandhills wetlands—which is probably almost all meadows in the Sandhills except for some on public property such as Valentine Refuge—meadows are cut for hay. This habitat would not be available for wildlife, especially certain birds that require meadow habitat for breeding. Sometimes, birds could successfully nest if the hay is cut after the nesting cycle has been completed. During years with greater rainfall in the spring and then warm and dry weather, hay is cut weeks earlier and thus has a greater impact on nesting birds. Any successful measures to protect meadows, marshes and lakes from drainage would need to provide an economic incentive for landowners to retain or reestablish meadows, marshes, and lakes. The moist soils provide the hay crop essential for feeding cattle. An increase in wet places, like a marsh or wet meadow, would decrease the size of a hay crop and reduce the size of the cattle herd that could be maintained on the available hay crop. This would reduce the economic return for a cattle operation.

SANDHILLS NATIONAL NATURAL LANDMARK

The Sandhills National Natural Landmark was established to recognize its grass-covered dune topography, native sandhills prairie and hilltop blowouts, and a variety of wetlands (Schultz and Tanner, no date). In the description of the natural values, the chief value of the designated area was the presence of water. The water resources here—meadows, marshes, and lakes—have been affected just as they have been elsewhere. By comparing the topographic map with ditch locations, apparently each of the meadow sites within the landmark boundary has been ditched. Topographic maps from 1948 show ditches were present then at some sites but other current ditches were intermittent drainageways. The ditch work includes the meadow north of Big Buckboard Lake, which has a variety of wetland soil types and is about 640 acres in size (Fig. 3). The ditch work includes a primary ditch and several laterals. The earth moved was sidecast as fill into Ga and Ma class wetland soils. The spoil piles here are shown on the topographic map. This ditching activity detracts from the value of the landmark since representative, undisturbed Sandhills wetlands no longer occur or have been altered.

SECTION 404

Section 404 of the Clean Water Act governs placing fill in a wetland. In the Sandhills, Section 404 regulations typically apply when a ditch is dug and the spoil is sidecast onto the adjacent wetland soils. These regulations apply to activity occurring after October 1984 (1989: John Peterson, Omaha Corps of Engineers Regulatory Division, personal communication). At many ditched areas seen during 1989 in Grant and Cherry counties, spoil was typically sidecast into the wetland. In 1988 and 1989 draining and sidecast activity occurred at nine locations along the railroad tracks between Wolfenberger Lakes near Ashby, near Whitman, and eastward into Hooker County (Section 404 records from Regulatory Division, Corps of Engineers, Omaha). Most of this activity was classified as maintenance work that did not require a Section 404 permit. According to this information, Wolfenberger Lake and a lake about five miles west of Whitman were almost completely drained. One new ditch and its sidecast fill, and a small amount of fill placed by Burlington Northern, were the only activities covered by Section 404. Burlington Northern removed the fill to comply with regulations and allow their work to continue.

The Monahan Circle-Dot Ranch was required to get a permit for two cases of placing unauthorized fill in a wetland—one site is five miles east of Whitman, and the second site is in section 28 T24N R37W (applications and correspondence on file, Corps of Engineers, Kearney). The application stated that the purpose of cleaning an existing ditch was "so we can cut more hay for our cattle" James A. Monahan wrote. The Corps is evaluating whether fill activity at Big Buckboard Lake and Stevenson Lake in Cherry County will require a permit (Mike Rabbe, Corps of Engineers in Kearney, personal communication). In Cherry County fill associated with ditching in section 14 T28N R28W was authorized under a nationwide permit.

Section 404 does not have jurisdiction over ditching activity, just the placing of fill. This means a wetland could be drained by ditches if the spoil is hauled to a non-wetland site for disposal. Section 404 does not offer any effective measures to conserve wetlands by regulating fill. It is not the fill that destroys the wetland, but the loss of standing water and the wetlands that would occur if ditching was not present.

SUMMARY

The ditching and loss of wetlands in Grant County and elsewhere indicate the need for measures to conserve and restore wetlands in the Sandhills. Efforts are needed to ensure that unaltered wet meadows and shallow-water wetlands remain as part of the water resources of this region. Where fea-
sible, lakes and wetlands could offer an opportunity for wetland restoration. The wetlands of the Sandhills are perhaps one of the most distinctive aspects of this dune country.

LITERATURE CITED


