DRAINAGE PROBLEMS OF POLK COUNTY

It appears paradoxical that a county with the annual precipitation varying from 19 to 22 inches should have drainage problems, where in other agricultural sections 35 to 45 inches of rainfall are considered necessary for good crop production. After the better drained land along the watercourses had been taken up by the first wave of settlers, succeeding settlers on the open prairie had to deal with the spring run-off from the melting snows. If moderate to heavy snows covered the land and warm temperatures prevailed in April, the run-off from the ridges combined with the run-off of the prairies to fan out over the more level lands of the Red River Valley covering farm lands and running over roads and drives. While the water covering the frozen soil seldom did much damage to the prairie farms, yet the depressions and pot-holes in the fields were filled as the waters drained away, thus presenting the first drainage problem. The last choice of and for the early settlers on the prairie was the land subject to over-flow from the streams. With the exception of the Red Lake River, other streams flowing across the valley from the higher elevations did not have deep cut valleys and at flood stage spread out over the farm lands. This was also true of the Red River, which marked the western boundary of the county.

The first drainage work of the prairie farmer, after locating his buildings on the highest spot on the farm, was to drain the pot-holes when an easy outlet could be found. The big problem was to find suitable or adequate outlets without dumping water on a neighbors land. A study of the topography of the county showed the general slope of the prairie section of the county to be from the southeast to the northwest, with a general slope of one foot per mile. The study showed also that the banks of the streams had been built up, especially so with the Red Lake River, so that the land sloped away from the river banks and the natural slopes paralleled the river. In order for the drainage water to get into the river, a high head of water was necessary to cut through the banks. The same was true when drainage ditches were run into the Red Lake River. The Sand Hill River was the chief offender of a stream in the county which spread out over the valley and formed what was called the Neilsville Swamp and also flooded nearby land one to several times per year. The unpredictable behavior of the Sand Hill River and the containing of the spring run-off affected the economy of the region to the extent that farmers, businessmen, and railroad officials became aroused to the seriousness of the drainage problem. As a result of the interest in drainage, the first Red River Valley Drainage Convention was held in Crookston on July 2, 1886, with representatives of all whose interests were involved present. An excellent report of this first drainage convention outlining the resulting action on the Sand
Hill River and other early drainage projects has been recorded by a former county engineer, George A. Ralph, in the HISTORY AND BIOGRAPHY OF POLK COUNTY, 1916, pp. 122-124. Drainage engineer Ralph also includes in his report the history of the early drainage legislation through the legislature, outlining procedures for the establishment of county and judicial ditches. According to the reports, the first great accomplishment of the Red River Valley Drainage Commission was to accept the proposal of James J. Hill that a drainage survey be made of the Red River Valley on the terms that The St. Paul, Minneapolis and Manitoba (now the Great Northern) pay one-half the costs and the participating counties pay the other half. The six border counties beginning with Wilkin on the south and extending north to include Kittson all took part in this survey. Ralph further reports that many were amazed to find that the slope of the land to the northwest across the prairies ranged from one to four or more feet per mile.

It was not until the legislative session of 1893 that the Red River Drainage Commission was legalized and an appropriation of $100,000 was made for drainage work and the first drainage laws were passed. As a result of the enabling drainage acts passed by the legislature, Polk County today has an elaborate and effective system with outlets into the rivers of the county and the Marias (apparently an old channel of the Red Lake River extending from west of Fisher in a north and northwesterly direction to its junction with the Red River several miles north of East Grand Forks). The network of ditches in the county can be seen on the accompanying Drainage Map of Polk County. As a matter of historical record, the first of each of the three types of ditches will be listed. The County Ditch No. 1 is six miles in length, running south and cutting through the river ridge into the Red Lake River two miles west of Crookston. The first state ditch completed by the Red River Valley Drainage Commission was the Sand Hill River State Ditch extending from Beltrami along the Sand Hill and emptying into that stream nine miles west. Judicial Ditch No. 1, one of the largest ditches of the county, has an average width of 50 feet, an average depth of 10 feet, is twelve miles in length and drains the northwest part of the county. In the prairie section of the county the ditches generally are located on section lines with most of the drainage going from east to west. Where it has been necessary to cut through the river ridge with the north and south ditches running into the Red Lake River, severe erosion has taken place at the ditch outlets. Striking examples of the erosion are shown in the Red Lake County ditch four miles east of Crookston and in the outlet of County Ditch No. 1 two miles west of the same city.

Farmers are now cooperating with the two Soil Conservation districts of the county in the farm drainage program. Through the use of land levellers, mechanized ditching and soil carrying equipment, spot losses in field crops are being eliminated and drainage waters are controlled by the best soil conservation practices.
TILE DRAINAGE PROSPECTS FOR POLK COUNTY

Many misconceptions concerning the value of tile drainage prevail in Polk County and in many of the other counties of the Red River Valley. No general rule or universal rule concerning tile drainage can apply to a county with as diversified topography and soil conditions as prevail in this county. There is no question but what tile lines of adequate size can drain sloughs, ponds or small lakes, but having tile lines to carry off surface water from fields is an entirely different matter. In order for tile lines to carry off surface water from the spring run-off, open man-holes must be placed over the tile lines. Even then sedimentation pits should be made to prevent the silting of the tile lines. The chief advantage of a tile line is that of removing the excess gravitational water from the fields during the growing season. Inasmuch as field soils freeze to a depth of four or more feet, the tile lines are not operative for the early spring rains. In the Fargo clay and Fargo silty clay soils often, with the heavy clay sub-soils which dominate the prairie section of the valley rapid percolation of water does not continue even over the tile line when the heavy soils compact in the trench. To get a quick percolation of the water down to the tile line stratas of gravel, cinders or other coarse materials should be placed diagonally from the surface to the tile line in all low spots over the lines. The typical clay subsoil has vertical cleavage and the lateral pull of gravitational water through the soil is very slow.

An extensive system of tile drainage was installed at the Northwest Experiment Station in 1908 in which 4\" and 5\" tile lines were spaced parallel to each other at distances of 50, 75, 100, 200, 250, 300 and 400 feet apart with outlets into an open ditch system. The greatest depth of the outlet ditch was seven feet at the northeast corner of the section where the outlet emptied into Judicial Ditch 60. Observation wells sunk to the level of the tile lines were placed between tile lines to determine the lateral pull of the gravitational water to the lines. The wells were sunk some fifteen years after the tile lines were installed which allowed time for drainage lines to be established to the tile. To summarize results we concluded that to effectively drain such soils that tile lines would have to be spaced some two rods apart, which would make the cost prohibitive. Studies were also made of kinds of tile, clay and cement types from different sources. Of the tile used at that time, the observations made after some twenty years in the soil disclosed the fact that the clay tile was more durable than the cement tile used in that experiment. It is my observation however that cement tile and culverts today, which are made with washed sand and gravel withstand the disintegrating action of our high lime soils. The same observation applies to all concrete construction which comes in contact with our high lime heavier soil types.

There are many small areas in Polk County that could be profitably tile drained, especially where earth barriers makes
surface drainage impracticable such as sloughs and marshes. Unless great economic gains result from such drainages, it would be better to retain the wet or marsh lands as a refuge for wild life, in some instances the deep sloughs or marshes might well become the drainage outlet for adjacent land in need of drainage.

As was previously pointed out, the slow lateral pull of gravitational water toward tile line in the heavy clay sub-soils of the Red River Valley and the difficulty of getting deep outlets for tile lines makes tile drainage on the level prairie farms impracticable. Lands subject to overflow in the spring run-off and from heavy summer rains present special problems. Roads, drives and dikes may be used to divert the over-flow waters, the farmers' problem then results in handling the rainfall that falls on the farm. The heavy clay sub-soils of the Red River Valley, which jealously hold the capillary water and prevent the rapid drainage of the gravitational water, serve as a water savings account for crops during the dry summers. Trees, shrubs, deep rooted crops like alfalfa, sugar beets and sweet clover not only reduce the water table in the soil but open up the soil for better penetration of summer rains.

A full report on the "Installation of an Experimental Drainage System can be seen in library copies of Bulletin 110, University of Minn., Northwest Experiment Station (now out of print).

Map showing network of County, State and United States Highways in Polk County. A good network of graveled township roads following section lines connect with the hard surfaced roads.
CHAPTER XIV

POLK COUNTY HIGHWAYS

Polk County, at the end of its first one hundred years of history, has an excellent system of roads and highways. Cities and towns of the county are connected by a fine network of concrete or bituminous paving. A network of well maintained county roads with black-top or good gravel surfacing, connect with the township roads to give all farmers easy access to excellent market roads. This modern road condition has not always prevailed. The early settlers on the clay loam prairie soils had excellent roads during summer when the soil was dry but after rains or when the frost was going out of the soil in the spring, the roads took on the epithet “gumbo”. Heavy traffic on the dirt roads was possible only when the roads were dry or frozen. Most of the heavy hauling on country roads was done when the ground was frozen, November through March. After the first snow-fall, before farm fencing was common the bob-sled and cutter traffic seldom paid attention to roadways but cut across country to make the shortest distance to its destination.

The first settlers in Polk County settled along the streams and watercourses, with the cabins and farm buildings in the shelter of the woods adjacent to the farm lands and roads went around the marshes, sloughs and lakes. As the townships got organized, roadways were laid out along section lines generally. A number of diagonal roads have been developed in the county and state trunk highway system to eliminate dangerous corners or curves or unnecessary mileage and construction expense.

As the townships throughout the county got organized and road and bridge fund tax levies were made, the first concern of the town boards was to develop the arterial roads of the township to connect with other township roads and county roads to give each farmer access to a market road. Today, with the exceptions noted, land locations can be easily found by the section line roads.

Polk County is fortunate in having an abundance of gravel for road building purposes in the old beach lines of Lake Agassiz and in numerous gravel pockets or islands in the prairie section of the county. The length of haul of gravel for the western townships of the county varies from a few miles up to twelve or fourteen miles. The length of haul of gravel has not been a deterrent factor in road improvement.

Highway engineers and township supervisors learned early that the roadways should be built up above the level of the surrounding land, for drainage and snow clearance. High roadways also served as barriers to divert water into ditches at the time of the spring run-off.
Great progress has been made in highways across the county since pioneer days. The Red River Trail, a north and south route across the county, is the first recognized trail used by whites in the county. Because it was used for the most part by fur traders when the ground was frozen, the trail was not as well marked as the all season Pembina Trail. The Red River Trail paralleled the Red River from Pembina south through the western part of the western border counties toward Lake Traverse before turning southwestward toward Mendota and later St. Paul. This trail was used from 1844 up to about 1860. The trail came from the north near Tabor, south and east of the Marias, and crossed the Red Lake River approximately one mile west of Fisher, thence south-eastward to avoid what was called the swamp to about where Beltrami now stands, thence south. The Pembina Trail, or Ridge Road, was a more or less all season road which followed the Campbell and other higher beaches of the glacial Lake Agassiz from Fertile north and west through Huot, Dorothy and on north and west to Pembina. This trail carried its heaviest traffic during the sixties and in the early seventies when steam boats and railroads took over the hauling of freight. Early settlers used the Ridge Road in Polk County until the township and county roads were developed so that today the identity of the Pembina Trail in Polk County has been quite largely lost. The last trail road of importance in the county, the trail over the gravel ridge east of Crookston through Benoit, Tilden Junction, and Dugdale, was replaced with a straight road to Mentor in 1917-18.

The county is fortunate today in having two transcontinental highways, with concrete paving, crossing the county. U. S. highway No. 2, seventy five miles in length, bisects the county from east to west, entering the county about one-half mile north of Lengby, proceeding west northwest connecting the principal towns of the county paralleling the Great Northern Railway (Duluth branch), through Crookston, and leaving the county at East Grand Forks. U. S. Highway No. 75, a route from Winnipeg, Canada, to the Gulf of Mexico, enters the county from the north some six and one-half miles north of Angus and proceeds south through Crookston and southwest through Climax, leaving the county south of Nielsville.

The first rural concrete paving in Polk County was laid between Crookston and the Northwest School and Experiment Station north of the city. The paving one and one-half miles in length was laid in 1920, which was before the Babcock plan for state highways was adopted. The pavement was paid for by joint assessments against the University of Minnesota, Polk County and the City of Crookston.

The network and condition of the township, county, state aid, state and federal highways in Polk County is a source of pride to the residents of the county. A detailed map of the roads in the county, prepared by the County Engineer, is attach-
ed to this county history as Plate No. 1. A diagonal road of some historic interest is county road No. 13 from Shirley northeastward to Dorothy in Red Lake County. This road was built on an abandoned railroad grade of the Great Northern Railway which connected with the Red Lake Falls line north. This grade was made a highway after the land was turned back to the county. This road was a short-cut vehicular highway to the Pembina Trail. The Pembina Trail, at its junction with county road No. 13 one half mile north of Dorothy, pretty well retains its identity today as a highway well up into Kittson County. It was an all season road and made easy access from Crookston to St. Hilare and points north.

The county roads, from the time the first petition was made to the commissioners for a road from Crookston to Grand Forks in April 1874, to December, 1958, have been arteries for the farm-to-market traffic. Present incumbent County Engineer Mr. Carl Erickson stated to the writer that the first real boost to county road construction outside of county levies came in 1945 when some 33 per cent of the state gasoline tax was returned to the counties. Polk County at that time received some $250,000. In 1957 State Constitutional Amendment No. 2 increased the allotment to Polk County to some $300,000 and in 1958 the assistance was $617,906. Engineer Erickson further reports that: thirty-one county roads totalled 127 miles; seventy state aid roads totalled 800 miles; municipal state aid roads 17 miles. As to the nature of the roads, Mr. Erickson reports: 98.6 miles bituminous, 832 miles of gravel surface, and .4 miles of pavement.

A brief historical review of the trunk highways in Polk County as reported by Lee R. Boyd, District Highway Engineer located at Crookston, includes the following information: 1921—the trunk highway system consisted of 99 miles of dirt road, 55.5 miles of gravel surface, 9.4 miles natural sandy, and 1.2 miles of concrete surface; 1923-24—a sum of $53,839.54 was spent in construction of state roads in the county; 1931-32—seventy eight miles of concrete paving (T. H. No. 2) was completed across the county together with connecting pavement on T. H. 59 from Erskine south to and beyond the south county line; 1950-56—concrete paving of T. H. 222 from 8 miles north of East Grand Forks to south to Climax, joining U. S. No. 75 at that point. The 1950's also saw the completion of the concrete paving of U. S.-T. H. No. 75 across the county, bituminous surfacing of T. H. 102 from Crookston to Fertile, and T. H. No. 32 from Marcoux to the county line south of Fertile. Other trunk highways entering the county include No. 9 from Crookston south through Beltrami, and No. 92 crossing Chester and Gully townships. In contrast to the 165.1 miles of dirt and gravel roads in the trunk highway system in 1921, Engineer Boyd points out the fact that in 1959 the T. H. system includes 148.4 miles of concrete, 102.6 miles of high type bituminous, and 8.02 miles of light bituminous, for a total of 259.02 miles of trunk highways.