UNIVERSITY OF WISCONSIN–EXTENSION

GEOLOGICAL AND NATURAL HISTORY SURVEY

Special Report #1

PRELIMINARY REPORT ON THE IRRIGATION POTENTIAL OF DUNN COUNTY, WISCONSIN

by
Perry G. Olcott,
Francis D. Hole,
and
G. F. Hanson

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Preliminary Report on the Irrigation Potential of Dunn County, Wisconsin

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July, 1967

Introduction

Farmers in Dunn County, as in other areas of the state, are becoming aware of the economic advantages of supplemental irrigation of crops. Irrigation in the county is in the initial stages of development but is increasing rapidly. Records indicate that irrigation began in 1951 when the state issued a permit to a riparian landowner to pump irrigation water from the Red Cedar River. A second permit for diversion of water from the Red Cedar was issued in 1958. In 1965 and 1966, six more permits were issued, allowing two diversions from the Red Cedar River, two from the Hay River, one from Elk Creek, and one each from Cranberry Creek and the Chippewa River. The first permit for construction of a high-capacity irrigation well was issued in 1962, and permits for nine more high-capacity irrigation wells were issued in 1966.

Large-scale irrigation is dependent on the availability of an adequate water supply, suitable soils lying in level tracts of 100 acres or more, and other factors such as climate. Since wells have proven to be the most desirable source of water for irrigation in other areas of the state, and will undoubtedly be the source preferred in Dunn County, the availability of ground water is crucial. Irrigable level land with suitable soil types is generally located in the valleys of the Chippewa and Red Cedar Rivers and their tributaries. Figure 1 shows those areas in the county which appear to be most favorable for irrigation.

The purpose of this report is to describe the general geology, the availability of ground water, and the suitability of soils for irrigation in Dunn County according to data presently available. More detailed information on geology, well yields, aquifer characteristics, and soils can be obtained as development proceeds and more data become available. It is anticipated that irrigation will have little impact on the overall ground water resources of the county until a considerable number of wells have been placed in operation. At that time, quantitative information will be available on the optimum spacing of wells to avoid problems of overdevelopment.

Acknowledgements

The principal source of information for this report has been unpublished data in the files of the Geological and Natural History Survey. The United States Soil Conservation Service has cooperated in the development of the data on soils and the United States Geological Survey in that on hydrology. Information on permits issued for irrigation from surface water was supplied by the state Public Service Commission, and the state Department of Resource Development supplied information on well permits.

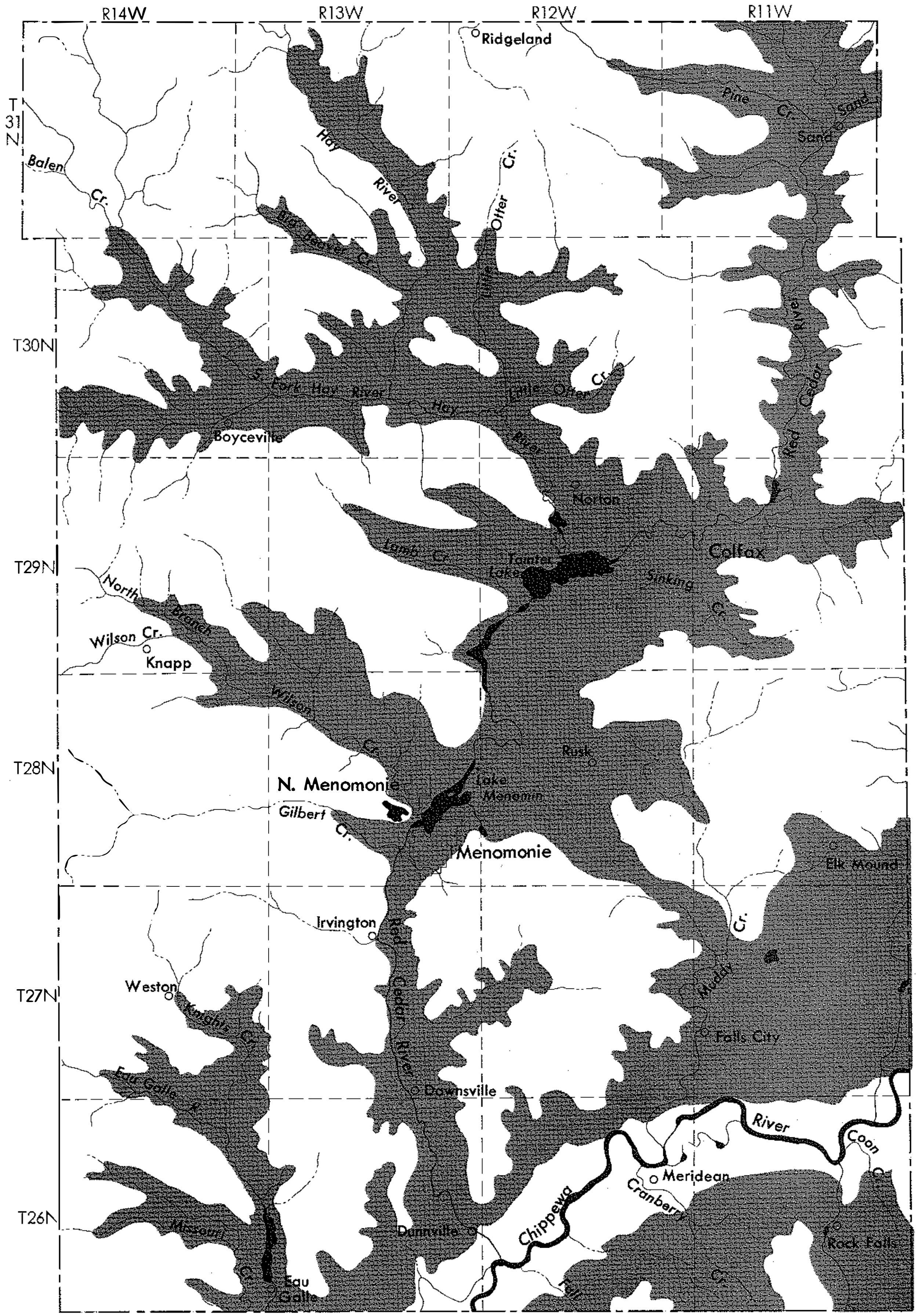


Figure 1. Generalized map of Dunn County showing areas of potential irrigation (shaded) based on soils, topography, and availability of ground water.

Geology

Ground water availability depends chiefly on the character and thickness of water-bearing rocks. Although the geology of Dunn County has not been mapped in detail, some generalizations can be made from well-log, outcrop, and topographic information.

The bedrock throughout most of Dunn County consists of sandstones of Cambrian age that yield moderate to large amounts of water. At higher elevations in the western and southern part of the county, the sandstones are capped by dolomite (a magnesium-rich limestone) of Ordovician age which yields only small quantities of water. The sandstone is underlain by crystalline rocks such as granite which yield virtually no water and which form the base of the ground-water reservoir.

The surface of the crystalline rocks dips to the southwest and the thickness of the sandstone formations increases proportionately. In the northeast part of the county the sandstone and dolomite formations are 200 to 300 feet thick, increasing to a thickness of 800 to 900 feet in the southwest. Generally, successively younger rocks form the bedrock surface toward the southwest.

About 30,000 years ago, a continental glacier covered Dunn County. The advancing glacier tended to plane off the hills and fill in deeply entrenched stream valleys with rock debris (drift) carried by the ice. When the glacier melted, streams carried the drift into the valleys, forming thick deposits of stratified sand, gravel, silt, and clay, called "outwash". The surface of the valley deposits is relatively flat and consequently is generally suitable for irrigation (Figure 1). Wetlands in the Chippewa Valley preclude irrigation in that area. The bedrock hills and uplands in the county have only a thin veneer of glacial deposits. Water-bearing characteristics of glacial deposits in the county are highly variable, but moderate to large yields of water can be obtained in many places.

A generalized cross section from Spring Valley in northeastern Pierce County through Menominee and Elk Mound in Dunn County (Figure 2) shows the dip, thickness, and relationship of the bedrock units and glacial drift. The character and water-yielding characteristics of these units are summarized in Table 1.

The Mt. Simon Sandstone Formation underlies the entire county and is about 250 feet thick. It consists of medium- to coarse-grained sandstone with some fine-grained sandstone. The Mt. Simon Formation yields moderate to large amounts of water to wells.

The Eau Claire Sandstone Formation, overlying the Mt. Simon, also is present throughout the county except in some areas along preglacial stream valleys where erosion has greatly thinned or entirely removed the formation. The Eau Claire Sandstone is about 100 to 150 feet thick and consists of medium- to fine-grained sandstone and shale. It generally yields only small quantities of water to wells but moderate yields may be obtained where shale is absent from the formation.

The Galesville Sandstone Formation ranges in thickness from about 30 to 50 feet. It is present under the southwestern part of the county and probably in the bedrock hills elsewhere in the county. The Galesville Formation generally yields moderate amounts of water to wells, but the formation is missing in most areas where soils and topography indicate irrigation to be most feasible (Figure 1). The unit consists of coarse- to fine-grained sandstone.

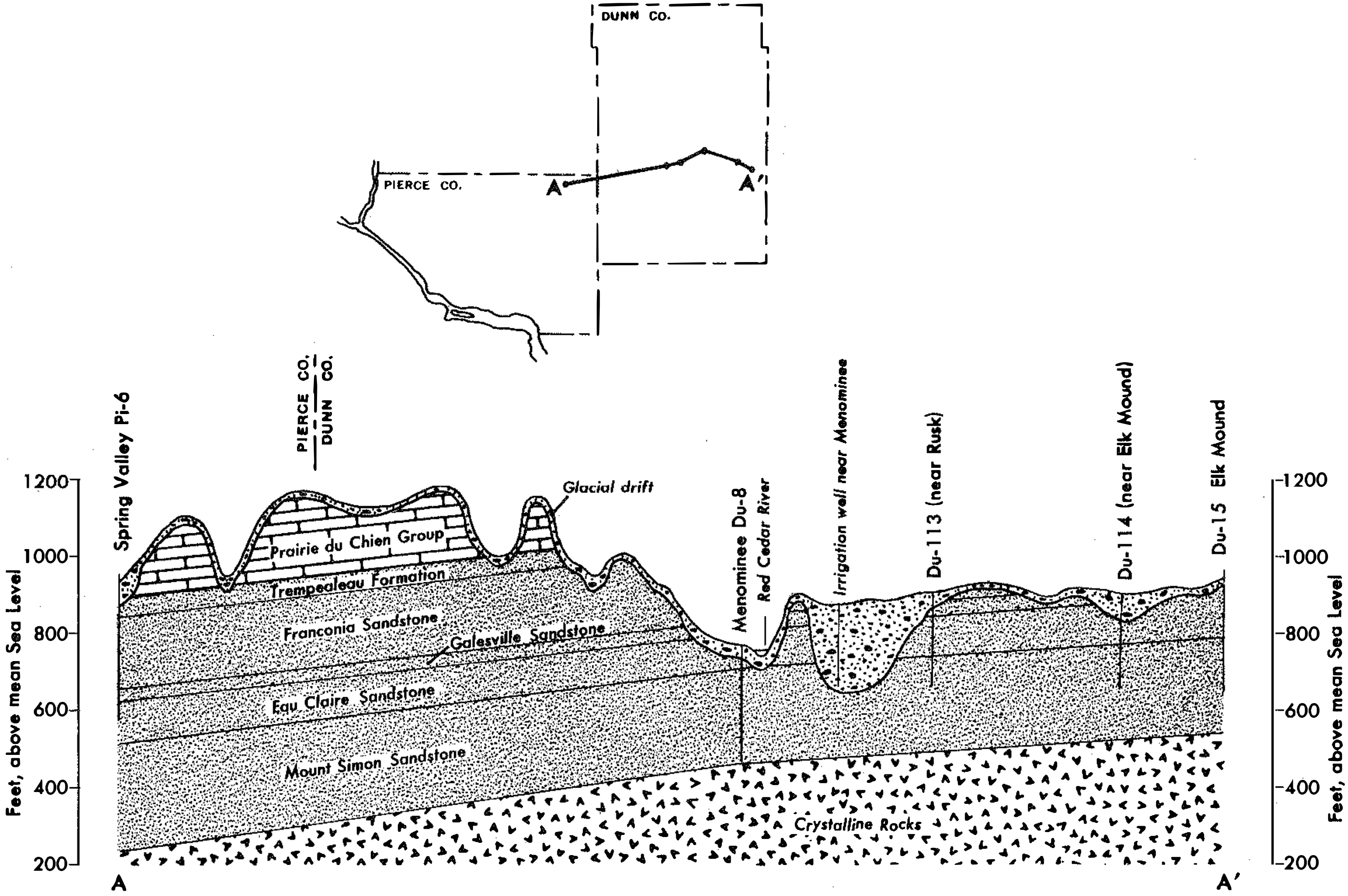


Figure 2. Generalized geologic cross section from Spring Valley (Pierce County) to Menominee to Elk Mound (Dunn County).

Table 1. Dunn County Rock Units and Their Water-Yielding Characteristics

Age	Rock unit	Range in thickness (feet)	Lithology	Water-yielding characteristics
Quaternary	Glacial drift	10-375	Unconsolidated clay, silt, sand, gravel, and boulders, stratified to unstratified, sorted to unsorted	Yields 800-1000 gpm* in areas of thick sand and gravel deposits. In many areas yields are much lower.
Ordovician	Prairie du Chien Group	0-200	Dolomite, some sand and shale; chert, white, oolitic	Yields 5-10 gpm to domestic wells. Not present in irrigation area.
Cambrian	Trempealeau Formation	0-25	Sandstone, dolomite, siltstone	Yields small amounts of water. Not present in irrigation area.
	Franconia Sandstone	0-200	Sandstone, medium to fine grained; some siltstone and shale	Yields moderate to small amounts of water. Not present in irrigation area.
	Galesville Sandstone	0-50	Sandstone, coarse to fine grained	Yields moderate amounts of water. Generally not present in irrigation area.
	Eau Claire Sandstone	0-150	Sandstone, medium to fine grained; much siltstone and shale	Yields small to moderate amounts of water.
	Mt. Simon Sandstone	80-250	Sandstone, medium to coarse grained	Yields moderate to large amounts of water.
	Precambrian Crystalline rocks		Granite and other crystalline rock types	Not water yielding.

*gpm=gallons per minute

The Franconia Sandstone Formation, Trempealeau Formation, and Prairie du Chien Group (Table 1) consist of sandstone, siltstone, and dolomite. These formations occur in the western and southwestern part of the county and in highland areas where the topography is too steep for irrigation. Moderate to small amounts of water can be obtained from the Franconia Formation but the Trempealeau Formation and Prairie du Chien Group yield only small amounts. Wells in the Prairie du Chien Group probably yield 5 to 10 gallons per minute (gpm).

Glacial deposits in highland areas of Dunn County are very thin, generally less than 30 to 50 feet, but they are very thick in the buried bedrock valleys. Apparently the preglacial Chippewa River flowed through a broad, deep channel and was the principal river draining the area. Deep tributary river valleys joining the preglacial Chippewa include the present Eau Galle River valley, the present Red Cedar valley approximately from Irvington to Dunnville, and a river valley trending from a point about two miles northeast of Knapp to North Menominee and then southeastward to the Chippewa River. These preglacial stream valleys contain 100 to 200 feet of glacial material over much of their area. A well near Eau Galle reported 375 feet of glacial deposits, but this is probably an exceptional case. Well logs near Downsville reported 130 and 184 feet of unconsolidated material and wells south of Elk Mound reported 134 and 145 feet of glacial deposits. One well east of Menominee and two wells northwest of Menominee, all of which are located in the southeastward-trending buried valley, penetrated respectively, 200, 178, and 170 feet of unconsolidated material.

The preglacial Red Cedar River north of Menominee and its tributary, the Hay River, followed their present valleys but probably emptied into the southeastward-trending bedrock valley near Menominee. Glacial deposits filling these valleys were not as thick as those in the buried valleys to the south of Menominee, and generally range from 50 to 150 feet thick.

The water-yielding properties of glacial deposits vary greatly. Very high yields may be obtained from clean sands and gravels, but yields decrease rapidly with the presence of silt and clay. Most wells in the buried valleys penetrate sand and gravel, but thick clay deposits are reported in many areas. Subsurface information is currently inadequate for predicting the nature of the valley fill with any degree of certainty.

Hydrology

The source of ground water is precipitation. Average annual precipitation in Dunn County is about 30 inches. About 20 inches of water is returned to the atmosphere by evaporation and by plant transpiration. About 2 to 4 inches of the remaining water runs off over the land surface to streams and is carried out of the county, and 6 to 8 inches percolates into the soil. The water percolating through the soil replenishes the soil moisture and the excess moves downward to the water table to become ground water. This ground water recharge plus the water already in storage in the ground-water reservoir is the amount of water available to wells.

Water in the ground-water reservoir is not static but moves by gravity from areas of recharge down the hydraulic gradient to areas of discharge. Recharge occurs over most of the county, and the hydraulic gradient generally is from topographically high to topographically low areas. Therefore, ground water is moving through the water-bearing rocks from the water divides in the highland areas of Dunn County to the streams where it is discharged. Ground-water discharge sustains streamflow much of the time, especially during dry periods. A generalized contour map of the ground water levels is shown in Figure 3. Ground-water movement is down-gradient and perpendicular to the contour lines on the map. The map indicates that ground water is moving into the county in many areas on the western, northern, and eastern sides and moving out of the county on the southern side in the Eau Galle and Chippewa river valleys. A very steep hydraulic gradient, in some places more than 100 feet per mile, occurs in much of the highland area of the county. Gradients are about 15 to 20 feet per mile in the level lowland areas.

Availability of Ground Water for Irrigation

Wells of sufficient capacity for irrigation (500-1000 gpm) probably can be developed in most areas of Dunn County mapped as suitable for irrigation (Figure 1). These areas are usually underlain by thick glacial drift overlying sandstone bedrock, both of which are capable of yielding large quantities of water. These water-yielding rock units, called aquifers, are generally hydraulically connected and act as a single aquifer, but they are discussed separately because wells often withdraw water from only one of the units.

Low well-yields may occur within the area mapped as potentially irrigable where the sandstone is thin and the unconsolidated deposits are silty or clayey. Information is presently inadequate for an accurate delimitation of these low-yield areas; however, the sandstone is thinnest on the eastern side of the county, particularly in valleys where its thickness has been further reduced by preglacial erosion. (See Figure 2.)

Yields of municipal wells penetrating sandstone bedrock in Menominee, Elk Mound, and Boyceville range from 500 to 1000 gpm. Comparable yields can be expected from sandstone wells over most of the irrigable land north of Menominee (Figure 1). Bedrock-well yields may be lower in the irrigable land south of Menominee because of thinning of the sandstone in the deep preglacial channels. Yields of 300 to 500 gpm or more can be expected from bedrock wells in that area.

Yields of wells penetrating glacial deposits are highly variable because of the variable lithology of the material. Yields of 800 to 1000 gpm probably can be obtained in some areas of thick deposits with a high percentage of sand and gravel. However, in many areas yields will be considerably lower.

Quality of Water

Ground water in Dunn County is suitable in quality for irrigation. Dissolved minerals in the water will not be harmful to crops. However, over much of the county there is a high concentration of iron in groundwater which by depositing iron oxide, may cause plugging problems in well screens.

Analyses of three city wells at Menominee (Table 2) will give some idea of the natural quality of the ground water. The three wells all penetrate sandstones of Cambrian age. The quality of water in glacial deposits is similar to that of water in the bedrock aquifer but is usually lower in total dissolved solids. Iron may also be a problem in water from the glacial deposits. Hydrogen sulfide (H_2S) has been reported in some wells, especially in the Rock Falls area.

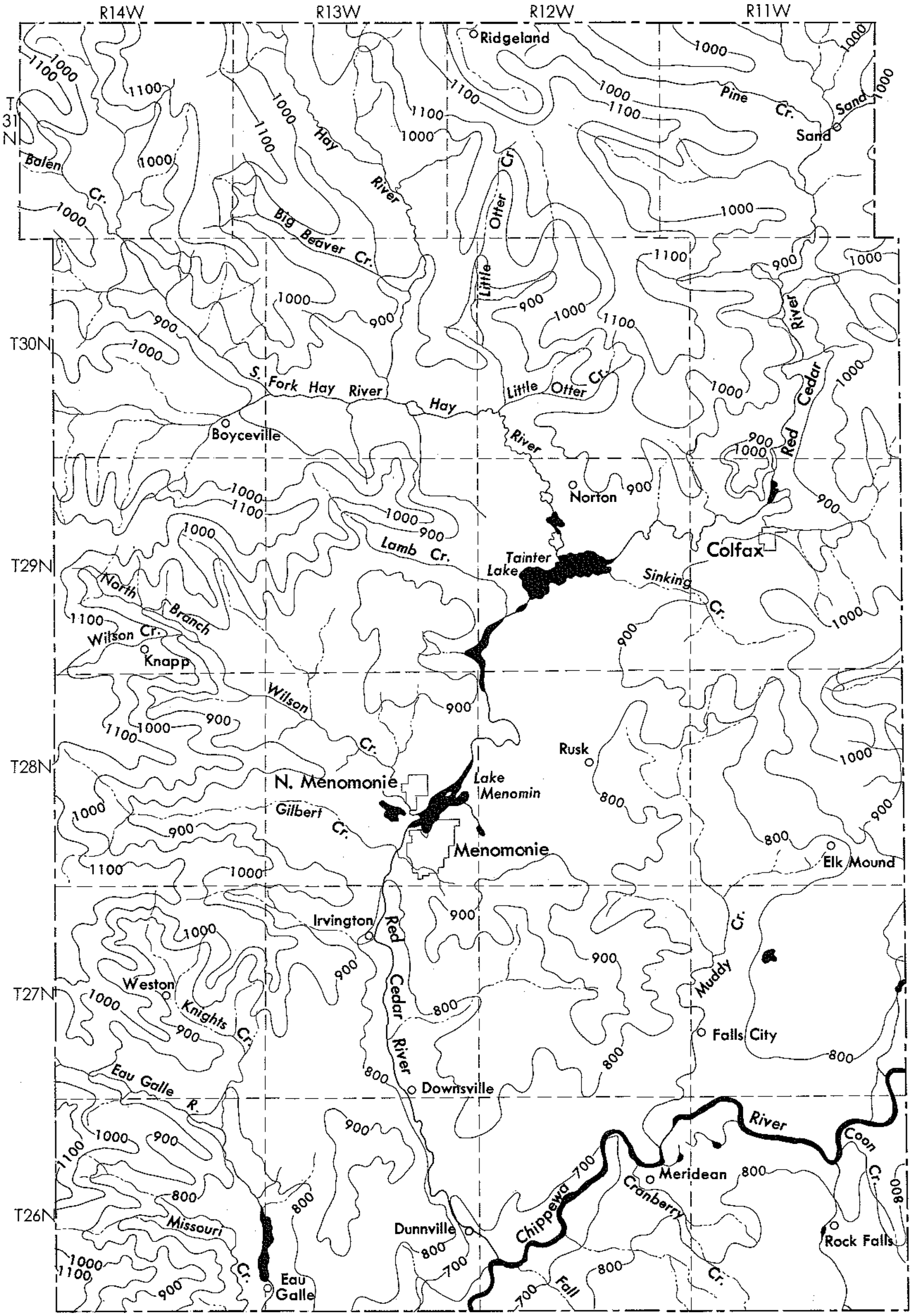


Figure 3. Generalized map showing the elevation of the water table in Dunn County. Datum is mean sea level.

Table 2. Analyses* Of Water In Three Wells, Dunn County, Wisconsin

Chemical analysis	Well #1	Well #2	Well #3
Hardness, total	168	214	132
Alkalinity, total	176	236	152
Calcium (Ca)	43	52	34
Magnesium (Mg)	18	25	15
Iron, total (Fe)	1.4	6.4	0.4
Manganese, total (Mn)	0	0	0
Chloride (Cl)	13	10	8
Sulfates (SO_4)	11	15	7
Fluorides (F)	.1	.05	.15
Total solids	276	324	178
pH	7.2	7.4	7.0

*Analyses by Wisconsin State Laboratory of Hygiene, 1946. All values except pH are given in parts per million.

Soils

Seventeen major groups of soils are differentiated on the soils map (Figure 4). Tables 3 and 4 show that a little more than a third (36.7 per cent) of the county, or 200,000 acres, is covered by nearly level sands and loams that are largely irrigable. These include about 88,000 acres of prairie sands (Sparta) and associated soils (C5)**; 50,000 acres of prairie loams (Dakota) and associated soils (C9); and 22,000 acres of light-colored sands (Plainfield) and associated soils (C6). Less extensive are other loams (Bertrand, A12; Onamia, G28; Tustin, E11) and sands (Vilas, H5). Characterizations, productivity ratings, and management recommendations for these soils are available from the Wisconsin Geological and Natural History Survey, Soil Survey Division, 203 Soils Building, The University of Wisconsin, Madison, Wisconsin, 53706. Feasibility of commercial irrigation will depend largely on the amount of acreage that can be operated in one general area.

**Figure 4 Legend

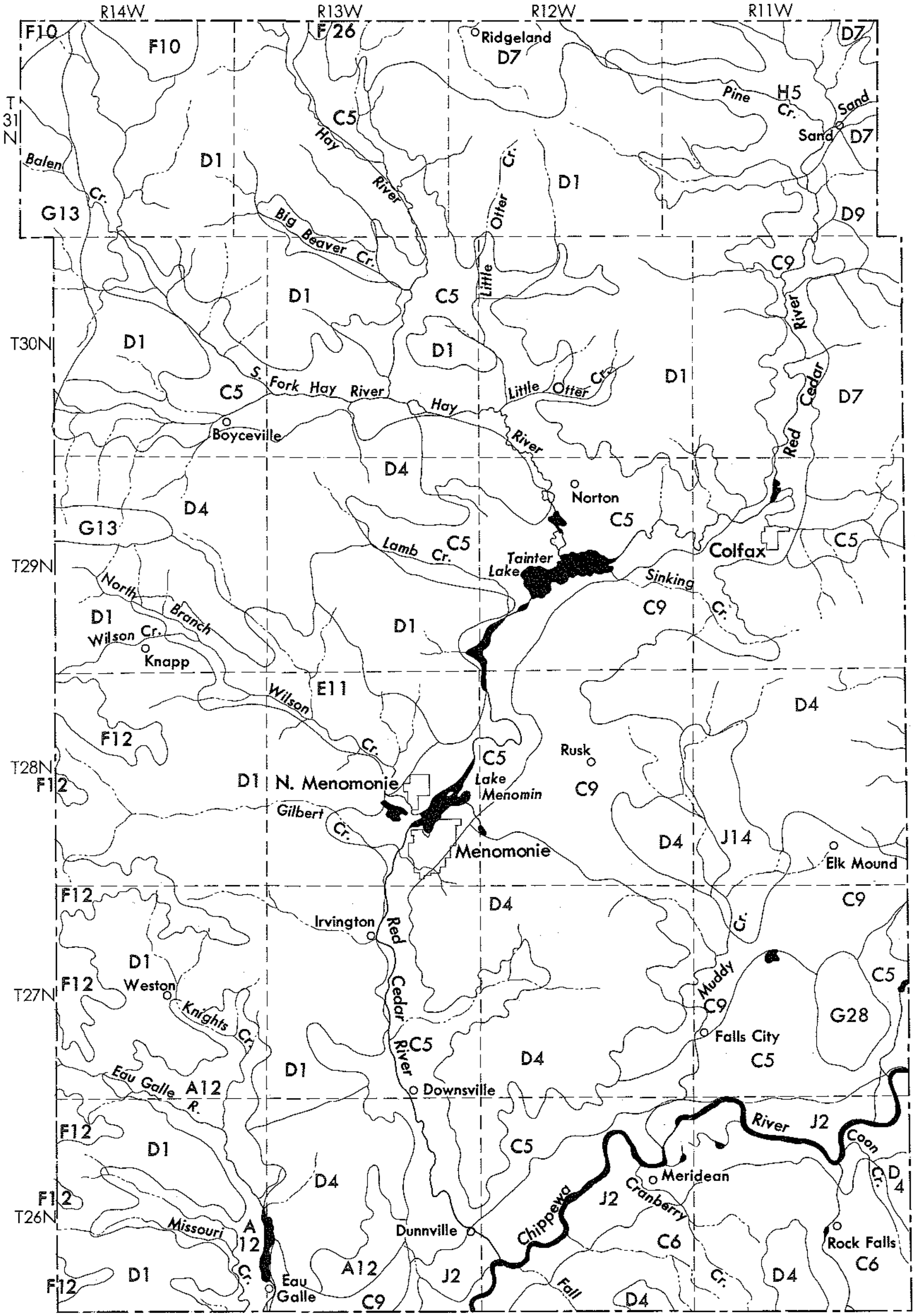


Figure 4. Generalized soils map of Dunn County. (See Legend on pages 11 and 12.)

Figure 4 Legend

Symbol	Soil group	Description	General rating
A12	Bertrand soils and associated silt loams and loams	Nearly level soils 2 to 4 feet deep over sandy deposits, well drained, very fertile	Good
C5	Sparta and Plainfield soils and associated sands	Nearly level dark sands of narrow outwash plains, deep, well drained, droughty, low in natural fertility	Good
C6	Plainfield and associated sands	Nearly level light-colored sands of narrow outwash plains, deep, droughty, very low in fertility	Good
C9	Dakota soils and associated loams and sandy loams	Nearly level dark loams and sandy loams of narrow outwash plains, deep, somewhat droughty, of medium fertility	Good
D1	Steep, rocky land with Gale soils and associated loams	Steep and rolling upland soils, many of them shallow and droughty, over sandstone	Not irrigable
D4	Norden soils and associated silt loams and sandy loams	Hilly and rolling loams, of medium to shallow depth, mostly on sandstone, particularly green sand	Not irrigable
D7	Hixton soils and associated loams and sandy loams	Hilly and rolling loams, of medium to shallow depth, mostly on yellowish-brown sandstone	Not irrigable
D9	Hixton soils and associated sandy loams and loams	Rolling sandy loams, loams, silt loams, somewhat shallow over sandstone, siltstone, and glacial drift; moderately fertile; somewhat droughty	Not irrigable
E11	Tustin soils and associated fine sandy loams	Nearly level sandy loams of old lake plains, with somewhat restricted drainage; deep, moderately fertile	Moderate
F10	Santiago soils and associated silt loams and loams and peat	Undulating silt loams and loams with some wet soils in depressions; acid, with somewhat restricted drainage	Rarely if ever irrigated
F12	Spencer soils and associated silt loams	Undulating deep silt loams with some wet soils in depressions; acid, with somewhat restricted drainage; moderately fertile	Not irrigable or rarely if ever irrigated

Figure 4 Legend (continued)

Symbol	Soil group	Description	General rating
F26	Poskin soils and associated silt loams and loams	Nearly level silt loams of outwash plains with high water table; shallow silty soils over acid sand and gravel; moderately fertile	Not irrigable unless artificially drained
G13	Cloquet soils and associated sandy loams and loams with peat	Rolling to undulating sandy loams and loams, somewhat stoney, droughty, moderately fertile to infertile	Irrigable only on level areas of limited extent
G28	Onamia soils and associated loams and silt loams with some peat	Nearly level sandy loams and loams, somewhat droughty, acid, moderately fertile	Good
H5	Vilas soils and associated sands and sandy loams with some peat	Nearly level sands and sandy loams; deep, acid, infertile, droughty	Good
J2	Wet alluvial soils	Nearly level loams, poorly drained	Not irrigable
J14	Acid sedge peat and muck and associated wet sands	Nearly level peat and muck and dark sands, poorly drained and infertile	Not irrigable except where artificially drained

Table 3. Estimated Extent of Major Dunn County Soil Groups

Symbol *	Acres	Per cent
A12	11,000	2.0
C5	88,006	16.0
C6	22,000	4.0
C9	49,503	9.0
D1	165,021	30.0
D4	93,507	17.0
D7	27,500	5.0
D9	5,500	1.0
E11	11,000	2.0
F10	1,650	0.3
F12	16,500	3.0
F26	1,650	0.3
G13	9,351	1.7
G28	5,500	1.0
H5	14,851	2.7
J2	22,000	4.0
J14	5,500	1.0
Total	550,039	100.0

*See Figure 4 Legend

Table 4. Irrigability of Soil Groups in Dunn County

Grouping	Description	Acres	Per cent
A12, C5, C6, C9, G28, H5, E11	Nearly level soils of narrow outwash plains (and some restricted lake plains). Irrigable.	201,860	36.7
D1, D4, D7, D9, G13	Hilly to rolling sandstone ridges and coves with loams, silt loams, and sandy loams. Not irrigable.	300,879	54.7
F10, F12, F26	Undulating, imperfectly-drained silty soils on till upland. Rarely if ever irrigated.	19,800	3.6
J2, J14	Wetlands, largely peat and muck. Irrigable only where artificially drained.	27,500	5.0
		550,039	100.0

Note: See Figure 4 Legend for definitions of symbols.

In summary, about a third of Dunn County is covered by nearly level sands and loams in narrow (one to four miles wide) glacial outwash plains that are largely irrigable. More than half of the county is rolling to hilly. The remainder consists of low-lying wetlands and imperfectly drained upland soils of limited extent.

Management Considerations

High-capacity irrigation wells rapidly remove large quantities of water from the ground-water reservoir and lower the ground-water levels in the immediate vicinity of the wells. The amount the water level is lowered depends on the rate of pumping and the ease with which water moves through the water-bearing rocks supplying the well (transmissibility). When wells are closely spaced, they may interfere with each other and compound the lowering of water levels in each of the wells. Lowered water levels, of course, increase pumping costs. Data are not available to determine accurately optimum well-spacing, but it is recommended that wells should be at least 1000 to 2000 feet apart.

Information Needs

Each irrigation well that is drilled in Dunn County can provide additional information on the geology and water-bearing characteristics of the aquifers underlying the county. However, this information is of little use until it is analyzed and tabulated for interpretation. As irrigation development increases in the county, well information will be vital for solving hydrological problems and defining the best areas for irrigation. It is requested that well owners make sure that samples of well cuttings are collected at 5-foot intervals and sent to the Wisconsin Geological and Natural History Survey, 1815 University Avenue, Madison, Wisconsin, 53706, for analysis. An accurate description of the well location as well as the owner's name and address should be sent with the samples. Sample bags are provided by the Survey.

Samples of well cuttings sent to the Wisconsin Geological Survey are examined under a microscope by a geologist. Most are bottled for permanent storage. A sample description is prepared and published together with well-construction and pumping-test information obtained from the Department of Resource Development. Examples of the published sample logs are shown in Figures 5 and 6. Copies of the published logs are sent to the well owner and driller and are available to the public on demand. The log provides the owner and driller with a permanent record of the well for reference in case repairs are necessary in the future. There is no charge for this service.

Conclusions

Irrigation in Dunn County is in the initial stages of development, but it is expected to increase. Wells will provide the major source of water.

Areas where irrigation appears most feasible are those with level topography which are underlain by substantial thicknesses of sandstone and/or clean sand and gravel. Wells in these areas may yield from 500 to 1000 gpm, although in some localities, where the sandstone is thin and the unconsolidated deposits silty or clayey, the yields may be considerably less. Data is presently inadequate for defining such low-yield areas.

It is anticipated that irrigation will not affect the ground-water reservoir significantly until a large number of wells are placed in operation, by which time adequate data should be available on the correct spacing of wells to minimize the effect of pumping on water levels.

Water in both the glacial drift and sandstone aquifers is of quality suitable for irrigation. Water in the glacial deposits generally is less mineralized than that in the sandstone, but iron occurs in both aquifers and may present problems.

Soils suitable for irrigation cover a little more than a third of Dunn County and include nearly level prairie sands and loams. These soils lie on the level valley glacial deposits where an adequate ground-water supply generally is available for irrigation.

UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
1815 University Avenue, Madison, Wisconsin 53706

Log No. Du-8
Issued:

County: Dunn

Well name Wisconsin Co-operative Daries, Inc. Well
Menomonie, Wis.
Owner.... Same as above
Address.. Same as above

Driller.. Fisher Well Drilling Co.
Engineer.

Completed...1951
Field check.
Altitude....
Use.........
Static w. l.
Spec. cap... over 12.5

R. 13W.
T. 28 N.
Sec. 27

Quad. Menomonie

Drill Hole						Casing & Liner Pipe or Curbing							
Dia.	from	to	Dia.	from	to	Dia.	Wgt.& Kind	from	to	Dia.	Wgt.& Kind	from	to
16"	0	81'				16"	pipe	0	81'				
15"	81'	116'				10"	pipe	0	116'				
10"	116'	331'											

Grout: Kind	from	to
Cement	0	116'

Samples from 0 to 331' Date received:
Sample Nos. 155462 to 155531 Examined by: F. T. Thwaites Date: 11-30-51
Formations: Drift, Eau Claire, Mt. Simon, Precambrian

Remarks: Water rises 28' above curb; 358 gpm does not stop flow. Water temperature 50.4 F.

LOG OF WELL:

DRIFT		0-3	3	Snd, fn to M, dk gry
		3-10	7	Snd, fn to C, yl gry
		10-30	20	Snd, fn to C, gry
	50	30-50	20	Snd, fn to C, lt gry; near bottom some cl, gry, dolic
EAU CLAIRE		50-55	5	Ss, Vfn, silty, lt gry
		55-65	10	Sts, sndy, lt gry
		65-70	5	Ss, M to fn, lt yl gry
		70-75	5	Ss, fn to M, silty, lt gry
		75-90	15	Ss, fn to C, lt gry
		90-95	5	Ss, M to fn, lt gry
		95-110	15	Ss, fn to M, silty, lt gry
		110-115	5	Ss, fn to C, silty, lt gry
	68	115-118	3	Sts, lt gry
MT SIMON		118-123	5	Ss, fn to VC, silty, lt gry
		123-128	5	Ss, M to C, lt gry
		128-136	8	Ss, C to fn, silty, lt gry
		136-155	19	Ss, C to fn, lt gry
		155-160	5	Ss, fn to M, silty, lt gry
		160-185	25	Ss, fn to VC, lt gry
		185-190	5	Ss, fn to VC, silty, lt gry

Well name Wisconsin Co-operative Daries, Inc. Well, Menomonie, Wis.
Sample Nos. 155462 to 155531

MT SIMON		190-200	10	Ss, fn to C, lt gry
		200-205	5	Ss, fn to M, lt gry
		205-210	5	Sts, sndy, lt gry
		210-230	20	Ss, fn to C, lt gry
		230-245	15	Ss, fn to VC, lt gry
		245-255	10	Ss, M to C, lt gry
		255-260	5	Ss, fn to VC, lt gry
		260-275	15	Ss, M to VC, lt gry
		275-285	10	Ss, fn to VC, lt gry, pnk
		285-290	5	Ss, M to VC, lt gry
		290-310	20	Ss, fn to C, lt gry, pnk
		310-314	4	Ss, fn to C, lt gry, pnk
		314-316	2	Ss, fn to C, gry, pnk, arkose
		316-320	4	Ss, fn to VC, lt gry, bl
	210	320-328	8	Cong, qtz pebs in coarse Ss, lt gry
P	3	328-331	3	Granite, lt pnk

END OF WELL

Figure 5. Wisconsin Geological Survey sample log of well in Dunn County penetrating bedrock.

UNIVERSITY OF WISCONSIN GEOLOGICAL & NATURAL HISTORY SURVEY
1815 University Avenue, Madison, Wisconsin 53706

Log No. Du-118
Issued:

County: Dunn

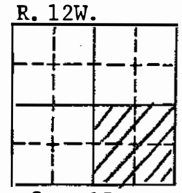
Well name: Wisconsin Highway Commission, Wayside Rest Area
Town of Red Cedar, Wis.

Owner.... Wisconsin State Highway Comm.
Address.. Madison, Wisconsin

Driller.. Fisher Well Drilling Co.
Engineer.

Completed... 1-22-64
Field check.
Altitude....
Use......... Rest Area
Static w. l. 20 feet
Spec. cap... 6.0

R. 12W.
T. 28 N.



Sec. 15

Quad. Menomonie

Drill Hole						Casing & Liner Pipe or Curbing							
Dia.	from	to	Dia.	from	to	Dia.	Wgt.& Kind	from	to	Dia.	Wgt.& Kind	from	to
10"	0	32'1"				10"	steel pipe	+12"	32'1"				
6"	32'1"	42'				6"	steel pipe	+12"	37'				
						6"	Johnson SS screen	37'	42'				
						10"	pipe	0	32'1"				

Grout: Kind	from	to
Cement	0	32'1"

Samples from 0 to 72'
* Sample Nos. 245460 to 245474
Formations: Drift

Date received: May 12, 1964
Examined by: M. E. Ostrom

Date: 7-18-64

Remarks: Well tested for 12 hours at 60 gpm with 10 feet of drawdown.* See also Sample nos. 245805-245813. Driller reports well deepened for observation to 72' then finished at 41', hole backfilled to finished depth.

LOG OF WELL:

Formation	Depth	Interval	Thickness	Description
DRIFT		0-5	5	St, dk yl rd bn, mch snd, tr sh
		5-15	10	Snd, mxd clr, M & C, Srnd, P srtg, trVC, fn, mch sh, tr Vfn gvl
		15-35	20	Snd, mxd clr, M & C, Srnd, P srtg, trVC, Vfn, fn, tr sh, Sts, Vfn gvl
		35-45	10	Snd, mxd clr, M & C, Srnd, P srtg, tr Vfn, fn gvl, ls
		45-55	10	Snd, mxd clr, M & C, F srtg, tr fn, tr ls
		55-65	10	Snd, mxd clr, M & C, Srnd, F srtg, tr fn, VC, Vfn, tr Vfn gvl, ls
		65-70	5	Snd, mxd clr, M & fn, Srnd, F srtg, trVC, fn, Vfn, tr Vfn gvl, ls, dol
	72'	70-72	2	Snd, mxd clr, M & C, Srnd, F srtg, tr VC, fn, Vfn, tr Vfn gvl, ls, dol

END OF WELL

Figure 6. Wisconsin Geological Survey sample log of well in Dunn County penetrating glacial drift.