

FOURTEENTH CENSUS OF THE UNITED STATES: 1920

DEPARTMENT OF COMMERCE

BULLETIN

BUREAU OF THE CENSUS

DRAINAGE : WISCONSIN

STATISTICS FOR THE STATE AND ITS COUNTIES

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INTRODUCTION.

This bulletin presents the statistics of drainage for Wisconsin collected at the census of 1920. The figures relate to conditions on January 1, 1920, except where indicated otherwise. No census of drainage has been taken heretofore, so there are no comparable figures for previous years. The data relate to the artificial drainage of land in farms and of other land that ultimately will be used for agricultural purposes. The organized drainage enterprises may include considerable areas of timbered and other unimproved

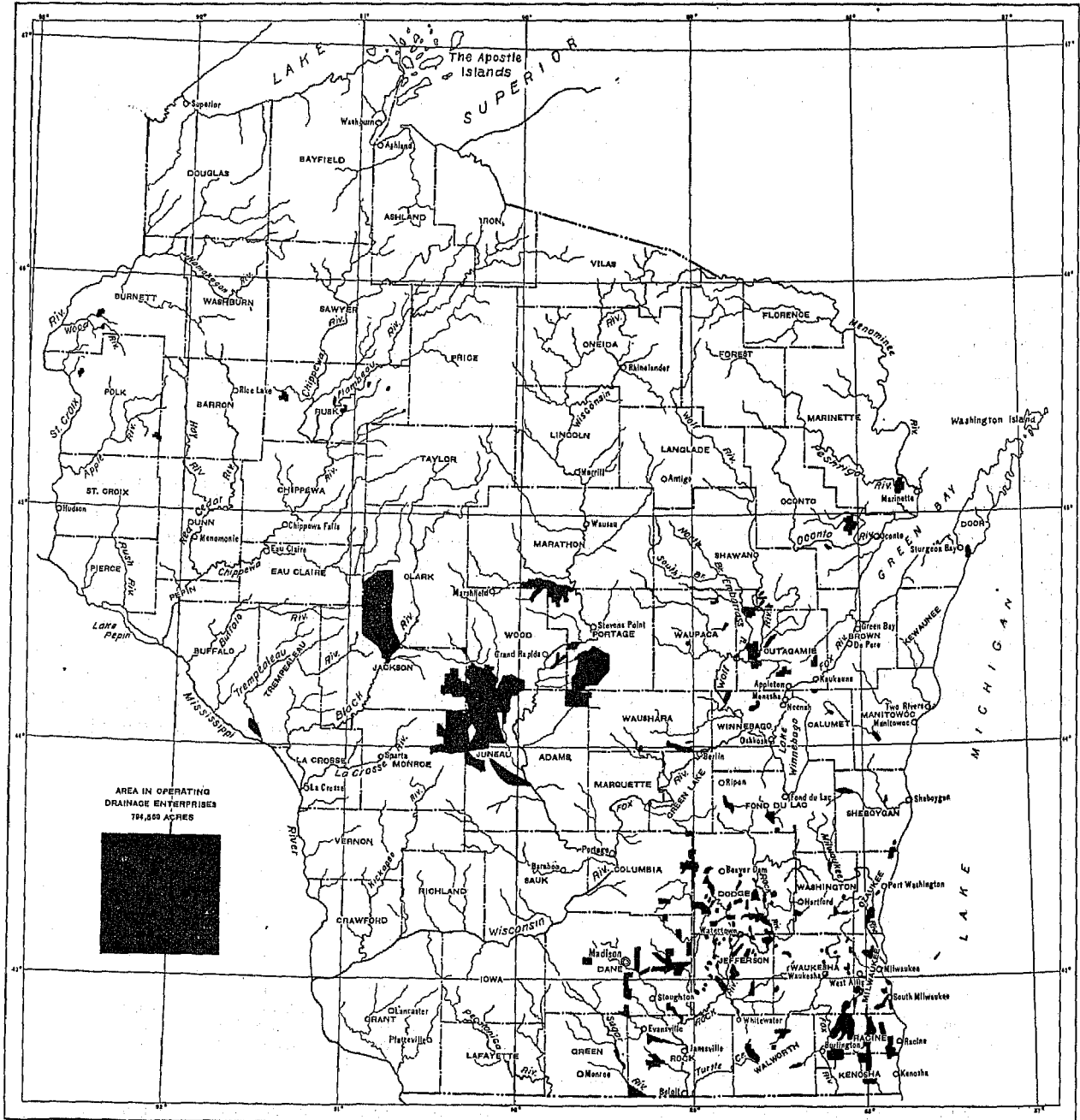
land not yet in farms. The statistics for drainage on farms were collected in the general census of agriculture, while the statistics for drainage enterprises were obtained in a special canvass of those enterprises. Since drainage on farms may be either inside or outside an organized enterprise, and the drains that each individual owner installs upon his own farm may be either supplemental to or entirely independent of the works installed by an enterprise, the figures for the two parts of the drainage census are presented separately.

TABLE 1.—SUMMARY FOR THE STATE: 1920.

ITEM.	Amount.	Per cent of total.
<b>DRAINAGE ON FARMS.</b>		
Number of all farms in the state.....	189,295	100.0
Farms reporting land having drainage.....	21,838	11.5
Farms reporting land needing drainage.....	52,228	27.6
All land in farms..... acres..	22,148,223	100.0
Improved land in farms..... acres..	12,452,216	56.2
Farm land reported as provided with drainage..... acres..	653,411	3.0
Farm land reported as needing drainage..... acres..	1,839,273	8.3
<b>DRAINAGE ENTERPRISES.</b>		
Approximate land area of the state..... acres..	35,363,840	100.0
All land in operating drainage enterprises..... acres..	794,569	2.2
Improved land..... acres..	254,504	0.7
Timber and cut-over land..... acres..	177,744	0.5
Other unimproved land..... acres..	362,321	1.0
Capital invested in and required for completion of operating enterprises.....	\$4,564,625	100.0
Capital invested in these enterprises to Dec. 31, 1919.....	\$4,163,055	91.2
Additional capital required to complete these enterprises.....	\$401,570	8.8

# WISCONSIN.

APPROXIMATE LOCATION AND AREA OF OPERATING DRAINAGE ENTERPRISES.



## DRAINAGE ON FARMS.

**Explanation of terms.**—To secure uniformity in the returns relating to drainage on farms, the Bureau of the Census supplied its enumerators with certain definitions, which are substantially as follows:

**Drainage of agricultural land** was defined, for census purposes, as the act or process of drawing off an excess of water by underground conduits, pipes, or tiles, or by open or covered trenches in the surface of the ground, for the purpose of improving the condition of the soil and crops.

The area provided with drainage, in farms, is the acreage actually benefited or made of more value for agricultural purposes by artificial drainage, but does not include land on which only temporary work has been done, such as "bedding" the fields or laying out "dead furrows" to hasten the surface flow.

The area needing drainage, in farms, comprises the additional land not now suitable for crops which could be made available for cultivation (1) "by drainage only," which is the acreage needing no clearing or which is covered with grass, weeds, or other annual growth, and (2) "by drainage and clearing," which is the acreage covered with trees, stumps, or perennial woody shrubs.

Improved land in farms includes all land regularly tilled or mowed, land in pasture which has been cleared or tilled, land lying fallow, land in gardens, orchards, vineyards, and nurseries, and land occupied by farm buildings.

Woodland in farms includes all land covered with natural or planted forest trees which produce, or later may produce, firewood or other forest products.

Farms in drainage and levee districts are those for which the operators have answered affirmatively the question, "Has any part of this farm been afforded drainage or protection against overflow by a drainage or levee district, or by the state, the county, or a private company or individual." Levee districts, however, generally are not included in the enterprises for which data are given in this bulletin (see definition of drainage enterprises, below).

**Farms and farm land.**—The acreage shown for drainage on farms represents land where drainage is actually in operation and which has actually become more fully available for growing crops by reason of the drainage. This is to be distinguished from the area merely provided with outlet facilities by organized drainage enterprises. Drainage on farms represents in most cases the result of work done by the farm owner, either independently or supplemental to the work done by a drainage enterprise, but the acreage would include also any farm land receiving similar benefits directly from the works of an enterprise.

## DRAINAGE ENTERPRISES.

**Explanation of terms.**—The more important terms used in connection with the census of drainage enterprises were defined as follows:

Drainage enterprises comprise public corporations and local improvement districts formed under state laws, commercial enterprises draining swamp or overflowed land for sale, other organizations that may be engaged in extensive land-drainage work, and also tracts of 500 acres or more drained by individual owners. Enterprises such as levee districts that have not authorized the construction of open ditches or tile drains are not included.

Enterprises located in more than one county were divided, for tabulation, and the part in each county treated as a separate enterprise, though the capacities of drainage pumping plants are given only in the counties in which the plants are located.

Operating enterprises, as designated in this bulletin, are those that had completed the drainage works authorized, or had at any rate begun actual construction work, on or before January 1, 1920; enterprises that had been established but had not begun construction are termed "nonoperating."

Land in drainage enterprises comprises the area that has been benefited or is to be benefited by the improvement works constructed by the enterprises. In the case of overlapping enterprises, deduction has been made for the amount of duplication.

All land in drainage enterprises is divided, without regard to drainage condition, into (a) improved land; (b) timber and cut-over land, which would require clearing to be thoroughly fit for cultivation; and (c) all other unimproved land, which would not require expensive clearing before cultivation.

The assessed acreage for any single enterprise is the same as the area in that enterprise. However, the total assessed acreage may be considerably greater than the total land in enterprises, for in summing up the assessed acreage in the county or state, deduction was not made for acreage assessed in more than one enterprise.

Improved land in drainage enterprises consists very largely of improved farm land, though it may include some other improved land receiving benefit from the works of the enterprises.

Timber and cut-over land includes farm woodland of natural or

planted forest trees as well as other timber land or areas that would need clearing of trees, stumps, or perennial woody shrubs.

Land designated as swampy or subject to overflow includes all land permanently or generally too wet for cultivation, land subject to periodical inundation by stream floods, seeped and alkali land in irrigated regions, and all other land unfit for cultivation by reason of insufficient drainage. This classification is without respect to the conditions as to improvement or timber.

The area suffering loss of crops is intended to include only land devoted to planted crops which suffer damage, either partial or complete, because of defective drainage. Land which would be cultivated if drained or protected against overflow is not included.

Capital invested, for the purpose of this investigation, was defined as cost, including charges for engineering, organization, rights of way, construction of drainage works, damages, land and buildings except those held for sale or farming, and any other expenditures properly chargeable to drainage and paid by the enterprise.

The drainage works of an enterprise include all varieties of underground conduits, pipes, or lines of tile, or drains of stone, wood, or other material; also open ditches and canals, together with accessory levees, dikes, dams, weirs, pumping machinery, gates, and other devices for the draining away or control of surface and soil waters.

Tile, as the term is here used, includes pipes of earthenware, concrete, or other material buried beneath the surface in such a way as to permit the excess water to flow away. The size, if circular, is expressed by the inside diameter in inches.

Ditches include all open artificial trenches, usually with sloping sides. The width is that of the bottom.

The type of drainage shows whether the drainage water from an enterprise is discharged by gravity or by pumping.

A pumping district is one where all or a part of the water from the drains collecting at a low point must be raised by some form of machinery in order that it may be removed from the area.

Drainage pumps include all kinds of machinery and devices for lifting the drainage water.

Pumping engines include all kinds of engines and motors for operating the drainage pumps.

Operating and nonoperating enterprises.—In most of the tables that follow, statistics are given for operating enterprises only. These enterprises, as already defined, include both those which have completed their drainage works and those with such works under construction; among the latter may be some that had completed the original plan of reclamation several years ago but were constructing extensions or enlargements on January 1, 1920. The nonoperating enterprises have a legal existence, though they have not yet accomplished any drainage. They may include districts that on the census date had completed their plans, sold bonds to cover the cost of the undertaking, and let contracts for the construction work, and also districts that had just been established by decree of the courts or the town boards of supervisors and were still subject to considerable change in area, plan of drainage works, and cost.

TABLE 2.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED AS BETWEEN OPERATING AND NONOPERATING ENTERPRISES: 1920.

CLASS.	LAND.		CAPITAL. <sup>1</sup>		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	813,569	100.0	\$4,168,055	100.0	\$512,570
Operating enterprises.....	794,569	97.7	4,163,055	99.9	401,570
With works completed.....	572,208	70.3	3,208,944	77.0	.....
With works under construction..	222,361	27.3	954,111	22.9	401,570
Nonoperating enterprises.....	19,000	2.3	5,000	0.1	111,000

<sup>1</sup> The inquiry asked for the "total cost of the enterprise to Dec. 31, 1919," and for an "estimate of additional investment to complete."

Location of enterprises.—More than 60 per cent of the acreage in operating drainage enterprises in Wisconsin is located in a group of seven counties near the center of the state, and most of the other land in such enterprises is in the southeastern counties. There are comparatively few operating enterprises in the northern third of the state and none in the southwestern corner.

TABLE 3.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY DRAINAGE BASIN: 1920.

DRAINAGE BASIN.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	813,569	100.0	\$4,168,055	100.0	\$512,570
Operating enterprises.....	794,569	97.7	4,163,055	99.9	401,570
Illinois River.....	87,351	7.0	381,130	9.1	.....
Rock River.....	110,814	13.8	667,670	16.0	43,000
Wisconsin River.....	370,016	45.5	1,914,833	45.9	37,600
Chippewa River.....	5,614	0.7	75,414	1.8	13,000
St. Croix River.....	5,080	0.6	23,678	0.6	.....
Mississippi River.....	138,037	17.0	219,500	5.3	115,000
Lake Michigan.....	107,657	13.2	880,830	21.1	192,970
Nonoperating enterprises.....	19,000	2.3	5,000	0.1	111,000
Rock River.....	5,000	0.6	1,500	.....	53,000
Wisconsin River.....	10,500	1.3	.....	.....	30,000
Lake Michigan.....	3,500	0.4	3,500	0.1	25,000

Condition of land in enterprises.—The drainage enterprises in Wisconsin have been organized in most part for the reclamation of swamp or marsh land or for the improvement of areas that were usually too wet for most profitable cultivation. The tracts generally are near or bordering the smaller streams of the state.

The usual purpose of an organized enterprise is merely to provide adequate outlets into which the landowners of the district may drain their farms, and to afford relief from overflow for the district as a unit. Therefore, the fact that an enterprise which has completed the construction of the drainage works authorized contains land still swampy or subject to overflow, or land that suffers damage to crops, does not show that the improvement works are inadequate.

TABLE 4.—LAND IN ALL ENTERPRISES, CLASSIFIED BY CONDITION: 1920.

CONDITION OF LAND.	OPERATING ENTERPRISES.				Nonoperating enterprises (acres).
	Total.		Works completed (acres).	Works under construction (acres).	
	Acreage.	Per cent of total.			
All land in enterprises.....	794,569	100.0	572,208	222,361	19,000
Improved land.....	254,504	32.0	220,908	33,596	280
Timber and cut-over land.....	177,744	22.4	84,280	93,464	3,325
Other unimproved land.....	362,321	45.6	267,020	95,301	15,395
Swampy or subject to overflow.....	130,111	16.4	68,008	61,203	18,300
Suffering a loss of crops.....	9,848	1.2	9,774	74	.....

Size of enterprises.—Presentation of the statistics by counties requires that an enterprise located in more than one county be divided and the part in each county be considered a separate enterprise. In this way 290 operating drainage enterprises are counted in Wisconsin, with an average area of 2,740 acres each. There are 29 such enterprises of 5,000 acres or more each, 118 of between 500 and 5,000 acres, and 143 of less than 500 acres each. There is no overlapping of the enterprises in this state.

TABLE 5.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY SIZE OF AREA ASSESSED: 1920.

AREA ASSESSED.	Land in enterprises (acres).	ASSESSED AREA.	
		Acreage.	Per cent of total.
All operating enterprises.....	794,569	794,569	100.0
Less than 200 acres.....	5,800	5,800	0.7
200 to 499 acres.....	20,010	20,010	3.3
500 to 999 acres.....	27,975	27,975	3.5
1,000 to 4,999 acres.....	168,051	168,051	21.1
5,000 to 9,999 acres.....	75,427	75,427	9.5
10,000 to 49,999 acres.....	228,428	228,428	28.7
50,000 to 99,999 acres.....	262,880	262,880	33.1

Character of enterprises.—All drainage enterprises in Wisconsin, except commercial and private undertakings and districts formed by special acts of the legislature, are either drainage districts operating

under the drainage district law of July 15, 1919 (ch. 557), or "drainages" operating under the farm drainage law of June 27, 1919 (ch. 446). These statutes repealed the earlier laws of the state providing for the formation of drainage enterprises, except so far as might be necessary or expedient to complete undertakings already begun, and all drainage district works and town drains constructed under earlier laws are to be maintained under the new drainage district law and farm drainage law, respectively.

A drainage district is established, according to the law of 1919, by the circuit court of any county in which all or a part of the district is situated, after receipt of a petition from the owners of a major part of the land in the proposed district or from a majority of the owners representing one-third or more of the land. Three drainage commissioners for each district are appointed by the court to investigate as to the feasibility and public utility of the proposed work and, when the district has been established, to administer its affairs. The cost of drainage is assessed against the land in proportion to the benefits that will accrue to the various tracts, but that for any part of the work may be assessed against the particular land or corporation to be benefited by that part. If the cost will exceed the benefits, the enterprise is abandoned, unless one or more petitioners agree to pay the excess and furnish security therefor. The commissioners' preliminary report must include a report from the state chief engineer regarding the practicability and completeness of the proposed plan of improvement and a report from the college of agriculture of the University of Wisconsin regarding the character of the soils and the value of the land for agriculture. If the enterprise will affect any navigable stream, the plan must be approved by the state railroad commission. The plan of drainage improvement and the assessments of damages and of benefits are made by the drainage commissioners. The plan of drainage must be approved or disapproved by the state chief engineer. The court holds public hearings upon the petition for establishment, upon the commissioners' preliminary report, and upon their final report presenting plans, cost estimate, and assessments. The commissioners may issue bonds or notes of the district to finance the work. Subdistricts may be formed within any drainage district, by the circuit court, upon petition and after public hearing; the cost is to be assessed by the commissioners of the original drainage district against the land to be benefited.

Very nearly all the drainage districts in Wisconsin were established under the drainage district law of April 23, 1891 (ch. 401), and the revision of June 17, 1905 (ch. 419). Each of those statutes provided that the districts should be organized by the circuit courts and be administered by three commissioners for each district, and that the cost should be assessed in proportion to the anticipated benefits. The requirements

for establishment and the method of organization were much like those of the new drainage district law, but neither of the earlier statutes included any provisions similar to those now requiring that reports upon the proposed work and upon the value of the land be secured from the state chief engineer and the college of agriculture.

A "drainage" under the 1919 statute is established by the county court upon petition from the owners of a major part of the land affected or from a majority of the owners controlling one-third or more of that land, or upon petition from a majority of the town board or boards of supervisors of the town or towns in which the land is situated. All "drainages" are administered by the farm drainage board of the county, composed of three residents appointed by the court when the first petition for a "drainage" is filed. This drainage board makes a preliminary investigation as to the practicability and public utility of the project and, after the "drainage" has been established by decree of the court, prepares the plan of drainage, assesses damages and benefits against the tracts of land, and lets contracts for construction. Public hearings are held by the county court upon the drainage board's preliminary report before the "drainage" is established, and later upon the assessments of damages and of benefits. With its earlier report the drainage board must submit, if the "drainage" will comprise more than 200 acres, a report from the state chief engineer regarding the sufficiency of the proposed work and one from the college of agriculture concerning the character of the soil and the value of the land. The final plan of drainage must be approved by the state chief engineer. The cost of the enterprise may exceed the estimated benefits only if the petitioners give security to cover the excess. The drainage board may issue notes or bonds to finance the work of each "drainage."

Town drains established under laws of March 9, 1871 (ch. 64), and of June 25, 1913 (ch. 579), were in general similar to the "drainages" to be established under the present farm drainage law. Petition for a drain was addressed to the town board of supervisors, which performed approximately the same functions as now are prescribed for the county court and the farm drainage board. For a drain to benefit land within a city or village, petition was addressed to the officials of the city or village, who would appoint a committee to investigate and to construct the drain if the project was approved. The cost was apportioned against the land in proportion to the benefits, and the law of 1871 permitted the landowners to perform the work of construction. No supervision over individual projects was exercised by the state, corresponding to what now is done in requiring reports from the state chief engineer and the college of agriculture.

The first drainage law of this state was enacted in 1852, providing means for one landowner to secure

drainage outlet across the land of an objecting owner, if necessary, through petition to a justice of the peace. A somewhat similar act of 1880 provided for proceedings under the county and circuit courts; an act of 1887 provided for proceedings under the town supervisors. A statute of 1862 (ch. 398) authorized the establishment and construction of county drains by the county board of supervisors upon petition from one or more landowners, damages and benefits being assessed by the supervisors. As amended (Revised Statutes of 1917, sec. 1381) that law authorizes the construction of drains by the county or town boards of supervisors for the benefit of land owned by the counties or towns.

There have been many amendments to the drainage laws that have been mentioned herein, but they have not affected the general form of organization described.

TABLE 6.—LAND AND CAPITAL INVESTED IN ALL ENTERPRISES, CLASSIFIED BY CHARACTER OF ENTERPRISE: 1920.

CHARACTER OF ENTERPRISE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All organized enterprises.....	813,569	100.0	\$4,168,055	100.0	\$512,570
Operating enterprises.....	794,569	97.7	4,168,055	99.9	401,570
Drainage districts.....	684,888	84.2	3,400,032	83.0	346,820
Laws of 1891, ch. 401.....	298,183	36.4	1,373,000	32.9	35,600
Laws of 1905, ch. 419.....	378,705	46.7	2,041,972	49.0	311,220
Special acts.....	9,000	1.1	45,000	1.1	—
"Drainages".....	105,681	13.0	664,423	15.9	54,750
Laws of 1871, ch. 64.....	49,619	6.1	186,664	4.5	750
Laws of 1913, ch. 579.....	53,140	6.5	449,152	10.8	54,000
Laws of 1919, ch. 446.....	2,842	0.3	28,607	0.7	—
Other.....	4,080	0.5	38,600	0.9	—
Nonoperating enterprises.....	19,000	2.3	5,000	0.1	111,000
Drainage districts.....	19,000	2.3	5,000	0.1	111,000
Laws of 1905, ch. 419.....	15,500	1.9	1,500	—	80,000
Laws of 1919, ch. 557.....	3,500	0.4	3,500	0.1	25,000

<sup>1</sup> Includes 1 commercial development, 1 individual ownership, and 1 enterprise not reporting character.

**Drainage works.**—The total works completed by drainage enterprises to December 31, 1919, comprised 1,691.3 miles of open ditches, 211.3 miles of tile drains, and 7.7 miles of accessory levees; the additional lengths under construction were 88.0 miles of open ditches, 40.1 miles of tile drains, and 2.5 miles of levees. These figures do not include drains or levees installed by individual farm owners supplemental to the works of the enterprises, nor the works of flood-protection or levee districts that had not undertaken the construction of ditches or tile drains. There is one drainage district in Wisconsin, comprising 6,597 acres, drained partly by pumping, having one centrifugal pump operated by steam engines of 150 horsepower.

The average depth of the main or outlet ditch was reported for each enterprise. The maximum depth of outlet reported for any enterprise in the state and the maximum in each county are shown in line 15 of County Table II. The maximum length, width, and

depth of outlet shown in that table for any county may not refer to the same enterprise.

County Table II, line 16, shows the mean depth of branch ditches (open ditches only), which is a very crude indication of the depth of soil drainage that may be obtained in the enterprises, as determined by the depth of outlet provided for farm drains. The mean depth was computed by giving each separate depth a weight in proportion to the acreage it serves. As most enterprises reported depths in whole numbers only, the occasional decimals were omitted in making these computations. Depths less than 3 feet and those 10 feet and greater were omitted, because it seemed that they did not represent so well the average depths of outlet provided for all the farms in those districts. To include both of these groups, computed as 3 feet and 10 feet, respectively, would make the mean depth for the state 7.0 instead of 6.5 feet.

TABLE 7.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY KIND OF DRAINAGE WORKS: 1920.

KIND OF WORKS.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All kinds.....	794,569	100.0	\$4,168,055	100.0	\$512,570
Open ditches only.....	657,668	82.8	2,942,667	70.7	279,350
Open ditches and levees.....	27,584	3.5	282,605	6.8	—
Tile drains only.....	2,938	0.4	59,770	1.4	—
Open ditches and tile drains.....	102,359	12.9	834,952	20.1	72,220
Open ditches, tile drains and levees.....	4,000	0.5	43,600	1.0	50,000

TABLE 8.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY AVERAGE DEPTH OF BRANCH DITCHES: 1920.

DEPTH OF BRANCH DITCHES.	Acreage.	Per cent of total.
All operating enterprises.....	794,569	100.0
Less than 3 feet.....	520	0.1
3.0 to 3.9 feet.....	17,669	2.2
4.0 to 4.9 feet.....	72,916	9.2
5.0 to 5.9 feet.....	25,622	3.2
6.0 to 6.9 feet.....	186,683	23.5
7.0 to 7.9 feet.....	79,349	10.0
8.0 to 8.9 feet.....	217,735	27.4
9.0 to 9.9 feet.....	18,000	2.3
10.0 feet and more.....	83,800	10.5
Not reporting branches.....	92,275	11.6

**Maintenance of works.**—The drainage district law of 1919 requires that the commissioners of each drainage district file with the circuit court each year a report including a statement of what repairs will be necessary during the coming year and an assessment to cover the necessary repairs, maintenance, and incidental expenses. The court hears all objections and determines the amounts of assessment. The laws of 1891 and 1905 also authorized the levy of assessments for maintenance of the drains.

The farm drainage law requires the farm drainage board of each county to report annually to the county court regarding each "drainage" under its control, including a statement of the repairs needed in the ensuing year and an assessment to cover the cost of

maintenance apportioned according to the confirmed benefits. The court hears objections to the report before confirming the assessment. The town drain law of 1913 authorized the town supervisors to levy assessments for repair purposes, and that of 1871 required each landowner affected to keep in repair the section of drain assigned to him by the town supervisors.

Under the date of organization are tabulated the entire area, works, and capital of each enterprise, even including extensions made after the original plan of reclamation was completed.

TABLE 9.—LAND AND CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY METHOD OF MAINTENANCE: 1920.

METHOD OF MAINTENANCE.	LAND.		CAPITAL.		
	Acreage.	Per cent of total.	To Dec. 31, 1919.		Additional required to complete.
			Amount.	Per cent of total.	
All operating enterprises.....	794,569	100.0	\$4,163,055	100.0	\$401,570
By district forces.....	181,416	22.8	1,038,827	25.0	2,750
By contract.....	349,886	44.0	2,109,393	50.7	39,600
By landowners.....	29,255	3.7	68,523	1.6	
By method not specified.....	14,860	1.9	182,947	3.7	
No maintenance provided.....	212,215	26.7	744,585	17.9	339,220
Not reporting.....	6,931	0.9	48,780	1.2	20,000

TABLE 11.—CAPITAL INVESTED IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	CAPITAL INVESTED.		
	To Dec. 31, 1919.		Additional required to complete.
	Amount.	Per cent of total.	
All operating enterprises.....	\$4,163,055	100.0	\$401,570
1870 to 1879.....	2,800	0.1	
1880 to 1889.....	65,966	1.6	
1890 to 1899.....	9,063	0.2	
1900 to 1904.....	1,314,577	31.6	36,350
1905 to 1909.....	1,042,098	25.0	
1910 to 1914.....	744,494	17.9	
1915 to 1919.....	963,693	23.1	365,220
Not reported.....	20,364	0.5	

TABLE 12.—DRAINS AND LEVEES (COMPLETED AND UNDER CONSTRUCTION) IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	DITCHES.		TILE.		LEVEES.	
	Miles.	Per cent of total.	Miles.	Per cent of total.	Miles.	Per cent of total.
1870 to 1879.....	9.5	0.5				
1880 to 1889.....	59.7	3.4				
1890 to 1899.....	26.3	1.5				
1900 to 1904.....	551.6	31.0				
1905 to 1909.....	455.6	25.6	19.5	7.8	2.5	25.5
1910 to 1914.....	311.3	17.5	19.0	7.6	5.1	50.0
1915 to 1919.....	357.0	20.1	211.6	84.2	2.5	24.5
Not reported.....	8.3	0.5	1.3	0.5		

. Date of organization.—The progress in drainage is shown only roughly by the dates of the organization of the enterprises, which are the dates when the districts were established by the courts or the town boards of supervisors, since there may be a period of a year or more between the decree of establishment and the beginning of actual construction and since the work of construction might occupy some years in a large district. It was not practicable, however, for the census to secure data as to the time of the beginning or the completion of the drainage works.

Crops.—The principal crops grown upon the drained land in drainage enterprises are hay and corn. Data were not secured to show the part of each enterprise planted to any crop, so the enterprises have been classified according to the principal crop, and the total area of improved land is shown thus classified in County Table II: No data were secured at the general census of agriculture to separate the crops grown upon land drained artificially from those produced upon land drained naturally.

TABLE 10.—LAND IN OPERATING ENTERPRISES, CLASSIFIED BY DATE ENTERPRISE WAS ORGANIZED: 1920.

DATE OF ORGANIZATION.	LAND.		AREA ASSESSED.	
	Acreage.	Per cent of total.	Acreage.	Per cent of total.
1870 to 1879.....	695	0.1	695	0.1
1880 to 1889.....	16,158	2.0	16,158	2.0
1890 to 1899.....	5,173	0.7	5,173	0.7
1900 to 1904.....	294,978	37.1	294,978	37.1
1905 to 1909.....	145,692	18.3	145,692	18.3
1910 to 1914.....	111,102	14.0	111,102	14.0
1915 to 1919.....	218,424	27.5	218,424	27.5
Not reported.....	2,347	0.3	2,347	0.3

## DRAINAGE—WISCONSIN.

COUNTY TABLE I.—DRAINAGE ON FARMS: 1920.

		THE STATE.	Adams.	Ashland.	Barron.	Bayfield.	Brown.	Buffalo.	Burnett.	Calumet.
1	Number of all farms in the state or county.....	189,295	1,557	1,131	4,516	1,791	3,498	2,089	1,872	2,987
2	Farms reporting land having drainage.....	21,838	87	32	117	252	517	51	145	255
3	Farms reporting land needing drainage.....	52,228	259	447	1,028	323	1,200	313	695	336
4	Farms in drainage and levee districts.....	3,693	34	2	22	.....	19	3	29	20
<b>LAND AND FARM AREA.</b>										
5	Approximate land area of the state or county..... acres.	35,393,840	437,700	692,480	566,400	961,920	338,560	439,680	550,400	207,360
6	All land in farms..... acres.	22,148,223	304,575	108,270	449,595	172,496	304,745	418,261	236,886	194,523
7	Improved land in farms..... acres.	12,452,216	148,138	36,253	208,936	50,389	207,027	202,321	79,611	145,005
8	Woodland in farms..... acres.	5,401,910	111,264	56,659	121,719	82,071	47,859	151,650	117,520	19,379
9	Other unimproved land in farms..... acres.	4,294,097	45,173	15,358	118,910	40,036	49,859	64,290	39,755	20,689
10	Farm land reported as provided with drainage..... acres.	658,411	7,827	665	2,477	5,460	12,761	1,069	4,035	5,660
11	Farm land reported as needing drainage..... acres.	1,839,273	13,245	27,845	41,158	15,835	30,578	8,019	33,012	7,084
12	Drainage only..... acres.	461,612	5,325	879	3,783	658	6,012	2,154	6,217	3,963
13	Drainage and clearing..... acres.	1,377,661	7,920	26,966	37,425	15,177	24,566	5,865	26,795	3,121

		Chip-pewa.	Clark.	Colum-bia.	Dane.	Dodge.	Door.	Douglas.	Dunn.	Eau Claire.	Fond du Lac.
1	Number of all farms in the county.....	3,729	5,116	3,320	6,217	4,633	2,396	1,557	3,566	2,368	4,190
2	Farms reporting land having drainage.....	123	188	436	721	1,051	181	55	123	91	535
3	Farms reporting land needing drainage.....	1,459	1,530	906	1,604	1,193	626	1,001	729	511	1,005
4	Farms in drainage and levee districts.....	22	32	231	177	187	11	3	36	17	77
<b>LAND AND FARM AREA.</b>											
5	Approximate land area of the county..... acres.	664,960	779,520	497,920	769,280	574,080	300,160	855,680	556,160	408,320	464,040
6	All land in farms..... acres.	457,998	476,377	463,639	721,156	522,217	264,126	154,671	490,044	307,346	446,710
7	Improved land in farms..... acres.	227,691	195,802	301,889	512,269	374,939	149,557	40,428	265,693	194,467	321,182
8	Woodland in farms..... acres.	130,048	137,131	66,362	85,501	36,202	79,959	69,791	150,405	68,504	32,672
9	Other unimproved land in farms..... acres.	100,259	143,444	95,388	123,386	111,076	84,610	44,452	73,946	44,375	92,856
10	Farm land reported as provided with drainage..... acres.	2,349	4,864	11,344	16,859	22,152	2,986	1,012	2,685	1,846	14,792
11	Farm land reported as needing drainage..... acres.	70,001	72,622	32,867	34,919	30,395	17,112	63,343	26,392	17,603	20,893
12	Drainage only..... acres.	6,411	5,128	18,285	24,215	21,689	3,596	1,089	3,432	2,030	12,744
13	Drainage and clearing..... acres.	63,590	67,494	14,582	10,704	8,706	13,516	62,254	22,960	15,573	7,649

		Forest.	Green.	Green Lake.	Iowa.	Jackson.	Jefferson.	Juneau.	Kan-sa-sha.	Kewa-nee.	Lafay-ette.
1	Number of all farms in the county.....	535	2,330	1,507	2,527	2,577	3,263	2,479	1,383	2,065	2,300
2	Farms reporting land having drainage.....	6	219	131	67	87	1,022	537	861	455	107
3	Farms reporting land needing drainage.....	167	388	346	140	746	1,188	915	797	1,007	250
4	Farms in drainage and levee districts.....	.....	14	39	2	32	187	291	99	11	1
<b>LAND AND FARM AREA.</b>											
5	Approximate land area of the county..... acres.	650,880	379,520	230,400	499,840	633,600	353,280	513,280	180,480	215,680	410,880
6	All land in farms..... acres.	56,029	344,542	213,518	460,938	389,345	331,204	327,561	158,832	210,584	373,121
7	Improved land in farms..... acres.	16,950	270,680	141,371	254,424	190,401	218,129	171,114	112,255	146,626	272,481
8	Woodland in farms..... acres.	24,695	35,290	21,469	85,004	128,098	43,622	95,359	15,471	33,937	35,308
9	Other unimproved land in farms..... acres.	14,384	38,572	50,678	121,510	70,846	69,453	61,088	28,106	30,021	65,332
10	Farm land reported as provided with drainage..... acres.	687	6,835	4,422	1,069	4,621	23,459	35,627	39,804	14,083	2,803
11	Farm land reported as needing drainage..... acres.	10,703	9,210	10,804	3,400	37,328	31,875	39,698	24,636	21,768	5,843
12	Drainage only..... acres.	562	5,328	5,187	1,910	7,138	18,740	11,528	15,949	6,067	3,045
13	Drainage and clearing..... acres.	10,141	3,882	5,617	1,490	30,190	13,135	28,170	8,687	15,711	2,798



# DRAINAGE—WISCONSIN.

COUNTY TABLE I.—DRAINAGE ON FARMS: 1920—Continued.

		Mani- towoc.	Mar- athon.	Mari- nette.	Mar- quette.	Mil- waukee.	Monroe.	Oconto.	Outa- ganie.	Ozau- kee.	Pepin.
1	Number of all farms in the county.....	3,904	6,058	2,531	1,432	2,574	3,519	3,114	3,746	1,727	1,034
2	Farms reporting land having drainage.....	1,464	66	181	222	1,167	181	242	761	617	35
3	Farms reporting land needing drainage.....	1,630	1,961	1,508	420	760	533	1,325	1,307	874	75
4	Farms in drainage and levee districts.....	109	6	112	18	184	131	40	45	90	4
<b>LAND AND FARM AREA.</b>											
5	Approximate land area of the county..... acres..	355,280	994,560	905,600	292,480	150,400	599,680	715,520	413,440	149,120	151,040
6	All land in farms..... acres..	358,511	650,959	275,738	271,317	111,033	468,553	310,037	347,824	141,115	140,263
7	Improved land in farms..... acres..	251,176	242,357	107,444	133,773	90,258	231,049	151,639	230,561	107,739	75,698
8	Woodland in farms..... acres..	54,581	243,086	76,093	85,306	12,921	155,752	90,551	44,915	12,092	48,310
9	Other unimproved land in farms..... acres..	52,754	164,610	80,198	52,238	7,854	81,782	61,847	66,348	21,284	16,254
10	Farm land reported as provided with drainage..... acres..	34,705	1,688	5,735	8,287	22,542	8,494	9,531	26,772	13,477	1,077
11	Farm land reported as needing drainage..... acres..	20,564	93,246	84,384	17,089	12,176	18,765	53,135	47,510	14,718	2,030
12	Drainage only..... acres..	14,690	5,249	5,563	8,199	5,392	7,887	8,213	17,319	6,795	100
13	Drainage and clearing..... acres..	14,874	87,997	78,821	9,800	6,394	10,878	44,922	30,191	7,923	1,924

		Polk.	Portage.	Price.	Racine.	Rich- land.	Rock.	Rusk.	Sauk.	Sha- wau.	Shebo- yan.
1	Number of all farms in the county.....	4,053	3,326	1,935	2,215	2,533	3,660	1,940	3,697	3,977	3,604
2	Farms reporting land having drainage.....	103	312	46	1,619	116	335	44	200	303	1,262
3	Farms reporting land needing drainage.....	1,196	534	1,272	1,170	305	702	794	578	1,393	1,630
4	Farms in drainage and levee districts.....	56	251	3	473	6	64	55	4	13	30
<b>LAND AND FARM AREA.</b>											
5	Approximate land area of the county..... acres..	593,400	519,680	818,560	207,360	377,600	458,240	592,000	538,880	741,120	333,440
6	All land in farms..... acres..	434,216	427,913	161,894	195,963	361,450	427,083	184,213	494,925	431,614	311,332
7	Improved land in farms..... acres..	185,140	250,287	40,387	146,456	186,824	343,328	46,676	279,878	193,770	226,734
8	Woodland in farms..... acres..	186,044	103,858	71,921	20,969	132,023	38,825	24,518	135,662	140,511	42,561
9	Other unimproved land in farms..... acres..	63,032	73,768	49,556	28,538	42,003	44,930	113,019	79,385	97,333	42,037
10	Farm land reported as provided with drainage..... acres..	2,157	31,913	598	71,843	1,644	11,876	596	4,521	6,456	34,208
11	Farm land reported as needing drainage..... acres..	46,595	26,069	60,150	30,557	6,405	22,206	27,886	12,603	44,823	27,400
12	Drainage only..... acres..	5,969	3,244	1,430	18,781	2,887	12,727	2,281	6,822	11,283	13,305
13	Drainage and clearing..... acres..	40,626	22,815	64,720	11,776	3,518	9,479	25,605	5,781	33,540	14,005

		Trem- peleau.	Wal- worth.	Wash- burn.	Wash- ington.	Wau- kesha.	Wau- paca.	Wau- shara.	Winne- bago.	Wood.	Other counties. <sup>1</sup>
1	Number of all farms in the county.....	3,138	2,779	1,350	2,799	3,406	3,770	2,468	2,711	3,066	26,469
2	Farms reporting land having drainage.....	98	560	23	623	1,075	345	190	709	350	137
3	Farms reporting land needing drainage.....	570	972	422	1,129	306	1,142	372	1,023	893	4,271
4	Farms in drainage and levee districts.....	10	59	.....	87	.....	62	18	44	108	13
<b>LAND AND FARM AREA.</b>											
5	Approximate land area of the county..... acres..	478,720	358,400	534,400	275,840	351,360	485,760	413,440	293,760	517,760	7,578,880
6	All land in farms..... acres..	461,525	330,011	178,298	264,351	333,519	420,206	363,417	256,327	321,907	3,356,325
7	Improved land in farms..... acres..	270,239	239,308	57,827	174,486	227,310	236,807	233,745	186,332	137,063	1,705,897
8	Woodland in farms..... acres..	135,567	38,037	71,401	38,230	52,073	92,965	84,493	25,511	79,030	970,046
9	Other unimproved land in farms..... acres..	55,719	52,666	49,070	51,635	54,136	90,434	45,179	44,484	105,814	680,382
10	Farm land reported as provided with drainage..... acres..	1,293	16,020	633	9,339	18,202	7,473	6,595	21,468	22,876	2,189
11	Farm land reported as needing drainage..... acres..	14,644	26,322	27,953	20,584	5,659	32,364	11,903	24,778	44,836	185,056
12	Drainage only..... acres..	6,331	18,969	4,100	13,144	2,863	12,993	4,636	14,639	8,358	14,183
13	Drainage and clearing..... acres..	8,313	7,363	23,853	7,440	2,796	19,371	7,272	10,139	36,478	178,873

<sup>1</sup> No drainage reported in Crawford, Florence, Grant, Iron, La Crosse, Langlade, Lincoln, Oneida, Pierce, St. Croix, Sawyer, Taylor, Vernon, and Vilas Counties.

DRAINAGE—WISCONSIN.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920.

	THE STATE.	Adams.	Clark.	Columbia.	Dane.	Dodge.	Door.	Fond du Lac.	
<b>LAND AREA.</b>									
1	Approximate land area of the state or county..... acres..	35,363,840	437,760	779,520	497,920	769,280	574,080	300,160	464,640
2	All land in operating drainage enterprises..... acres..	794,569	16,390	98,000	4,668	39,239	21,597	4,000	5,935
3	Improved land..... acres..	254,504	9,834	9,800	2,204	6,535	4,482	600	1,778
4	Per cent of all improved land in farms.....	2.0	6.6	5.0	0.7	1.3	1.2	0.4	0.6
5	Timber and cut-over land..... acres..	177,744	4,098	68,600			108	800	389
6	Other unimproved land..... acres..	362,321	2,458	19,600	2,464	32,704	17,007	2,600	3,768
7	Swampy or subject to overflow, in enterprises..... acres..	130,111	2,458	49,000	985	6,896	3,291	1,000	925
8	Suffering loss of crops from defective drainage..... acres..	9,848	983		28	30			25
9	Assessed acreage..... acres..	794,569	16,390	98,000	4,668	39,239	21,597	4,000	5,935
10	Excess over all land in enterprises..... acres..								
<b>DRAINAGE WORKS.</b>									
Open ditches:									
11	Completed..... miles..	1,691.3	50.3	23.3	24.2	114.0	103.0	1.1	28.6
12	Additional under construction..... miles..	88.0	46.7			5.8		0.9	
13	Maximum completed in any enterprise..... miles..	144.5	50.3	23.3	7.0	26.0	10.5	1.1	4.0
14	Maximum width at bottom of ditch <sup>1</sup> ..... feet..	60	16	10	8	24	8	3	40
15	Maximum of average depths of outlet ditches <sup>1</sup> ..... feet..	13.0	8.0	6.0	10.0	10.0	10.0	4.0	7.0
16	Mean depth of branch ditches <sup>1</sup> ..... feet..	6.5	8.0	6.0	5.1	5.0	3.7		7.0
Tile drains:									
17	Completed..... miles..	211.3				97.0	3.7		0.3
18	Additional under construction..... miles..	40.1				7.3		5.5	
19	Maximum completed in any enterprise..... miles..	43.0				43.0	1.2		0.3
20	Maximum size of tile..... inches..	30				24	24		12
Accessory levees and dikes:									
21	Completed..... miles..	7.7							
22	Additional under construction..... miles..	2.5							
Pumping plants:									
23	Engine capacity..... horsepower..	150							
24	Pump capacity..... gallons per minute..								
25	Area served by pumps..... acres..	6,597							
26	Area drained by open ditches only <sup>1</sup> ..... acres..	657,668	16,390	98,000	4,668	25,398	19,259		5,485
27	Length of these ditches..... miles..	1,462.6	50.3	70.0	24.2	88.2	93.0		26.3
28	Average length per acre..... feet..	11.7	16.2	3.8	27.4	18.3	25.5		25.3
29	Area having open ditches and levees <sup>1</sup> ..... acres..	27,584							
30	Length of these ditches..... miles..	79.1							
31	Average length per acre..... feet..	15.1							
32	Length of the accessory levees..... miles..	7.7							
33	Area drained by tile only <sup>1</sup> ..... acres..	2,958				1,270	60		
34	Length of these tile..... miles..	97.2				83.0	1.0		
35	Average length per acre..... feet..	173.5				345.1	88.0		
36	Area drained by open ditches and tile <sup>1</sup> ..... acres..	102,359				12,571	2,278	4,000	450
37	Length of these drains..... miles..	347.6				52.9	12.7	7.5	2.6
38	Average length per acre..... feet..	17.9				22.2	29.4	9.9	30.5
39	Area having open ditches, tile drains, and levees <sup>1</sup> ..... acres..	4,000							
40	Length of these drains..... miles..	44.2							
41	Average length per acre..... feet..	58.3							
42	Length of the accessory levees..... miles..	2.5							
<b>DEVELOPMENT OF LAND.</b>									
43	Improved land in operating enterprises, 1920..... acres..	254,504	9,834	9,800	2,204	6,535	4,482	600	1,778
44	Improved land prior to drainage..... acres..	50,071		9,800		1,353	398		761
45	Increase since drainage..... acres..	204,433	9,834		2,204	5,202	4,084	600	1,017
46	Per cent of increase.....	408.3				390.2			133.6
47	Per cent increase is of all improved land in farms, 1920.....	1.6	6.6		0.7	1.0	1.1	0.4	0.3
48	Timber and cut-over land, 1920..... acres..	177,744	4,098	68,600			108	800	389
49	Timber and cut-over land prior to drainage..... acres..	231,732	12,292	68,600		1,220	144	800	389
50	Decrease since drainage..... acres..	53,988	8,194			1,220	36		
51	Per cent of decrease.....	23.3	66.7			100.0	25.0		
52	Other unimproved land, 1920..... acres..	362,321	2,458	19,600	2,464	32,704	17,007	2,600	3,768
53	Other unimproved land prior to drainage..... acres..	512,766	4,098	19,600	4,668	36,686	21,055	3,200	4,785
54	Decrease since drainage..... acres..	150,445	1,640		2,204	3,982	4,048	600	1,017
55	Per cent of decrease.....	29.3	40.0		47.2	10.9	19.2	18.8	21.3
56	Swampy or subject to overflow, 1920..... acres..	130,111	2,458	49,000	985	6,896	3,291	1,000	925
57	Swampy or subject to overflow prior to drainage..... acres..	701,307	16,390	68,600	4,668	37,779	21,357	2,400	5,333
58	Decrease since drainage..... acres..	571,196	13,932	19,600	3,683	30,883	18,066	1,400	4,408
59	Per cent of decrease.....	81.4	85.0	28.6	78.9	81.7	84.6	58.3	82.7
<b>CAPITAL INVESTED AND COST PER ACRE.</b>									
60	Total capital invested in and required for completion of operating enterprises..... dollars..	4,564,625	98,000	159,000	41,352	346,313	95,545	28,000	72,066
61	Capital invested in these enterprises to Dec. 31, 1919..... dollars..	4,163,055	98,000	44,000	41,352	326,313	95,545	3,000	72,066
62	Additional capital required to complete these enterprises..... dollars..	401,570		115,000		20,000		25,000	
63	Average cost per acre when completed..... dollars..	5.74	5.98	1.62	8.86	8.83	4.42	7.00	12.14
64	Enterprises constructing open ditches only..... dollars..	3,222,017	98,000	159,000	41,352	190,607	52,755		65,509
65	Average cost per acre when completed..... dollars..	4.90	5.98	1.62	8.86	7.50	2.74		11.94
66	Enterprises constructing open ditches and levees..... dollars..	282,666							
67	Average cost per acre when completed..... dollars..	10.25							
68	Enterprises constructing tile drains only..... dollars..	59,770				33,000	1,000		
69	Average cost per acre when completed..... dollars..	20.21				25.98	10.67		
70	Enterprises constructing open ditches and tile drains..... dollars..	907,172				122,706	41,790	28,000	6,557
71	Average cost per acre when completed..... dollars..	8.86				9.76	18.35	7.06	14.57
72	Enterprises constructing open ditches, tile drains, and levees..... dollars..	93,000							
73	Average cost per acre when completed..... dollars..	23.25							
<b>CROPS.</b>									
74	Improved land in enterprises reporting—								
75	Hay as principal crop on drained land..... acres..	97,966	9,834		1,606	2,744	680	600	306
76	Corn as principal crop on drained land..... acres..	97,073			38	2,121	3,802		932
77	Small grains as principal crop on drained land..... acres..	24,086			560	200			
78	Vegetables as principal crop on drained land..... acres..	2,647				1,470			
79	Other crops as principal crop on drained land..... acres..	19,590							
80	Not reporting principal crop on drained land..... acres..	32,790		29,400					540

<sup>1</sup> When works under construction have been completed.

DRAINAGE—WISCONSIN.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920—Continued.

		Jackson.	Jefferson.	Juneau.	Kenosha.	Marathon.	Milwaukee.	Monroe.	Oconto.
<b>LAND AREA.</b>									
1	Approximate land area of the county .....	633,600	353,280	513,280	180,480	994,560	160,400	599,680	715,520
2	All land in operating drainage enterprises.....	46,760	17,461	133,297	11,803	11,679	8,392	61,100	4,300
3	Improved land.....	4,140	5,630	27,904	10,277	2,336	7,355	27,641	2,000
4	Per cent of all improved land in farms.....	2.2	2.6	16.3	9.2	1.0	8.1	12.0	1.3
5	Timber and cut-over land.....	15,264	18	38,069		8,175		21,472	490
6	Other unimproved land.....	27,356	11,813	67,324	1,526	1,168	1,037	11,987	1,810
7	Swampy or subject to overflow, in enterprises.....		1,436	7,014	1,004			29,158	770
8	Suffering loss of crops from defective drainage.....		204	445				1,162	
9	Assessed acreage.....	46,760	17,461	133,297	11,803	11,679	8,392	61,100	4,300
10	Excess over all land in enterprises.....								
<b>DRAINAGE WORKS.</b>									
<b>Open ditches:</b>									
11	Completed.....	25.2	93.4	289.3	14.5	19.0	49.2	80.3	12.3
12	Additional under construction.....	4.8		9.2				0.8	4.9
13	Maximum completed in any enterprise.....	13.0	5.6	144.5	7.0	19.0	8.5	50.8	11.3
14	Maximum width at bottom of ditch <sup>1</sup> .....	30	8	40	30	60	18	20	10
15	Maximum of average depths of outlet ditches.....	10.0	7.0	10.0	9.0	8.0	9.0	10.0	6.5
16	Mean depth of branch ditches <sup>1</sup> .....	7.0	3.2	6.1	7.0	7.0		7.4	5.7
<b>Tile drains:</b>									
17	Completed.....		8.2		10.0		4.8		
18	Additional under construction.....				0.7				1.0
19	Maximum completed in any enterprise.....		3.5		4.2		2.3		
20	Maximum size of tile <sup>1</sup> .....		18		30		20		
<b>Accessory levees and dikes:</b>									
21	Completed.....			0.8					
22	Additional under construction.....								
<b>Pumping plants:</b>									
23	Engine capacity.....								
24	Pump capacity.....								
25	Area served by pumps.....								
26	Area drained by open ditches only <sup>1</sup> .....	46,760	16,387	128,357	40	11,079	7,332	61,100	600
27	Length of these ditches.....	30.0	88.4	282.5	0.5	19.0	47.2	81.1	1.0
28	Average length per acre.....	3.4	28.6	11.6	66.0	8.0	34.0	7.0	8.8
29	Area having open ditches and levees <sup>1</sup> .....			4,940					
30	Length of these ditches.....			16.0					
31	Average length per acre.....			17.1					
32	Length of the accessory levees.....			0.8					
33	Area drained by tile only <sup>1</sup> .....		230				820		
34	Length of these tile.....		2.9				3.8		
35	Average length per acre.....		66.0				24.5		
36	Area drained by open ditches and tile <sup>1</sup> .....		804		11,763		240		3,700
37	Length of these drains.....		10.3		24.7		3.0		17.2
38	Average length per acre.....		60.8		11.1		66.0		24.5
39	Area having open ditches, tile drains, and levees <sup>1</sup> .....								
40	Length of these drains.....								
41	Average length per acre.....								
42	Length of the accessory levees.....								
<b>DEVELOPMENT OF LAND.</b>									
43	Improved land in operating enterprises, 1920.....	4,140	5,630	27,904	10,277	2,336	7,355	27,641	2,000
44	Improved land prior to drainage.....	2,500	50	3,271	4			3,384	1,480
45	Increase since drainage.....	1,640	5,580	24,633	10,273	2,336	7,355	24,257	520
46	Per cent of increase <sup>2</sup> .....	65.6		753.1				716.8	35.1
47	Per cent increase is of all improved land in farms, 1920.....	0.9	2.6	14.4	9.2	1.0	8.1	10.5	0.3
48	Timber and cut-over land, 1920.....	15,264	18	38,069		8,175		21,472	490
49	Timber and cut-over land prior to drainage.....	15,264	18	41,300	280	10,511		45,344	490
50	Decrease since drainage.....			3,240	280	2,336		23,872	
51	Per cent of decrease.....			7.8	100.0	22.2		52.6	
52	Other unimproved land, 1920.....	27,356	11,813	67,324	1,526	1,168	1,037	11,987	1,810
53	Other unimproved land prior to drainage.....	28,996	17,393	88,717	11,519	1,168	8,392	12,372	2,330
54	Decrease since drainage.....	1,640	5,580	21,393	9,993		7,355	885	520
55	Per cent of decrease.....	5.7	32.1	24.1	85.8		87.6	3.1	22.3
56	Swampy or subject to overflow, 1920.....		1,436	7,014	1,004			29,158	770
57	Swampy or subject to overflow prior to drainage.....	28,996	17,461	126,540	11,519	11,679	8,392	57,100	2,420
58	Decrease since drainage.....	28,996	16,025	119,526	10,515	11,679	8,392	27,942	1,650
59	Per cent of decrease.....	100.0	91.8	94.5	91.3	100.0	100.0	48.9	68.2
<b>CAPITAL INVESTED AND COST PER ACRE.</b>									
60	Total capital invested in and required for completion of operating enterprises.....	113,570	47,137	761,004	100,100	53,200	110,120	167,039	44,232
61	Capital invested in these enterprises to Dec. 31, 1919.....	101,800	47,137	739,100	100,100	53,200	110,120	165,113	30,612
62	Additional capital required to complete these enterprises.....	11,770		21,904				1,926	14,220
63	Average cost per acre when completed.....	2.43	2.70	5.71	8.48	4.56	13.12	2.73	10.29
64	Enterprises constructing open ditches only.....	113,570	20,334	711,604	400	53,200	95,141	167,039	312
65	Average cost per acre when completed.....	2.43	1.80	5.54	10.00	4.56	12.98	2.73	0.52
66	Enterprises constructing open ditches and levees.....			49,600					
67	Average cost per acre when completed.....			10.02					
68	Enterprises constructing tile drains only.....		4,753				6,479		
69	Average cost per acre when completed.....		20.87				7.90		
70	Enterprises constructing open ditches and tile drains.....		13,100		99,700		8,500		43,920
71	Average cost per acre when completed.....		14.65		8.48		36.42		11.87
72	Enterprises constructing open ditches, tile drains, and levees.....								
73	Average cost per acre when completed.....								
<b>CROPS.</b>									
74	Improved land in enterprises reporting—								
75	Hay as principal crop on drained land.....	1,640	181	3,905		2,336		23,622	150
76	Corn as principal crop on drained land.....		5,129	1,500	10,249		6,345	4,000	
77	Small grains as principal crop on drained land.....			15,050					
78	Vegetables as principal crop on drained land.....				28		910		
79	Other crops as principal ones on drained land.....			2,449			100	19	1,850
80	Not reporting principal crop on drained land.....	2,500	320						

<sup>1</sup> When works under construction have been completed.

<sup>2</sup> Per cent not shown when more than 1,000.

## DRAINAGE—WISCONSIN.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920—Continued.

		Outagamie.	Ozaukee.	Portage.	Racine.	Rock.	Rusk.	Shawano.	Sheboygan.	
<b>LAND AREA.</b>										
1	Approximate land area of the county.....	acres..	413,440	149,120	519,680	207,300	453,240	592,000	741,120	333,440
2	All land in operating drainage enterprises.....	acres..	18,305	5,960	67,567	61,847	15,792	5,174	4,600	7,106
3	Improved land.....	acres..	5,468	4,462	21,734	47,265	5,372	1,104	2,970	561
4	Per cent of all improved land in farms.....		2.3	4.1	8.7	32.3	1.6	2.4	1.5	0.2
5	Timber and cut-over land.....	acres..	649	928	2,920	2,920	174	174	3,206	3,206
6	Other unimproved land.....	acres..	12,188	570	45,833	11,662	10,420	3,896	1,630	3,339
7	Swampy or subject to overflow, in enterprises.....	acres..	530		5,500	5,562	4,656	712	720	4,000
8	Suffering loss of crops from defective drainage.....	acres..			5,500	414	72			
9	Assessed acreage.....		18,305	5,960	67,567	61,847	15,792	5,174	4,600	7,106
10	Excess over all land in enterprises.....	acres..								
<b>DRAINAGE WORKS.</b>										
11	Open ditches:									
12	Completed.....	miles..	68.4	23.7	153.4	95.3	30.5	17.6	16.0	23.4
13	Additional under construction.....	miles..	6.6	1.0					1.1	6.2
14	Maximum completed in any enterprise.....	miles..	23.4	4.9	108.0	37.5	9.0	5.3	5.0	18.8
15	Maximum width at bottom of ditch <sup>1</sup> .....	feet..	6	25	60	30	20	2	6	30
14	Maximum of average depths of outlet ditches <sup>1</sup> .....	feet..	8.0	8.0	8.0	12.0	8.0	9.0	8.0	13.0
16	Mean depth of branch ditches <sup>1</sup> .....	feet..	4.3	6.6	7.8	7.0	5.9	3.0		7.0
17	Tile drains:									
18	Completed.....	miles..		2.1		31.7		36.1		4.4
19	Additional under construction.....	miles..	14.2			0.4		11.0		
20	Maximum completed in any enterprise.....	miles..		1.1		10.3		26.7		2.0
21	Maximum size of tile <sup>1</sup> .....	inches..	16	15		24		16		15
22	Accessory levees and dikes:									
23	Completed.....	miles..	1.0							
24	Additional under construction.....	miles..	2.5							
25	Pumping plants:									
26	Engine capacity.....	horsepower..								
27	Pump capacity.....	gallons per minute..								
28	Area served by pumps.....	acres..								
29	Area drained by open ditches only <sup>1</sup> .....	acres..	12,618	4,238	67,567	7,000	15,792	1,028	4,600	6,560
30	Length of these ditches.....	miles..	38.2	19.8	153.4	7.0	30.5	7.5	17.1	28.0
31	Average length per acre.....	feet..	16.0	24.7	12.0	5.3	10.2	38.5	19.6	22.5
32	Area having open ditches and levees <sup>1</sup> .....	acres..	1,687							
33	Length of these ditches.....	miles..	6.8							
34	Average length per acre.....	feet..	21.3							
35	Length of the accessory levees.....	miles..	1.0							
36	Area drained by tile only <sup>1</sup> .....	acres..		22						270
37	Length of these tile.....	miles..		1.0						4.0
38	Average length per acre.....	feet..		240.0						70.5
39	Area drained by open ditches and tile <sup>1</sup> .....	acres..		1,700		51,847		4,140		250
40	Length of these drains.....	miles..		6.0		120.4		57.2		2.0
41	Average length per acre.....	feet..		18.6		11.6		72.8		42.2
42	Area having open ditches, tile drains, and levees <sup>1</sup> .....	acres..	4,000							
43	Length of these drains.....	miles..	44.2							
44	Average length per acre.....	feet..	58.3							
45	Length of the accessory levees.....	miles..	2.5							
<b>DEVELOPMENT OF LAND.</b>										
46	Improved land in operating enterprises, 1920.....	acres..	5,468	4,462	21,734	47,265	5,372	1,104	2,970	561
47	Improved land prior to drainage.....	acres..	1,463	278		22,276	43	105	1,120	25
48	Increase since drainage.....	acres..	4,005	4,184	21,734	24,989	5,329	999	1,850	536
49	Per cent of increase <sup>2</sup> .....		273.8		112.2			951.4	165.2	
50	Per cent increase is of all improved land in farms, 1920.....		1.7	3.9	8.7	17.1	1.6	2.1	1.0	0.2
51	Timber and cut-over land, 1920.....	acres..	649	928	2,920	2,920	174	174	3,206	3,206
52	Timber and cut-over land prior to drainage.....	acres..	2,905	1,202	7,746	2,920			3,387	181
53	Decrease since drainage.....	acres..	2,256	274	7,746				181	5.3
54	Per cent of decrease.....		77.7	22.8	100.0					
55	Other unimproved land, 1920.....	acres..	12,188	570	45,833	11,662	10,420	3,896	1,630	3,339
56	Other unimproved land prior to drainage.....	acres..	13,937	4,480	59,821	30,651	15,749	4,895	3,480	3,694
57	Decrease since drainage.....	acres..	1,749	3,910	13,988	24,989	5,329	999	1,850	355
58	Per cent of decrease.....		12.5	87.3	23.4	68.2	33.8	20.4	53.2	9.6
59	Swampy or subject to overflow, 1920.....	acres..	530		5,500	5,562	4,656	712	720	4,000
60	Swampy or subject to overflow prior to drainage.....	acres..	11,088	5,960	67,567	49,907	15,792	3,740	4,600	7,106
61	Decrease since drainage.....	acres..	10,558	5,960	62,067	44,345	11,136	3,028	3,880	3,106
62	Per cent of decrease.....		95.2	100.0	91.9	88.9	70.5	81.0	84.3	43.7
<b>CAPITAL INVESTED AND COST PER ACRE.</b>										
63	Total capital invested in and required for completion of operating enterprises.....	dollars..	167,540	63,160	441,920	406,000	88,375	32,516	10,490	260,033
64	Capital invested in these enterprises to Dec. 31, 1919.....	dollars..	117,540	60,160	441,920	406,000	88,375	69,516	9,740	135,033
65	Additional capital required to complete these enterprises.....	dollars..	50,000	3,000				13,000	750	125,000
66	Average cost per acre when completed.....	dollars..	9.15	10.60	6.54	6.56	5.60	15.95	2.28	36.59
67	Enterprises constructing open ditches only.....	dollars..	59,874	24,660	441,920	35,000	88,375	7,617	10,490	238,900
68	Average cost per acre when completed.....	dollars..	4.75	5.82	8.54	5.00	5.60	7.41	2.28	36.31
69	Enterprises constructing open ditches and levees.....	dollars..	14,666							
70	Average cost per acre when completed.....	dollars..	8.69							
71	Enterprises constructing tile drains only.....	dollars..		1,000						8,633
72	Average cost per acre when completed.....	dollars..		45.45						31.28
73	Enterprises constructing open ditches and tile drains.....	dollars..		37,500		371,000		74,899		12,500
74	Average cost per acre when completed.....	dollars..		22.06		6.76		18.07		50.00
75	Enterprises constructing open ditches, tile drains, and levees.....	dollars..	93,000							
76	Average cost per acre when completed.....	dollars..	23.25							
<b>CROPS.</b>										
77	Improved land in enterprises reporting—									
78	Hay as principal crop on drained land.....	acres..	4,068	1,575	20,054			865	1,570	150
79	Corn as principal crop on drained land.....	acres..		2,887		39,713	5,372			411
80	Small grains as principal crop on drained land.....	acres..			1,080				1,400	
81	Vegetables as principal crop on drained land.....	acres..						239		
82	Other crops as principal ones on drained land.....	acres..	1,400		600	7,532				
83	Not reporting principal crop on drained land.....	acres..								

<sup>1</sup> When works under construction have been completed.<sup>2</sup> Per cent not shown when more than 1,000.

DRAINAGE—WISCONSIN.

COUNTY TABLE II.—OPERATING DRAINAGE ENTERPRISES: 1920—Continued.

		Trem- pealeau.	Wal- worth.	Washing- ton.	Wauke- sha.	Wau- shara.	Winne- bago.	Wood.	Other counties. <sup>1</sup>	
<b>LAND AREA.</b>										
1	Approximate land area of the county.....	acres	478,720	358,400	275,840	351,360	413,440	293,700	517,700	5,087,360
2	All land in operating drainage enterprises.....	acres	4,301	8,910	4,500	7,848	7,240	6,246	64,343	20,209
3	Improved land.....	acres	430	4,048	330	4,757	456	3,710	18,911	10,410
4	Per cent of all improved land in farms.....		0.2	1.7	0.2	2.1	0.2	2.0	13.8	0.5
5	Timber and cut-over land.....	acres	2,581		2,825	419	100		4,536	1,833
6	Other unimproved land.....	acres	1,290	4,862	1,345	2,672	6,594	2,536	40,896	7,966
7	Swampy or subject to overflow, in enterprises.....	acres				501	794			3,199
8	Suffering loss of crops from defective drainage.....	acres				288	57			430
9	Assessed acreage.....		4,301	8,910	4,500	7,848	7,240	6,246	64,343	20,209
10	Excess over all land in enterprises.....	acres								
<b>DRAINAGE WORKS.</b>										
11	Open ditches:									
12	Completed.....	miles	7.3	23.3	20.5	35.1	16.9	10.0	137.0	85.2
13	Additional under construction.....	miles								
14	Maximum completed in any enterprise.....	miles	7.3	11.2	7.5	10.0	9.0	6.0	47.0	15.0
15	Maximum width at bottom of ditch.....	feet	30	20	25	20	16	10	60	30
16	Maximum of average depths of outlet ditches.....	feet	6.0	9.0	8.0	8.0	8.0	7.0	10.0	10.0
17	Mean depth of branch ditches.....	feet	6.0	7.0	7.0	4.9	8.0		7.1	5.0
18	Tile drains:									
19	Completed.....	miles		7.5	0.5	5.0				
20	Additional under construction.....	miles								
21	Maximum completed in any enterprise.....	miles		6.0	0.5	5.0				
22	Maximum size of tile.....	inches		14	8	10				
23	Accessory levees and dikes:									
24	Completed.....	miles	4.8						0.8	0.3
25	Additional under construction.....	miles								
26	Pumping plants:									
27	Engine capacity.....	horsepower								150
28	Pump capacity.....	gallons per minute	( <sup>3</sup> )							2,296
29	Area served by pumps.....	acres	4,301							
30	Area drained by open ditches only.....	acres		4,810	4,300	6,348	7,240	6,246	40,083	17,913
31	Length of these ditches.....	miles		14.7	19.5	28.1	16.9	10.0	90.0	83.2
32	Average length per acre.....	feet		16.1	23.9	20.0	12.3	8.5	9.5	24.5
33	Area having open ditches and levees.....	acres	4,301						14,360	2,296
34	Length of these ditches.....	miles	7.3						47.0	2.0
35	Average length per acre.....	feet	9.0						17.3	4.6
36	Length of the accessory levees.....	miles	4.8						0.8	0.3
37	Area drained by tile only.....	acres		280						
38	Length of these drains.....	miles		1.5						
39	Average length per acre.....	feet		28.3						
40	Area drained by open ditches and tile.....	acres		3,820	200	1,500				
41	Length of these drains.....	miles		14.6	1.5	15.0				
42	Average length per acre.....	feet		20.2	39.6	52.8				
43	Area having open ditches, tile drains, and levees.....	acres								
44	Length of these drains.....	miles								
45	Average length per acre.....	feet								
46	Length of the accessory levees.....	miles								
<b>DEVELOPMENT OF LAND.</b>										
47	Improved land, in operating enterprises, 1920.....	acres	430	4,048	330	4,757	456	3,710	18,911	10,410
48	Improved land prior to drainage.....	acres		130	40				200	1,410
49	Increase since drainage.....	acres	430	2,918	290	4,757	456	3,710	18,711	9,000
50	Per cent of increase.....				725.0					638.3
51	Per cent increase is of all improved land in farms, 1920.....		0.2	1.6	0.2	2.1	0.2	2.0	13.7	0.4
52	Timber and cut-over land, 1920.....	acres	2,581		2,825	419	100		4,536	1,833
53	Timber and cut-over land prior to drainage.....	acres	2,581		2,975	1,169	570		7,279	2,162
54	Decrease since drainage.....	acres			150	750	380		2,743	330
55	Per cent of decrease.....				5.0	64.2	66.7		37.7	15.3
56	Other unimproved land, 1920.....	acres	1,290	4,862	1,345	2,672	6,594	2,536	40,896	7,966
57	Other unimproved land prior to drainage.....	acres	1,720	8,780	1,485	6,679	6,670	6,246	56,864	16,630
58	Decrease since drainage.....	acres	430	3,918	140	4,007	76	3,710	15,968	8,670
59	Per cent of decrease.....		25.0	44.6	9.4	60.0	1.1	59.4	28.1	52.1
60	Swampy or subject to overflow, 1920.....	acres				501	794			3,199
61	Swampy or subject to overflow prior to drainage.....	acres	4,301	8,910	4,500	7,848	7,240	6,246	59,807	16,061
62	Decrease since drainage.....	acres	4,301	8,910	4,500	7,347	6,446	6,246	59,807	12,802
63	Per cent of decrease.....		100.0	100.0	100.0	93.6	89.0	100.0	100.0	80.1
<b>CAPITAL INVESTED AND COST PER ACRE.</b>										
64	Total capital invested in and required for completion of operating enterprises.....	dollars	50,000	63,465	64,500	44,835	27,000	20,400	394,200	143,463
65	Capital invested in these enterprises to Dec. 31, 1919.....	dollars	50,000	63,465	64,500	44,835	27,000	20,400	394,200	143,463
66	Additional capital required to complete these enterprises.....	dollars								
67	Average cost per acre when completed.....	dollars	11.63	7.12	14.33	5.71	3.73	3.27	6.13	7.10
68	Enterprises constructing open ditches only.....	dollars		33,560	59,500	27,835	27,000	20,400	250,700	118,463
69	Average cost per acre when completed.....	dollars		6.98	13.84	4.38	3.73	3.27	5.02	6.61
70	Enterprises constructing open ditches and levees.....	dollars	50,000						143,500	25,000
71	Average cost per acre when completed.....	dollars	11.63						9.99	10.80
72	Enterprises constructing tile drains only.....	dollars		4,905						
73	Average cost per acre when completed.....	dollars		17.52						
74	Enterprises constructing open ditches and tile drains.....	dollars		25,000	5,000	17,000				
75	Average cost per acre when completed.....	dollars		6.54	25.00	11.33				
76	Enterprises constructing open ditches, tile drains, and levees.....	dollars								
77	Average cost per acre when completed.....	dollars								
<b>CROPS.</b>										
78	Improved land in enterprises reporting—									
79	Hay as principal crop on drained land.....	acres	430			311	456	882	8,265	6,736
80	Corn as principal crop on drained land.....	acres		4,048	330	3,696		2,828		3,674
81	Small grains as principal crop on drained land.....	acres				750			5,026	
82	Vegetables as principal crop on drained land.....	acres							5,620	
83	Other crops as principal ones on drained land.....	acres								
84	Not reporting principal crop on drained land.....	acres								

<sup>1</sup> Includes only Barron, Brown, Buffalo, Burnett, Calumet, Green, Green Lake, Manitowoc, Marinette, Polk, and Waupaca counties. <sup>2</sup> When works under construction have been completed. <sup>3</sup> Pumping plant located in Buffalo County. <sup>4</sup> Per cent not shown when more than 1,000.