SOIL SURVEY OF ADAMS COUNTY, WISCONSIN.

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DESCRIPTION OF THE AREA.

Adams County is situated a little south of the center of the State of Wisconsin. It is bounded on the north by Wood and Portage Counties, on the east by Waushara and Marquette Counties, on the south by Columbia County, and on the west by Juneau County and the Wisconsin River. The county is elongated in shape, having a maximum length of 42 miles north and south and varying in width from 10 to 20 miles east and west. It comprises an area of 670 square miles, or 428,800 acres.

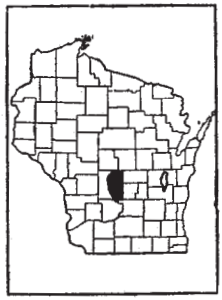

FIG. 33.—Sketch map showing location of the Adams County area, Wisconsin.

The general topography is that of a plain with sandstone mounds or buttes projecting above the general level. A strip 6 or 7 miles wide along the east side in the southern half of the county is generally rolling to hilly. A prominent feature in the southeastern corner of the county is the glacial moraine known as the "Divide." The land east of this is undulating to hilly and the streams flow east and southeast. West of the divide is an extensive level sandy plain interspersed with marshes and occasional sandstone mounds projecting from 100 to 300 feet above the plain.

The generally level surface of the plain is also interrupted by the narrow valleys of the streams which cross it and by a dunelike or hilly topography in parts of the survey, especially in certain sections of Ts. 19 and 20 N., Rs. 5 and 6 E., where the sandy soils have suffered wind erosion. Near the Wisconsin River, in the northwest corner, the level character of the plain is broken by several terraces with differences in elevation of 20 to 80 feet, their abrupt and steep slopes giving the impression of a range of hills. Bordering the Wisconsin River are level bottom lands, from one-half mile to 2 miles wide, which are subject to occasional overflow during the spring and fall floods. Sloughs, marshes, abandoned stream channels, and occasional lakes appear here, and numerous springs issuing from the edge of the highland feed small streams flowing across the bottom lands.

The highest elevations occur in the northern part of the county and the lowest in the southern. Railroad elevations at various places on the borders or within the county are as follows: Nekoosa (Wood County) 957 feet, Plainfield (Waushara County) 1,108 feet, Arkdale 919 feet, Adams 956 feet, Grandmarsh 1,010 feet, Brooks 954 feet, and Kilbourn (Columbia County) 893 feet.

Adams County is drained by the Wisconsin River, which borders the county on the west, and its tributaries, Fourteenmile Creek in the northern part, Roche a Cri and Little Roche a Cri Creeks in the central part and White and Neenah Creeks in the southern and eastern parts. These streams have a rapid flow and drain the western and southern parts of the county quite thoroughly. The largest areas of undrained land are in the northeast corner of the county and back of the moraine along the east side. The stream valleys are shallow, being only slight depressions in the eastern and central parts, but having 30 to 50 foot banks in the western part along the river. Water power is developed on the Wisconsin River at Nekoosa in Wood County on the north, and at Kilbourn in Columbia County on the south. Feed mills and power plants are located on some of the tributary streams at Friendship, White Creek, Easton, Arkdale, and New Rome.

Adams County was organized in 1858 from a part of Portage County. The first settlement was a post called Walsworth Tavern, located 2 miles from Big Spring. Land was first farmed in 1844 and 1845, and Friendship was settled in 1856. Most of the present inhabitants are descendants of the early settlers who came from eastern States. People of Irish, Norwegian, and German descent are found in various parts of the county. A settlement of Bohemians is located in the northwestern part of the county, in Rome Township. The county is most thickly populated along the eastern edge and in the southwestern corner, and in the western part bordering the river, in the regions of the better soils. Large areas in the interior are practically undeveloped and very sparsely settled. According to the 1920 census this county has a population of 9,287. Friendship, the county seat, had a population in 1920 of 442, and Adams, a new town on the Chicago & North Western Railway, 1 mile south of Friendship, a population of 1,119. Other small inland towns having a population of 100 or less are Plainville, Easton, White Creek, Arkdale, Monroe Center, and Davis Corner. Grandmarsh and Brooks are small railroad towns in the eastern part of the county.

Adams County has but one railroad line, the so-called short line of the Chicago & North Western Railway between Milwaukee and La Crosse. This line crosses the southern half of the county in a northwest-southeast direction. The county is in the main well supplied with roads, even in the most undeveloped sections, the sands and clays of the region being freely used for road building. The roads of the State trunk highway system which cross parts of the county are kept in first-class condition.

Telephone service is maintained in nearly all the developed sections of the county.

Before the building of the railroad a few years ago, all the products of Adams County were marketed through towns in adjoining counties. Dairy products and stock are shipped from Kilbourn, Necedah, Adams, Grandmarsh, Brooks, and Hancock. Potatoes are shipped from Arkdale, Kilbourn, and Necedah. Most of the grain and hay is fed to stock and but little grain except rye is shipped.

CLIMATE.

The climate of Adams County is very similar to that reported by stations in the central part of the State. Although the county ex-

tends over 40 miles north and south, there is probably no great variation in the average growing season in the southern and northern extremes.

The average length of the growing season, between killing frosts, is 152 days as recorded at Hancock. Frosts occur on the peat marshes in the northern part more often than on the highland, but this is due largely to the character of the soil, rather than to any climatic difference. As a general rule it is found that killing frosts occur on the marshes of any region at about the same time as killing frosts occur 150 miles farther north on the upland.

The annual rainfall averages about 31 inches, the larger part of which occurs in the summer months during the growing season, when it does the most good; however, crops occasionally suffer from lack of moisture during dry seasons, especially on the sandy soils.

The table below gives the more important climatic data recorded by the Weather Bureau station at Hancock, located in Waushara County, a few miles from the eastern boundary of Adams County and within the extensive area of level land which covers most of Adams County.

Normal monthly, seasonal, and annual temperature and precipitation at Hancock, Waushara County.

(Elevation, 1,086 feet.)

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1895).	Total amount for the wettest year (1911).
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
December	20.1	54	−31	1.24	1.75	1.95
January	14.5	53	−36	1.26	1.40	.65
February	16.0	53	−35	1.19	1.20	2.25
Winter	16.9	54	−36	3.69	4.35	4.85
March	30.1	83	−30	1.73	.50	1.38
April	45.1	86	7	2.65	.97	1.23
May	56.7	93	21	4.48	1.83	7.40
Spring	44.0	93	−30	8.86	3.30	10.01
June	66.7	102	31	4.42	1.44	7.12
July	71.7	103	44	3.70	1.76	3.13
August	68.8	100	33	3.28	3.37	3.81
Summer	69.1	103	31	11.40	6.57	14.06
September	61.0	97	20	3.53	1.44	5.81
October	48.7	84	14	2.50	.40	6.89
November	33.4	69	−10	1.51	1.73	2.54
Fall	47.7	97	−10	7.54	3.57	15.24
Year	46.1	103	−36	31.49	17.79	44.16

AGRICULTURE.

Adams County was originally forested, but agriculture early made its way up along the Wisconsin River in the wake of the lumbermen, many of whom worked in the camps and on the river in winter and on their farms in summer. The first record of farming in Adams

County dates back to 1844, when settlers located in the southeastern part, which was probably the best white-pine timber section of the county. The chief crops then, as now, were corn, rye, buckwheat, and hay. Previously to 1880 wheat was an important crop on the heavier soils, and about 1860 there was a considerable acreage in hops.

At present (1920) the greatest number of farms are in the towns[1] of New Haven, Jackson, Springville, Dell Prairie, and Strongs Prairie, along the river and in the southern part of the county. The greatest number of silos and the largest acreages of corn, barley, and oats are found in these towns also. The largest acreages of rye are grown in Lincoln, Springville, New Chester, and Jackson Towns, and of potatoes in Strongs Prairie, Leola, Colburn, and Richfield Towns. The largest acreages of new land brought under cultivation in 1919 are the towns of Jackson, Rome, Preston, and Quincy.

The present agriculture of the county consists chiefly of dairy farming and the production of special crops for sale. In certain sections where hay and pasture are less abundant, the special crops take the leading place. Potatoes and rye are the main cash crops, some of the farmers buying feed to supplement their corn and hay with the proceeds from the sale of these crops.

Cream and butter are the chief dairy products sold. Creameries located at Kilbourn, Briggsville, Friendship, Hancock, Plainville, White Creek, Easton, Davis Corner, Brooks, Grandmarsh, Quincy, Arkdale, Monroe Center, and Grand Rapids obtain all or part of their cream in Adams County. In many localities the cream is collected by trucks at a fixed price per can of 100 pounds. According to the census there were 8,223 milk cows and 7,118 other cattle in Adams County in January, 1920, and the receipts from sale of dairy products in 1919 totaled $392,797.

The following table, compiled by the Wisconsin Department of Agriculture, comparing the milk production in Adams and Waukesha Counties, shows that increased production and higher prices prevail in the latter, where better methods of soil improvement are practiced and where the percentage of purebred cattle is very high. However, allowance should be made for the difference in the soils of the two counties, which is reflected in the production of general farm crops and in practically all farm operations, and for the better markets for the Waukesha County products.

Milk production in Adams and Waukesha Counties, Wis., 1919.

Item.	Adams County.	Waukesha County.
Average number of days cows milked in 1919	288	.....
Average daily production per cow in 1919, pounds	15.4	20.3
Average price received for milk, per 100 pounds	$2.61	$3.18
Return per cow per year	$115.75	$193.82

The census reports 6,422 hogs, 5,479 horses and mules, and 1,359 sheep in the county in January, 1920.

Of the farm crops, the cereals have the greatest acreage and value. Rye leads with 39,827 acres in 1919; corn follows with 21,332 acres,

[1] The word "town" as used in this report is synonomous with township.

oats with 8,850 acres, buckwheat with 1,566 acres, wheat with 1,532 acres, and barley with 835 acres. The total value of cereal crops is given as $1,397,444.

Of the hay and forage crops, wild grasses occupied 12,301 acres, and tame grasses 10,667 acres. The leading wild grass is a more or less coarse variety of marsh grass cut in the late summer and fall on the extensive peat marshes. Although this hay has a low feeding value, it is highly prized by sandy-land farmers for winter feed for young stock and horses and for mixing with better feeds for cattle, and some go as far as 10 to 15 miles to cut and haul the marsh hay. Wire grass, another variety, is extensively cut and sold for grass-rug manufacture.

The acreage in potatoes, the only special crop reported, decreased from 8,286 acres in 1909 to 6,244 acres in 1919. This reduction is due in part to the increasing difficulty in getting laborers to do the large amount of hand work necessary with this crop. The potatoes are marketed mainly through storehouses at Holmsville, Necedah, Grandmarsh, Hancock, and Kilbourn. Cucumbers are grown to a small extent and pickled at Brooks and Kilbourn.

Apples are the most common orchard crop, 7,909 trees of bearing age being reported. Most of these are grown in the southeastern part of the county, where the soils containing more or less calcareous red clay seem to be best adapted to fruits, especially apples. Grapes and strawberries are produced in small quantities.

The adaptation of soils to certain crops is recognized. The loams and silt loams of the Superior and Union series which have a large water-holding capacity are found to produce the best pasture and hay, as well as better crops of grain and corn, and the most highly developed general and dairy farms are located on these soils.

Dairy farming is much hampered on the sandy soils by lack of good permanent pasture and hay land. This is partly overcome where the sandy farm includes some marsh or lowland, which supplies pasture when the sandy pastures become dry in early summer. Rye and corn, and potatoes to some extent, are grown on the sandy soils, and buckwheat on the lower lying marsh-border soils. Some of the best potato lands in Strongs Prairie Town consist of sand to fine sandy loam surface soils underlain by a layer of clay at depths of 10 to 36 inches.

Modern machinery and equipment are in common use on all the better farms. Horse-drawn planters, diggers, and sprayers are used in the potato sections. Many of the remote and sandy farms are poorly equipped, and the stock is of inferior quality. There are only 281 silos, and these are found mainly in the sections of better soils.

Many abandoned farmsteads are found in the remoter and more sandy parts of the county. In some towns as many as 20 to 30 such farms were noted, in addition to many separate fields which were formerly cultivated but which now lie idle. It is estimated that 15 per cent of the farms have been abandoned.

According to the census of 1920 there are 1,557 farms in the county, with an average size of 195.6 acres, nearly one-half of which is classed as improved land. The number of farms has decreased at the rate of 12 to 16 farms per year in the last 20 years. Some of these have been consolidated with other holdings. The average size of the farms has increased from 151 acres in 1890 to 195.6 acres in 1920. Farms

vary in size from 40 to 300 acres or more. The average value of all property per farm in 1919 is given as $8,310.

The farmers on the heavy soil types favor a four-year rotation consisting of clover, hay, corn or potatoes, and grain. On sandy-land farms a three-year rotation of corn, rye, and clover, or clover, corn, and potatoes is more often used. A five-year rotation that includes one or more of these crops twice or introduces one or two years of fallowing, is occasionally used.

The run-down sandy farms seldom receive manure and but little clover is grown, the crops including rye, corn, and buckwheat, with intervals of fallowing or idleness.

On sandy land rye is quite commonly seeded at the last cultivation of the corn or among the shocks, and then fall pastured. This method has the advantage of protecting the soil, preventing blowing, and keeping the soil more compact than where more plowing and harrowing are done.

Stable manure is the most common fertilizer used, and since many sandy farms do not support more than 3 to 10 head of stock, the supply is never sufficient. Rye and clover are sometimes plowed under, but green manuring is not at all common. Commercial fertilizers and lime have been used in a few cases in an experimental way only.

Farm labor is scarce and the wages are high, so that generally the farmer depends on the members of his own household or his neighbors for extra help. The farm labor is nearly all local in character, and the prices paid are so variable that no average can be given.

About four-fifths of the farms are operated by owners. Some of the more sandy farms are rented, the rental being $1 to $1.25 an acre cash, or, on the better sandy farms, one-third of the crop. The selling price of land varies greatly with its location and the kind of soil. The better farms sell for $100 to $125 an acre. Remote sandy land sells as low as $10 or $15, while well-kept and well-situated sandy farms may bring $25 to $40 an acre.

SOILS.[2]

The soil-forming material in Adams County is prevailingly of a light sandy nature. In the southeastern part of the county are some heavy materials consisting of an unassorted mass of clay, silt, sand, and stone fragments, or what is termed geologically as bowlder clay, and in the same section are some heavy sediments which consist of a pinkish clay. Associated with these heavier deposits and in the morainic ridge a little westward the material to a great depth is sand, fine to medium in texture, and carrying some stones and gravel, mostly of crystalline rocks. West of the moraine is a vast sand plain interrupted only by occasional sandstone mounds or ridges, some terraces, and the alluvial plain along the Wisconsin River. This large plain is a part of the bed of the old glacial Lake Wisconsin. Some of the sediments deposited in this old lake are of a heavy nature, like the pinkish clay referred to above, but these are

[2] Adams County adjoins Wood and Portage Counties on the north and Columbia County on the south. Where the soil boundaries do not agree, the difference is due to changes in correlation and to a more detailed mapping of the soils in Adams County. The Plainfield sand, eroded phase, in Wood County is mapped as Plainfield sand, rolling phase, in Adams County, and the Whitman sand of Wood County becomes Granby sand in Adams County. Where differences occur along the Columbia County line, the type mapped in Adams County represents practically the same soil as mapped in abutting areas across the line.

exposed only in a few places, and evidence is lacking to show that they are continuous under any extensive areas.

While the entire county has for its local rock formation a sandstone of massive to shaly structure, this has had only an indirect influence on the soils, except in the mounds and ridges, where it projects through the plain and in exposures at lower levels along the Wisconsin River, resulting from erosion. Here the soils are residual or very largely residual from the underlying rock. The sand of the plains and terraces no doubt is very largely of sandstone origin, but a considerable proportion also came from crystalline rocks such as occur farther north. This is shown in the gravel content, which consists almost altogether of crystalline material. The sandy till also is almost altogether from sandstone and crystalline rocks, while the heavier till or bowlder clay and heavy lake clays are of a more complex origin, with medium to strong limestone influence. The pinkish or reddish cast of the lake clays apparently was imparted by highly ferruginous material transported from the Lake Superior region.

The soils that have developed from these various classes of material may be divided into four main groups: (1) Those of light color, developed under forest cover where fair to good drainage has become established; (2) those of dark color, developed under prairie conditions, with good drainage; (3) those of dark color, developed in low-lying, wet, forested and semimarshy areas; and (4) those of dark-brown to black color, derived from decaying vegetable remains, ordinarily classed as Peat and Muck.

The light-colored soils are by far the most extensive. They include all of the better drained sand plains and terraces (other than a few scattering areas developed under a condition of open prairie), the residual sandstone areas, the sandy morainic areas, the higher lying areas of the heavier till and lake sediments, and the better drained portions of the overflow plains along the Wisconsin River.

The characteristic profile of the light-colored sandy soils consists of a thin surface layer of leaf mold, an inch or more of a gray to dark-gray mixture of sand and organic matter, and below this a bright yellowish brown color which becomes gradually paler with depth and at about 2½ feet gives way to grayish material much less completely weathered. Areas under cultivation have a grayish-brown to brown surface soil.

The light-colored soils, developed from heavy till and lake sediments, have a dark-gray layer of an inch or more under the leaf mold, grading below into a dull-yellowish to gray mottled layer of about the same texture; this gives way to the subsoil proper, which in the till areas is of heavy, tough nature and yellowish-brown color, with some rusty iron streakings, and in the areas of lake sediments is a heavy pinkish-colored clay. The surface soil in cultivated fields has a brownish-gray color.

The material from which the heavy soils have been formed originally carried varying quantities of limestone material, such as is now found in the unweathered substratum, but through the agencies of weathering and leaching all free carbonates have been removed to a depth of 2 to 3 feet and the surface layer is in an acid condition. The sandier types also are deficient in lime, but the material as originally laid down did not contain any appreciable quantity of

limestone material and the climatic conditions under which they have developed have not favored the accumulation of carbonates near the surface.

The dark soils developed under prairie conditions have dark-brown surface soils and yellowish-brown subsoils, giving way to grayish sandy and gravelly deposits at depths of 2½ to 3 feet.

Where the drainage is poor but not of a distinctly marshy or swampy character, dark-brown to black soils, high in organic matter, and gray to bluish-gray and brown mottled subsoils have developed. In the marshes and swamps is an extensive development of Peat which ranges up to several feet in depth and is underlain by sand in most places. The black soils developed in poorly drained areas from the heavier lake sediments have not been completely leached of lime and the soil, if not carrying detectable quantities of free carbonates, is neutral to only slightly acid. The dark-colored sandy types, on the other hand, as well as the Peat bogs underlain by sand, are in an acid condition.

The alluvial plains along the Wisconsin River and the larger creeks, except in scattering small areas or swales where heavier deposits have accumulated, are made up of light sandy material, and the color ranges from brown as originally laid down to gray mottled with various shades of brown. Usually the more mottled areas lie farthest back from the streams, where a marshy condition exists, and the surface may consist of a thin layer of Muck or of a dark soil with a high content of organic matter.

Classified on the basis of difference in color and in character and arrangement of the different horizons in the 3-foot profile, the soils of the county are separated into a number of groups, or what are designated in the soil survey as soil series. The series are divided into soil types on the basis of difference in texture of the surface soils.

The residual sandstone soils are classed in two series—the Boone series, in which the subsoils are as light as the surface soils in texture, and the Union series, in which the subsoils are somewhat heavier and more compact than the surface soils. The light sandy soils of the glacial moraines and till plains belong to the Coloma series, and those of heavier texture to the Miami series. The light-colored soils of the sand plains are classed in the Plainfield series, and those of dark color developed under prairie conditions in the Waukesha series. The dark-colored poorly drained soils associated with the Waukesha and Plainfield soils are of the Granby series. The light-colored soils with heavy pink clay subsoils are classed in the Superior series, while those of similar origin with poor drainage and dark color belong in the Poygan series. The overflow plains are characterized by two distinct kinds of soil, one fairly well drained and the other marshy; these are grouped in the Genesee series. In any other State than Wisconsin the brown alluvium would be classed in the Ondawa series and the dark marshy areas in the Podunk series.

The types of the Boone series have light-brown or grayish-brown surface soils grading into a yellowish-brown subsoil. They are of a light sandy nature with little change in texture from the surface downward. Some sandstone fragments occur locally on the surface and through the soil section, and unweathered sandstone occurs at varying depths below the surface. The topography is undulating to

rolling and broken. Three members of the series are mapped—the sand, fine sand, and fine sandy loam, the fine sand being shown on the map as a phase of the sand.

The Union series as mapped in Adams County includes soils having a smooth silty texture and color characteristics similar to those of the Boone series. The more rolling areas have shaly sandstone fragments on the surface and through the soil section, and there seems to be no doubt that the material is residual from the underlying sandstone. The smooth areas are practically free of stone fragments of any kind, and the characteristic smoothness of the material suggests that it may have accumulated by wind action. The silt loam with a smooth phase is the only type mapped.

The Coloma series includes soils that in cultivated fields are grayish brown to brown, or, in virgin areas, gray to dark gray in the surface inch or two and yellowish brown beneath, resting upon a yellowish-brown light-textured subsoil. Gravel and stones are carried on the surface and in the soil section and through the sandy till which forms the substratum. The topography is undulating to strongly rolling and rough. The sand, fine sand, and fine sandy loam are mapped, the latter with two phases. The smooth phase represents an intermediate condition between the typical Coloma and the Miami soils.

The surface soils in the Miami series are brownish gray where cultivated, or dark gray to a depth of an inch or more and brownish yellow or light brown beneath in the virgin condition. The subsoil is a dull yellowish brown, which may show slight mottlings with gray, and rusty iron streakings. It is rather heavy in texture and compact in structure to a depth of 30 to 36 inches, changing below to more friable calcareous material. The surface is gently undulating to rolling and the natural drainage is fairly good. The silt loam is mapped.

In the types of the Plainfield series the surface soils are grayish brown to brown in cultivated fields and gray to dark gray in the surface inch or two and yellowish brown beneath in virgin areas. The subsoil is yellowish brown, with a texture like the surface soils, and grades into grayish sand or sandy and gravelly material at depths of 2½ to 3 feet. The topography is level to slightly uneven, except in areas modified by wind action, where the surface may be strongly undulating. The sand and fine sand, with a rolling phase of each, the sandy loam, and fine sandy loam members are mapped, the Plainfield sand being the most extensive type in the county.

The surface soils of the Superior series have about the same coloration as those of the Miami series. The upper subsoil is yellowish brown to pale yellowish with some gray mottlings, ranging from sandy in the light members to rather heavy in the heavier members, and the lower subsoil is a pinkish or reddish heavy silty clay, which is calcareous below depths of 2 feet. The topography is level to gently undulating and sloping. The series is represented by the sandy loam, fine sandy loam, silt loam, and silty clay loam types. The silty clay loam is shown on the map as a heavy phase of the silt loam.

The types of the Waukesha series have dark-brown surface soils, with a lighter brown to yellowish-brown subsoil not any heavier than the soils in texture, and resting upon unweathered sand and gravel at depths of 2½ to 3 feet. The surface is level or nearly so. The

types mapped are the sandy loam, fine sandy loam, and loam, the loam being shown as a heavy phase of the fine sandy loam.

The surface soils of the Poygan series are black, from a high content of organic matter, and rest upon a heavy clay subsoil, which ranges in color from bluish gray and yellow mottled to pinkish with some gray mottlings. The lower subsoil is calcareous, the same as that of the Superior soils. The Poygan soils occupy low-lying positions with poor drainage, in association with the Superior soils. Only the clay loam type is mapped in the present survey.

The Granby series includes types with black sandy surface soils and gray, yellow, and brown mottled subsoils, resting upon beds of sand or heavier material. The types are extensively developed through the sand plains, are flat in topography, and naturally poorly drained. The series is represented by the sand, fine sandy loam, and silt loam.

The Genesee series, as mapped, includes the recent alluvium along the streams. In the better drained areas the surface soil and subsoil are brown, while in marshy areas the surface layer of a few inches is dark and may be muck or peat, and the subsoil is grayish mottled with yellow and brown. Only the fine sandy loam is mapped.

The organic soils are all classed as Peat, the areas with a depth of 18 inches or less as a shallow phase, and those where the depth is more than 36 inches as a deep phase.

The names and the actual and relative extent of the different soils are given in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Plainfield sand	168,256	44.7	Superior sandy loam	6,336	1.5
Rolling phase	23,552		Superior silt loam	4,352	1.3
Plainfield fine sand	37,056	10.8	Heavy phase	1,280	
Rolling phase	9,280		Plainfield fine sandy loam	4,544	1.1
Granby sand (Dunning)	30,592	9.2	Plainfield sandy loam	4,480	1.0
Mucky phase	9,152		Superior fine sandy loam	3,840	.9
Peat	16,704		Rough stony land	3,456	.8
Deep phase	11,776	7.8	Granby fine sandy loam (Dunning)	3,136	.7
Shallow phase	4,672		Waukesha fine sandy loam	2,304	.6
Coloma fine sand	29,120	6.8	Heavy phase	512	
Genesee fine sandy loam	16,640	3.9	Union silt loam (Knox)	448	.6
Boone sand	1,280	1.9	Smooth phase	2,048	
Fine phase	6,912		Poygan clay loam	1,920	.4
Coloma fine sandy loam	2,816		Miami silt loam	1,344	.3
Gravelly phase	576	1.9	Boone fine sandy loam	1,216	.3
Smooth phase	4,544		Granby silt loam (Dunning)	1,216	.3
Waukesha sandy loam	6,784	1.6			
Coloma sand	6,656	1.6	Total	428,800	

NOTE.—The names in parentheses are those used in the report published by the State.

BOONE SAND.

The Boone sand consists of a light-brown sand underlain by a yellowish-brown sand subsoil. The type occurs at the base of several of the sandstone mounds scattered over the county. The soil is largely residual from sandstone, but has been modified to some extent by wind, so that in agricultural value it differs but little from the rolling phase of the Plainfield sand.

The Boone sand is inextensive, and as it includes the slopes around the mounds very little of it has been cultivated. Most of the soil is covered with brush or with oak and jack pine.

The topography is undulating to rolling, and the soil is droughty, owing to its sandy character. Where the surface is not too rolling, rye and corn can be grown. The soil is not well adapted to pasture, hay, or small grains.

Boone sand, fine phase.—The Boone sand, fine phase, consists of grayish or light-brown fine sand passing into yellowish-brown fine sand at 6 to 8 inches. The subsoil, except for occasional sandstone fragments, is a uniform yellowish fine sand to a depth of 3 feet or more. The phase is developed in the vicinity of sandstone outcrops and mounds which have not been covered by the deposits of glacial Lake Wisconsin and the outwash from the margin of the glacier. This soil is mainly derived from the decomposition of the underlying rock, but in places it was difficult to decide whether the deeper fine sands were residual or lacustrine and wind-blown materials, and some such materials probably have been included.

The largest areas of this soil occur in the southwestern part of the county within a mile or two of the Wisconsin River, about the base of Rattlesnake Mound and Quincy Bluff in Quincy Town and on the flat-topped sandstone ridges in the northeast corner of Springville and the southeast corner of Easton Towns.

The surface varies from nearly level or gently undulating to rolling, the rolling topography being confined to the slopes surrounding some of the mounds. The phase has good surface and internal drainage, but owing to its open structure crops are likely to suffer for lack of moisture in dry seasons.

The fine phase is not extensive, occupying a total area of about 11 square miles. A large part has never been cleared, especially the undulating to rolling areas, which are covered with a thick growth of scrub oak, jack pine, or brush. The more level parts are cleared and cultivated or lie fallow. The main crops are rye, corn, and oats. Rye yields 6 to 10 bushels, corn 15 to 20 bushels, oats 20 bushels, and potatoes 50 to 100 bushels per acre. Clover does fairly well on new or manured fields, but it often dies out in winter or in the dry hot weather.

This soil requires careful farming to maintain its productiveness. Areas of the type bordering the river are closely associated with the better soils; these areas are farmed better, give larger yields, and are held at higher prices than elsewhere. The selling price ranges from $50 to $100 an acre north of Kilbourn, while in the remoter area in the southeastern corner of Easton Town prices range from $20 to $35 an acre.

BOONE FINE SANDY LOAM.

The surface soil of the Boone fine sandy loam consists of a brown to grayish-brown fine sandy loam, 8 to 10 inches deep, underlain by yellowish-brown light fine sandy loam, which grades into yellowish fine sand in the deeper subsoil. The fine sandy loam occupies an intermediate position between the fine phase of the Boone sand and the Union silt loam.

The type is confined to the southwestern part of the county. It has a generally undulating to rolling topography and includes ridges and slopes.

The area in sections 30 and 31, T. 15 N., R 6 E., constitutes a variation. Here the surface is nearly level, the surface soil is slightly darker than typical, and the drainage is impeded to some extent by a subsoil layer of sticky mottled sandy clay loam overlying sandstone at 18 to 30 inches. Small sandy knolls and flat wet spots, with a considerable mixture of shaly sandstone slabs on the surface, occur locally. This area should properly have been mapped as Vesper fine sandy loam, as it corresponds to that soil as described in other counties, but owing to its small extent in this county it is included with the Boone soils.

Except in the variation noted, the Boone fine sandy loam is well drained. The type is practically all under cultivation, and fair yields of corn, oats, rye, hay, and potatoes are obtained.

UNION SILT LOAM (KNOX).

The Union silt loam consists of 7 to 9 inches of a grayish-brown friable silt loam, resting upon a yellowish-brown silt loam to light silty clay loam, which extends to a depth of 3 feet or more. Some small sandstone fragments occur on the surface and through the soil section and are rather abundant below 3 feet.

The type occurs in the southwestern part of the county. With its smooth phase it forms a more or less continuous strip along the Wisconsin River from White Creek southward for about 15 miles. Where the topography ranges from nearly level to very gently rolling the smooth phase is recognized, while the typical soil occupies the more strongly rolling areas and the steeper slopes along streams.

The drainage is good, and some areas are subject to erosion. For this reason and the fact that the soil is rather difficult to handle, a large proportion of the type has not been cleared, the forested areas supporting a growth of oak, poplar, and pine. Areas under cultivation are used principally in the production of oats, corn, and wheat. The yields and general agricultural conditions are not as good as on the smooth phase of the type, which is considered one of the most valuable soils in the county, but are better than on the light sandy soils.

Union silt loam, smooth phase.—The surface soil of the Union silt loam, smooth phase, consists of 7 or 8 inches of grayish-brown friable silt loam. The subsoil is a light yellowish brown compact silt loam, which changes to compact yellowish-brown silty clay loam at 30 to 36 inches. Usually in the level areas the heavy subsoil continues below 4 feet.

Although the surface is nearly level, the drainage of the phase is usually good.

The areas of this soil with sandstone and shale fragments on the surface are probably residual from the underlying formations, while in others the material may have accumulated through wind action. In section 13, T. 15 N., R. 5 E., the type lies only 10 to 15 feet above the river bottoms and may be of more directly alluvial origin, but owing to its small extent it is correlated with the smooth phase, as its agricultural character is the same. Some of the phase occupies level areas from 100 to 200 feet above the river.

The Union silt loam, smooth phase, while not extensive, is one of the best soils in the county. Oats are reported to yield 40 to 50 bushels, corn 30 to 50 bushels, and wheat 25 to 30 bushels per acre.

Pasturage is good, and alfalfa can be grown, with the application of lime. Dairying is practiced, and a few high-grade herds are maintained. Some smaller farms supply the hotels and summer resorts at The Dells with farm products.

Barnyard manure is the only fertilizer in general use, and, except for a few experiments with lime and phosphorus, commercial fertilizers have not been used. The better farms on this phase sell as high as $125 to $150 an acre.

COLOMA SAND.

The Coloma sand consists of a surface soil of brown to light-brown sand of medium texture, 7 or 8 inches deep, resting on a subsoil of brownish-yellow sand which becomes yellowish at 28 to 30 inches. A small quantity of gravel is scattered over the surface and mixed with the soil in places, and many small knolls and patches are very stony or gravelly.

The Coloma sand occurs in the southeastern part of the county east of the glacial moraine or divide. It has a total area of about 10 square miles. The topography in general is undulating to rolling, although in a few areas the surface is nearly level.

Portions of the more level land are cultivated, but the greater part of the type, including the rolling land, is covered with thick oak brush or larger scrub and red oak trees and is used for pasture.

Crops on this type are subject to drought in dry seasons, and the soil is shifted by winds on the rolling areas, so that yields are often very poor. On the more level land and where the soil is carefully farmed, the crops are equal to those on the Coloma fine sand in the same locality. Yields of 8 to 10 bushels of rye, 20 to 30 bushels of corn, one-half ton of clover, and 50 to 100 bushels of potatoes per acre are reported.

COLOMA FINE SAND.

The Coloma fine sand consists of 8 to 10 inches of brown fine sand over a subsoil of yellowish-brown fine sand, which contains some gravel below 24 to 30 inches. The deeper subsoil is generally yellowish fine sand, though white or reddish bands may occur.

The Coloma fine sand occupies the greater part of the glaciated region in the southeastern part of the county, or a total area of over 45 square miles. The topography is generally undulating to rolling, with small areas which are hilly and others nearly level. Owing to its sandy character and undulating surface, this soil is always well drained, and in dry seasons crops suffer for want of sufficient moisture.

While a considerable part of this soil is cultivated, a large part is still in forest of oak, with scattered jack pine or oak brush, or lies as fallow or abandoned fields. A larger proportion of the soil is cultivated in the southeast corner of the county, where heavier soils are associated with the fine sand, than farther north where the fine sand occurs in larger bodies.

Rye and corn are the chief crops. Potatoes are grown on a number of farms. Clover and oats are also grown on the better farms. Yields of rye range from 6 to 18 bushels, averaging about 13 bushels; oats yield 15 to 30 bushels, corn 11 to 30 bushels, and potatoes 80 to 100 bushels per acre. There is considerable variation in the crops

and buildings on this soil, due largely to the difference in farm practices and in part to slight variations in the value of the soil itself. The presence of large bowlders scattered over the land or large oak trees with but few jack pines are often indications of slightly better moisture and fertility conditions than the average on this type.

Some of the farmers carry on general farming, with but little clover and 2 or 3 cows, while others are able by better methods to have 10 or more cows on the same area of land. There is never enough manure produced, so that it should be carefully conserved and applied, and clover should be grown in the rotation. A silo greatly increases the value of the corn crop for winter feed, as compared with the too common practice of feeding from the shocks, which sometimes stand in the field until spring.

The selling price of land of the Coloma fine sand ranges from $15 to $50 an acre, depending upon location, improvements, and condition of the land. Undeveloped land may be had for less, while the average partly developed farm brings about $20 to $25 an acre.

COLOMA FINE SANDY LOAM.

The Coloma fine sandy loam is a grayish-brown fine sandy loam, 8 to 10 inches deep, resting upon a yellowish-brown fine sandy loam to loam. The loamy subsoil may continue to a depth of 3 feet or more or give way in the lower section to sand. The type includes rolling ridges, slopes, and hills where the soil is shallow, gravelly, and often stony. While the topography and stoniness do not greatly hinder cultivation on much of the soil, a large part of it is in forest of oak, hickory, elm, poplar, and a few birch and maple, and used for pasture and woodlots. Some cultivated areas are more subject to erosion than the smooth phase of the type.

Crops and yields are much the same as on the smooth phase, although more rye and less corn are grown on the typical fine sandy loam and more of the type is in hay and pasture land.

Farms on this type in Ts. 14 and 15 N., R. 7 E., sell for $60 to $150 an acre, undeveloped land being held at the lower price and some of the better farms at or above the higher price.

Coloma fine sandy loam, gravelly phase.—The gravelly phase of the Coloma fine sandy loam includes the rough, hilly, or very gravelly and stony land in the glaciated southeastern section of the county. The soil is variable in character, including fine sand and fine sandy loam, the greater part being sandy. This land consists mainly of sharp knolls, gravel ridges, or steep stony slopes, valued only for the slight pasturage it affords. It occurs in association with some of the best soils of the county, but owing to its sandy character it is subject to drought. Very little of the land can be cultivated. Most of it is covered with a growth of black and white oak and brush. The phase is inextensive and is valued principally for the small amount of pasturage it affords.

Coloma fine sandy loam, smooth phase.—The smooth phase of the Coloma fine sandy loam is a light-brown to grayish-brown fine sandy loam, 8 to 10 inches deep, overlying a yellowish-brown sticky loam or sandy clay loam. This heavy subsoil may change to a gravelly sandy loam or yellowish sand at 24 to 40 inches or may extend below the reach of a 4-foot auger. Scattered bowlders are found on the surface.

This phase occurs in the southeastern part of the county. The topography is gently undulating to nearly level, and many areas occupy gentle slopes or saucer-shaped flats. The soil is generally well drained.

Most of this phase is cultivated and highly developed farm land. The forested areas support a growth of large white and black oak, with some poplar, birch, and elm, or brush.

The main crops grown are hay, small grains, corn, and some potatoes and wheat. Potatoes yield 100 to 150 bushels, rye 15 to 20 bushels, corn 35 to 40 bushels, oats 40 to 50 bushels, and barley 30 to 40 bushels per acre. Dairying and general farming are practiced. Milk, cream, potatoes, and some grain are sold in Kilbourn and Briggsville. Most of the corn and grain are fed on the farms, and a number of hogs and young stock are fattened for market. Timothy and clover do well and pastures can be easily maintained.

MIAMI SILT LOAM.

The Miami silt loam is a light-brown or grayish friable silt loam 6 to 8 inches deep overlying a compact yellowish-brown silt loam containing some gravel. At 20 to 24 inches the subsoil becomes a dark yellowish-brown silty clay loam which grades into a gravelly sandy loam at 30 to 36 inches or below the reach of a 40-inch auger. Scattered bowlders and small stones are found on the surface.

Included with the type are small areas having a brown loam soil, resting upon a yellowish-brown loam which grades into a yellowish-brown clay loam at depths of 16 to 20 inches. These areas of loam occur in association with the Coloma fine sandy loam on slopes and in slightly depressed areas. The topography is gently undulating, with just sufficient surface variation to insure good drainage.

The typical silt loam occurs in one area lying mainly in secs. 28, 29, and 33, T. 14 N., R. 7 E., in the southeastern corner of the county.

This soil is formed of glacial till, and has been derived in part from the underlying sandstone, the granitic rocks of the north, and from limestone. There are a few limestone pebbles, and granitic gravel fragments in the soil in places, and the substratum carries considerable limestone material. The type shows varying degrees of acidity, but this condition is no more marked or uniform than in many places where Miami soils occur directly over limestone.

The Miami silt loam is practically all farmed and is valued highly. The original timber growth was heavy, consisting of large white oak, red oak, and black oak, and some hickory and maple. Dairying is practiced in this section, and the cream is sold in Kilbourn and Briggsville. Hay, corn, small grain, and potatoes are grown. Yields of 60 bushels of oats, 40 bushels of barley, 50 bushels of corn, and 150 bushels of potatoes per acre are reported. Improved farm land in this vicinity sells for $100 to $150 an acre.

PLAINFIELD SAND.

The Plainfield sand, to an average depth of 8 to 10 inches, consists of a loose sand of medium texture and brown color, containing only a small amount of organic matter. The subsoil grades from a brown sand in the upper part into a yellowish-brown sand below, and includes here and there gravelly layers at 24 to 30 inches. Normally

the substratum is sand or gravelly sand to depths of 6 feet or more, but a few small areas near Friendship have a heavy pinkish-red clay at depths of 4 to 6 feet.

The Plainfield sand is the most extensive soil in Adams County. Together with the marshy soils it occupies the great outwash plain extending from the moraine on the east nearly to the Wisconsin River on the west.

The surface of the typical Plainfield sand is in general level, with slight marshy depressions and occasional sandstone mounds or ridges. Owing to its sandy character and open gravelly subsoil, the type is somewhat droughty, and many crops suffer for lack of moisture during the growing season.

This soil, which is derived from a deposit composed mainly of sandstone material mixed with some material from granite, has been affected to a slight extent also by the limestone over which the ice passed to the eastward. Limestone cobblestones and gravel were at one time dug and burned for lime in parts of the moraine in eastern Adams County, and the outwash soils (Plainfield) bordering the moraine may be somewhat better than the average because of the presence of this limestone.

While this is the most extensive soil in the county, and therefore includes a greater number of farms than any other type, perhaps not more than one-tenth or one-eighth of its area is improved farm land. Large areas are forested, the growth including oak and jack pine trees and brush. There is also a considerable acreage of fallow and abandoned fields which were formerly under cultivation.

The most important crops grown are corn, rye, buckwheat, and potatoes. Clover does fairly well on new land and in wet seasons, but often the land is cropped continuously to rye and corn until yields are unprofitable, and after a period of idleness it is again cropped without growing clover or returning any plant food in the form of green manure or fertilizer. On some of the better farms, however, care is taken to keep up the supply of organic matter by growing clover once in three years; manure is carefully conserved and applied and a rotation of crops is followed. Shallow plowing and the substitution of harrowing or disking for deep plowing in order to keep the soil compact are also practiced. On such farms yields of 10 to 16 bushels of rye, 20 to 35 bushels of corn, and 1 to 1½ tons of clover or mixed hay per acre are obtained. Marsh or bottom land supply dry weather pasture and aid many in maintaining a herd of stock; others, by renting cheaply a large acreage of pasture in the vicinity, are enabled to maintain some degree of fertility on their own farms at the expense of the rented land. One head of stock for each 10 acres under cultivation is maintained on such farms. Perhaps on a majority of the sand farms not more than 3 to 5 head are kept, and on these farms crop failures are much more frequent and the yields in good years are smaller.

Some of the better farms sell for $25 to $35 an acre, but large acreages in the more remote and undeveloped sections can be had for $4 to $12 an acre. Occasionally a buyer unfamiliar with the conditions pays $50 to $60 or more an acre, but profitable farming is very difficult on this land with such a high capitalization.

Plainfield sand, rolling phase.—The Plainfield sand, rolling phase, includes all of the undulating to rolling areas in the Plainfield sand, such as the slopes bordering the stream valleys and drainage channels

and the lands where the wind has heaped the sand into dunes. In some places it includes lands partly or completely surrounded by marsh. The phase is considered more difficult to cultivate than the level land, probably because it is looser and more readily drifted and has a smaller content of organic matter than the level soil. Most of the phase is covered with brush or oak and jack pine. Its main use is for pasture or woodlots.

PLAINFIELD FINE SAND.

The Plainfield fine sand consists of a brown or light-brown fine sand, 6 to 9 inches deep, overlying a subsoil of yellowish-brown fine sand, which grades into yellow fine sand. Gravel occurs in the subsoil in places, but generally the type is free from gravel and stones.

The largest area occurs in the northwestern part of the county, extending north from Arkdale and Roche a Cri Creek and west nearly to the Wisconsin River.

Like the Plainfield sand, this soil was deposited by waters from the melting glacier and later modified by wind action. The surface is level or, in a few places, very gently undulating. The soil is well drained and in dry seasons is somewhat droughty. Owing mainly to its finer texture, the type has a somewhat better water-holding capacity than the Plainfield sand. Since this type is associated with small areas of better soils having heavier subsoils, probably a greater proportion of it is cultivated than of the Plainfield sand. Most of the farms are situated between and in the vicinity of Arkdale and Monroe Center. Probably over half of the type is undeveloped. In remoter sections large areas are forested with large jack pine or red and black oak.

The crops most generally grown include potatoes, rye, corn, oats, and hay. While dairying is the leading industry on most of the better farms on this soil, a considerable acreage of potatoes is grown as a special cash crop in the vicinity of Arkdale. The State census for 1919 shows that in Monroe and Strongs Prairie Towns, in which the Plainfield fine sand is the predominant soil, potatoes occupied 456 and 1,040 acres, respectively. In the latter town a larger part of this acreage is on heavier soil associated with the fine sand. In some places a sticky layer may be present in the subsoil beyond reach of a 4-foot auger; these areas give better yields, and where their development warrants are mapped separately as Plainfield fine sandy loam.

Yields of 80 to 125 bushels of potatoes, 15 to 30 bushels of oats, and 15 to 40 bushels of corn are reported. Crops suffer for lack of moisture in dry seasons, but yields are slightly higher and the fertility is somewhat easier to maintain than on the Plainfield sand.

Plainfield fine sand, rolling phase.—The rolling phase of the Plainfield fine sand includes all of this type where the surface is distinctly undulating to rolling in character. In Strongs Prairie Town it includes more or less parallel, narrow, wooded, irregular ridges 15 to 40 feet high, surrounded by level to flat areas of better soil, most of which is cultivated. Beginning 2 miles east of Monroe Center and extending to the northeast is a considerable area of uniformly undulating to rolling, medium to fine sand, covering about 12 or 15 square miles. The whole area has a dunelike character, and while most of it is covered with oak and jack pine or brush, portions on which

cultivation has been attempted show a marked tendency to revert to the active dune character unless very carefully handled.

There are quite a number of abandoned farms and clearings in this section, especially on the east side. On the north side of the large area in the northwestern part of the county is a group of farms called the Bohemian Settlement, where considerable farming is done on this phase. Rye, corn, and potatoes are the crops generally grown.

PLAINFIELD SANDY LOAM.

The Plainfield sandy loam varies considerably in texture. The surface soil ranges from a loamy sand or sand to a sandy loam and fine sandy loam within very short distances, but the subsoil below 4 to 10 inches is quite uniformly a medium loamy sand, locally including small quantities of gravel. The color is brown to light brown in the surface soil, changing to yellowish brown in the subsoil.

This type occupies a total area of about 7 square miles. It is confined to the vicinity of the Wisconsin River, where it occupies a part of the level terraces which appear to have been reworked after their first deposition by more recent overflows of the river.

The topography is practically level with an imperceptible slope to the west and south toward the river. Slight knolls and flats occur, the soil being somewhat heavier on the flats and sandier on the higher portions.

The type was originally forested with jack pine and oak trees or brush, and parts were semiprairie with open grassy areas and scattered oak trees.

The type is now mostly cleared, and is cultivated at intervals. Its productivity is variable, depending largely on the season and the care taken in handling the soil, which is so droughty that crops suffer in dry seasons. Some areas differ only slightly from the Plainfield sand, but the soil as a whole is more productive than the sand.

On some of the better farms corn yields 30 to 50 bushels, potatoes 80 to 125 bushels, rye 15 to 20 bushels, and oats 20 to 30 bushels per acre. Where the soil is manured and limed, fair yields of clover can be grown.

Although it is very difficult to maintain pastures, dairying is the leading industry, some of the farmers using the bottom lands along the river for pasture.

PLAINFIELD FINE SANDY LOAM.

The surface soil of the Plainfield fine sandy loam consists of a brown to grayish-brown fine sandy loam, 6 to 10 inches deep, overlying yellowish fine sand. In places a yellow, gray, or mottled sticky layer 2 to 6 inches thick occurs in the sandy subsoil at depths of 24 to 40 inches. In other places the lower part is a gravelly sand or sandy loam. Where the heavy layer is reddish clay, the soil is mapped as Superior fine sandy loam.

This type is not extensive. It is developed in the sandy plains, occupying narrow strips or flats, which as a rule are slightly depressed below the general level. These areas lie near the moraine on the eastern side of the county and along the Wisconsin River in various places in the terraces, where finer material has settled in slight depressions, in stagnant water, or along old slough channels. The fine sandy loam is usually well drained because of its generally open subsoil, although water stands on some of the lower spots in the spring.

Practically all the type is under cultivation. Rye, corn, potatoes, and hay are the principal crops grown. Corn yields 30 to 50 bushels, rye 15 bushels, potatoes 125 bushels, and clover 1½ tons per acre.

As the areas of this soil are not large, and very few farms are made up of this soil exclusively, no distinct type of farming has been developed. Dairying and general farming are practiced on most of these farms, and on a number of them potatoes are grown as a cash crop.

Crops appear better and the buildings are often of a better class where this soil predominates than on the Plainfield fine sand, with which much of this soil is associated. Land values are also somewhat higher, farms with a good proportion of this soil often selling for $40 to $50 or more an acre.

The advantage of this soil over the Plainfield sand and fine sand lies in the fact that it has a greater moisture-holding capacity. A better sod can be maintained on it, and larger yields of clover and hay can be obtained. It contains a greater percentage of silt and clay, and consequently has a better balanced supply of mineral plant food than the more sandy types. However, the soil may be easily run down and requires considerable care to keep it productive.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Plainfield fine sandy loam:

Mechanical analyses of Plainfield fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
313017	Soil, 0 to 7 inches.	0.9	17.4	15.5	36.2	8.8	16.5	4.7
313018	Subsoil, 7 to 40 inches.	1.6	16.2	15.7	38.9	8.1	14.3	5.3

SUPERIOR SANDY LOAM.

The Superior sandy loam consists of 8 to 10 inches of brown or grayish-brown sand or fine sand over yellowish-brown sand, with a compact, sticky, red or mottled clay subsoil at 24 to 30 inches below the surface. This clay subsoil extends below the reach of a 4-foot auger.

The Superior sandy loam is not very extensive, and occurs in scattered irregular areas mainly in Strongs Prairie and Monroe Towns. It occupies level to flat areas interspersed with low, winding, wooded, sandy ridges and knolls heaped up by the wind in the vicinity of Monroe Center, Arkdale, and Holmsville, and west and northwest of Friendship. A few small areas are also found near Easton to the south of Friendship.

This is one of the more desirable types of soil in the county. Although the surface is level, the drainage is generally good because of the open sandy surface soil. A few wet spots occur where the clay lies near the surface. The type is particularly suited to potatoes and oats because of its warmth, workability, and water-holding capacity. Corn, hay, clover, rye, and wheat also do well where the soil is properly farmed. Stock is more easily maintained and more manure is available where this soil composes the farms.

Yields of 125 to 200 bushels of potatoes, 40 to 50 bushels of corn, 40 to 50 bushels of oats, and 20 bushels of wheat per acre are reported.

The surrounding sandy soils, lacking the heavy subsoil, are subject to drought; the effect of the presence of the clay subsoil layer in the Superior soil is seen in the larger size of plants and the greener color of the foliage in fields on this type.

On some farms potatoes are not grown as extensively as formerly, because of decreased yields and the increasing difficulty in obtaining good stands of clover. On such farms, where not enough stock is kept, commercial fertilizers could be used to advantage. Small quantities have already been used on some farms.

SUPERIOR FINE SANDY LOAM.

The soil of the Superior fine sandy loam consists of 8 or 10 inches of grayish-brown fine sandy loam over yellowish-brown fine sandy loam or fine sand. Reddish-brown sticky loam, or very fine sandy loam with red clay beneath, occurs at depths of 24 to 36 inches. The red clay layer may be only a foot deep, and underlain by sandy layers and more clay, or may continue down for many feet, as shown by well records. In scattering small areas the surface soil is a grayish-brown sandy loam to loam, 6 to 8 inches deep, underlain by a pinkish heavy clay subsoil like the subsoil of the Superior silt loam.

The Superior fine sandy loam occurs in the southeastern part of the county and in Monroe and Strongs Prairie Towns. The topography is generally level or gently undulating, but in a few places it is rolling, although never sufficiently so to hinder cultivation. Drainage is usually adequate, except in a few flat areas in Strongs Prairie Town, where water stands on the surface for a time in the spring or after heavy rains.

While this type is inextensive and occurs in small strips or narrow irregular areas, it is considered a valuable soil because of its productiveness. Clover usually does well, except on a few wet spots, and very good yields of other crops are obtained. Corn yields 50 bushels, potatoes 150 to 200 bushels, and oats 40 to 60 bushels per acre.

Farms on which this soil predominates sell for $75 to $100 an acre, although the price may be lower, depending on the proportion of poorer soil included in the farm, its location, and improvements.

SUPERIOR SILT LOAM.

The Superior silt loam consists of grayish or yellowish-brown silt loam to silty clay loam, 8 to 16 inches deep, overlying pink or red, moderately calcareous heavy clay.

This type is developed chiefly in the southeastern part of the county, about Mason and Jordan Lakes. It has a nearly level to gently rolling topography. Much of it occurs on gently undulating slopes midway between the Coloma soils of the hills and knolls, and the level or low-lying Superior and Poygan clay soils of the lower slopes, stream margins, and flats. Owing to its undulating surface this type, despite its heavy subsoil, is generally well drained.

The Superior silt loam, although not extensive, is one of the best soils in the county. The greater part of it is under cultivation; the rest is in small wooded areas of oak, hickory, elm, and some maple and basswood. The chief crops grown are hay, clover, oats, corn, barley, and some wheat. Dairying is the prevailing type of farming. Yields of 50 to 60 bushels of corn, 40 to 50 bushels of oats, 25 to 30 bushels of wheat, and good yields of barley are reported. Red clover and alsike clover do particularly well.

This type on the whole is considered better for the production of small grains and hay than the adjacent Coloma fine sandy loam. It is an earlier soil and more easily worked than the heavy Superior and Poygan soils in the same locality. The better farm land brings $75 to $125 an acre.

Superior silt loam, heavy phase.—The soil mapped as a heavy phase of the Superior silt loam is a silty clay loam, but was combined with the Superior silt loam on account of its small extent. It consists of a grayish-brown silty clay loam, 2 to 4 inches deep overlying reddish silty clay loam, which passes into red clay at 8 or 9 inches. This red clay extends below 4 feet; some well records show it at depths of 16 to 50 feet or more.

The Superior silt loam, heavy phase, is inextensive. It occurs only in the southeastern corner of the county in New Haven Town, where it occupies level or flat to very gently sloping areas bordering Mason Lake and a number of the tributary streams and valleys. Because the topography is level or nearly so and the compact subsoil prevents the rapid downward movement of water, the drainage is deficient in many places. Numerous springs issue at the upper edges of the phase where it joins the more rolling land, and streams of fine spring water cross the farms in this vicinity.

A large part of the phase is used for pasture or is in forest. Its value for crops would be greatly increased by laying tile drains. However, in cultivated areas good crops of oats, red and alsike clover, timothy, wheat, barley, and corn are produced. Dairying and general farming are practiced. Yields of 2 tons of hay, 40 to 60 bushels of oats, 30 bushels of wheat, and 35 to 40 bushels of barley are reported on this soil. The flat areas are somewhat late and cold and do not produce as good corn, potatoes, or barley as the better drained land. Farms on this phase sell for $75 to $125 an acre.

WAUKESHA SANDY LOAM.

The surface soil of the Waukesha sandy loam consists of 12 to 14 inches of dark-brown sandy loam or loamy sand, over a subsoil of yellowish-brown or chocolate-brown loamy sand. The subsoil is a yellow sand below 24 to 30 inches and contains considerable fine gravel at depths of 20 to 36 inches.

The Waukesha sandy loam occurs in places on the outwash plains bordering the glacial moraine or divide in the eastern part of the county and on parts of the Wisconsin River terraces on the western border of the county in the towns of Quincy, Strongs Prairie, and Monroe. This is water-laid soil deposited during overflow or lakelike conditions produced by the advance of the glacial ice and its subsequent melting and recession.

The topography is level, with very little variation except where stream channels have cut across the terraces, making shallow draws or ravines.

Because of the open character of the subsoil and the sandy texture of the surface, this type is always well drained, and unless rains occur at regular intervals during the growing season, crops are likely to suffer from lack of moisture.

The Waukesha sandy loam occupies a total area of approximately 10 square miles. Most of it is cultivated, although parts lie fallow nearly every season, because not enough manure is produced to

maintain fertility, and profitable crops are often obtained only by fallowing the land. Very little of the type has timber on it, the original vegetation having been mainly grass, with scattered clumps of oak and jack pine. The most important crops are rye, corn, potatoes, and buckwheat.

Dairying is practiced by those farmers who have bottom land or marsh pasture land to supplement the pasturage of the drier land. Rye, potatoes, corn, and cream are the products sold. In Strongs Prairie Town potatoes were formerly grown even more extensively than at present. Potatoes are considered by the farmers as being hard on the soil and are grown mainly on the newer fields. Some of this land is badly run down and the organic matter has been so depleted that the soil has begun to drift. Lanes or hedges of jack pine have been planted for protection from wind on a few farms.

But little fertilizer except barnyard manure is used. Some farmers keep the land in sod about 2 years out of 5. Clover does fairly well and soy beans are grown on a number of farms. Rye yields 7 to 10 bushels, corn 25 to 40 bushels, potatoes 80 to 150 bushels, buckwheat 20 bushels, and oats, on new ground, 25 to 30 bushels per acre.

Farms on which this type occurs sell for $30 to $60 an acre.

In farming this soil the organic matter should be maintained by the frequent growing and plowing under of clover or soy beans. Effort should be made to prevent drifting so far as possible; the soil should be kept firm by rolling, and shallow and infrequent plowing; and seeding should be much thinner than on heavy soils for best results. The soil is acid and should be given liberal applications of lime before seeding to clover. Liming is doubtless the most important step in improving this type. Commercial fertilizer can also be used with profit. A 2–10–4 mixture is well suited to this soil, and 200 to 400 pounds per acre is the usual application, except on potatoes, where more should be used. Complete mixed fertilizers should be used until good stands of clover are obtained, after which the nitrogen may be omitted from the fertilizer and this element obtained through the clover plant.

WAUKESHA FINE SANDY LOAM.

The Waukesha fine sandy loam is a dark grayish brown to black fine sandy loam to loamy fine sand or sandy loam, 8 to 12 inches deep, underlain by yellowish-brown sandy loam, which grades into yellowish-brown sand, containing a scattering of gravel, at 16 to 30 inches. The deeper subsoil is either sandy or gravelly. The surface layer is variable in texture, ranging from loamy fine sand to sandy loam and heavy fine sandy loam within very short distances.

The Waukesha fine sandy loam occurs on the terraces and outwash areas in the southeastern and northwestern parts of the county, mainly in Dell Prairie and Strongs Prairie Towns. It is not an extensive soil, covering a total area of about 4 square miles.

The topography is level, with slight flats and knolls due to wind or water action. Because of the open subsoil, the drainage is generally good, although small flat spots occur on which water stands after heavy rains.

The Waukesha fine sandy loam is all under cultivation. The original vegetation was mainly prairie grass, but a few oaks now are present. The crops grown are mainly corn, rye, potatoes, clover,

and oats. Yields of 15 to 40 bushels of corn, 10 to 15 bushels of rye, 25 to 35 bushels of oats, and 80 to 140 bushels of potatoes per acre are reported.

This soil responds to good care. The content of organic matter should be maintained by frequent seeding to grass or clover. This also improves its water-holding capacity, which is important, as crops sometimes suffer for lack of moisture in dry seasons, especially where the soil is "run down." Farms on which this soil occurs sell for $25 to $75 an acre.

Waukesha fine sandy loam, heavy phase.—The Waukesha fine sandy loam, heavy phase, consists of 12 to 14 inches of dark-brown to black heavy loam over a subsoil of yellowish-brown or chocolate-brown heavy loam. This is underlain at 24 to 36 inches by a sandy gravelly loam which extends below 4 feet.

The phase is inextensive, the largest area of one-half square mile lying in Dell Prairie Town on a part of the outwash area west of the glacial moraine or divide. The topography is level, the soil occupying slight flats or depressions which receive the surface water from surrounding land. Despite this, the soil is fairly well drained owing to its open gravelly subsoil. This soil is fertile, giving good yields. Corn averages 40 to 50 bushels, oats 40 to 70 bushels, and barley 30 to 40 bushels per acre. Clover and timothy hay yield well.

POYGAN CLAY LOAM.

The Poygan clay loam to an average depth of 8 to 10 inches is a black clay or clay loam containing much organic matter. The subsoil is a bluish sticky clay, mottled at 18 to 20 inches. Gravelly, sandy, and mottled layers are found in the subsoil at 24 to 30 inches. The lower subsoil is calcareous.

The Poygan clay loam occupies level to very gently sloping, wet and undrained areas. It is used principally for pasture, although a few small areas are cultivated. Most of it is open grass sod or boggy land, with some brush, bordering streams or marshes. The type has a total area of about 3 square miles and occurs mainly in New Haven Town in the southeastern corner of the county.

With proper tile drainage or surface ditching this soil could be made highly productive, and good corn, hay, clover, and root crops could be grown.

GRANBY SAND (DUNNING).

The Granby sand, to a depth of 3 to 5 inches, is a black loamy sand or fine sand containing a large percentage of organic matter. The subsoil is a grayish or brownish sand which is mottled with reddish and yellow streaks at 20 to 24 inches, and is generally white or yellowish at 40 inches.

The Granby sand occupies low-lying marsh-border areas. It is generally open marsh-grass land, but in places is brushy or covered with a thick growth of alder, willow, poplar, and birch.

The soil is used largely for pasture or for cutting marsh hay. Where ditches have been installed, as in Leola Town, it is the first to be cultivated, since it occupies the higher borders of the marshes which are benefited by the lowering of the water table. In such places very fair crops of potatoes, rye, corn, buckwheat, and oats have been produced.

Because of its higher content of organic matter and better moisture conditions, this soil when drained has better crop possibilities than the surrounding upland Plainfield sand. The soil can nevertheless be impoverished in a short time, with consequent reduction in yields, as under cultivation the organic matter rapidly disappears unless care is taken to conserve it.

Granby sand, mucky phase.—The Granby sand, mucky phase, consists of 8 to 16 inches of black mucky sand or sandy loam overlying grayish or brown coarse sand. In most places a layer of 2 or 3 inches of black peaty muck overlies the surface as well. This soil differs from the typical Granby sand in the greater depth and loaminess of the dark surface layer overlying the coarse sand subsoil.

A variation of the phase consists of dark-brown to nearly black sandy loam or sand underlain by yellowish-red or mottled clay at 18 to 24 inches. The largest area of this variation, lying in secs. 28 and 33, T. 18 N., R. 5 E., is level to flat land, including grassy swales with patches of thick brush alternating with low islands of sandy soil which are cultivated or are covered with oak, poplar, jack pine, and white pine.

The Granby sand, mucky phase, is developed in fairly large areas, mainly in the northeastern part of the county. Most of the phase produces marsh grass and is used for hay and pasture. The brushy patches include alder, willow, poplar, and birch. Although small portions can be cultivated, most of the land is too wet without drainage for cultivated crops. Hay, oats, and corn are grown to a small extent.

Drainage is the first requirement in the improvement of this soil. With thorough drainage by tiles or ditches this soil would be capable of producing good yields of all crops grown in the vicinity, and would probably have a better moisture-holding capacity and more enduring fertility than the typical sand soil.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the typical Granby sand:

Mechanical analyses of Granby sand.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
313042	Soil, 0 to 4½ inches	4.5	50.7	24.4	12.8	1.1	4.3	2.2
313043	Subsoil, 4½ to 36 inches	2.1	51.2	30.6	12.9	0.2	1.2	1.9

GRANBY FINE SANDY LOAM (DUNNING).

The surface soil of the Granby fine sandy loam is a dark-brown to black fine sandy loam, with a depth of about 12 inches. In some places the texture varies from sandy loam to very fine sandy loam. The surface soil is rich in organic matter. The subsoil is a dark-brown to grayish-brown fine sandy loam to gritty sandy clay loam. Where the streaks or layers of clayey material are deepest, the subsoil is mottled with yellow or red. The texture of soil and subsoil is somewhat variable, but the average is a fine sandy loam and a somewhat heavier and deeper soil than the other Granby types.

The Granby fine sandy loam is not very extensive, and generally occurs in small patches. Like the other Granby types, it is low-lying,

wet land, useful only for pasture or the cutting of marsh hay. Parts of it are brushy, but most of the type is grass or open boggy land. A few places were noted where it is cultivated in dry seasons, but in general this soil, in common with the other Granby types, is too wet to cultivate. Drainage is the first step necessary in its improvement. When drained and improved, good yields of corn, potatoes, buckwheat, oats, rye, and hay are obtained.

GRANBY SILT LOAM (DUNNING).

The Granby silt loam, to a depth of 10 to 18 inches, is a dark-brown to black loam or silt loam containing much organic matter. In places the surface is mucky or peaty for a few inches. The subsoil is variable, but generally it is a dark-colored heavy silty clay loam, passing into grayish or bluish sandy clay loam, with rust-colored mottlings at 18 to 24 inches. Sandy or gravelly layers occur in the lower subsoil in places.

This type occurs in small patches in depressions and sags in the upland or in lowlands bordering streams and marshes. A few areas are sufficiently well drained to cultivate. The larger part of the type occurs as open grass marshes and brushy areas along some of the streams, and is distinguished on the map by marsh symbols. It includes some fairly large areas of open marsh in the Wisconsin River bottoms, where the soil is mainly dark silt loam and where considerable quantities of marsh hay are cut by farmers on the adjoining sandy terrace lands.

The chief value of the Granby silt loam is for pasture and marsh hay. The marshy areas along the river are subject to overflow, and consequently can not be easily drained, but some of the depressions in the higher land, if tiled and ditched, would doubtless be productive.

GENESEE FINE SANDY LOAM.

The Genesee fine sandy loam, includes the low-lying first bottoms bordering the Wisconsin River and the larger tributary creeks. Along the river where it is subject to periodic overflow the soil is mixed and variable. The type generally consists of about 8 inches of light yellowish brown or chocolate-colored fine sandy loam to loam overlying a loose, open, sandy or gravelly subsoil.

The type as mapped includes marshy areas subject to more frequent overflow, and large, semiopen grassy areas, which furnish very fair pasture. The forest consists of thick brush or large trees, including elm, birch, basswood, soft maple, and poplar.

Mapped with the type are slightly higher lying areas which are not subject to as frequent overflow, and which range from medium or fine sand to coarse and gravelly sand. Such areas are generally covered with a thick growth of jack pine or oak brush.

A few clearings have been made on some of the higher knolls and cultivation attempted, but nearly all have been abandoned because of the uncertainty of crops. Very little of the timber on the bottoms is of any commercial value except for fence posts and firewood.

The Genesee fine sandy loam is valued chiefly for the pasture it affords; a number of farmers on the adjoining terrace lands pasture their stock in inclosed areas or on the open bottoms. The type can not be protected from the river except at an expense probably not warranted by the quality of the soil, and it is unlikely that crops will be grown extensively on this soil for some time.

PEAT.

Peat is dark-brown to black organic soil derived from the decay of water-loving vegetation, such as grasses, moss, and sedges. The subsoil is sandy nearly everywhere in Adams County, except in a few Peat marshes occurring in New Haven and Strongs Prairie Towns, where red or blue clay is found. The depth of the surface deposit of Peat varies from a few inches to 10 feet or more. This soil was separated into three divisions on the basis of the depth of the Peat, the deposits of medium depth being mapped as typical Peat, and the shallow and deep deposits as shallow and deep phases of Peat.

In the Peat of medium depth the surface deposit varies from 18 inches to 3 feet. Except in the southeastern corner of the county, the subsoil is generally sandy. The medium Peat is widely distributed and rather extensive. The largest areas are in the towns of Leola, Colburn, Richfield, Adams, and Lincoln. Most of the marshes are open grass areas, on parts of which marsh hay or wire grass for grass-rug manufacture are cut. Part of the Peat is covered with thick alder and willow brush. Some of the marshes are used for pasture in the dry months of the summer, although most farms on the marsh border do not keep many head of stock because the upland soil is so sandy.

Peat, shallow phase.—In the areas of Peat, shallow phase, the dark-brown to black organic matter varies from 6 to 18 inches in depth. The subsoil is sand or fine sand; in places it contains a shallow, sticky layer. The shallow phase is generally black (sometimes mucky) and more fully decomposed than many of the deeper deposits. It is wet, flat land, used mainly for pasture. Marsh grass is cut on the open parts. The vegetation is partly grass and partly willow, alder brush, and a few tamaracks.

Peat, deep phase.—The deep phase consists of dark-brown to black spongy, fine-grained Peat, generally somewhat more decomposed and compact at about 2 feet than in the surface layer. This phase occupies the central parts of the larger and deeper marshes. The largest areas are in Leola and Colburn Towns. The areas in Leola Town are almost entirely open grasslands, while a large part of the Colburn areas are covered with thick brush.

The phase ranges from 3 to 15 feet in depth, averaging about 5 feet. The Leola marshes have been partly drained, outlet ditches having been installed on the section lines, as shown on the soil map.

At the present time not much of this deep Peat is cultivated, except the Leola marsh, the farming of which is confined largely to the border soils and shallower Peat. This is partly because the Peat is sometimes too wet without any lateral ditches, and partly because cultivated crops, especially corn, have been severely frozen some seasons. Marsh grass and wire grass are cut on parts of the phase, and in a few places a stand of tame grasses has been established which furnishes good pasture.

Potatoes, corn, buckwheat, rye, and soy beans are grown, but mostly on the shallower Peat or on small island areas of Granby and Plainfield soils. On the Leola marsh a number of farms are raising the ordinary farm crops, with varying degrees of success. No fertilizer except a little barnyard manure is used. More complete drainage and the use of commercial fertilizers are necessary to make this soil productive.

ROUGH STONY LAND.

Rough stony land includes all rock outcrops, steep sandstone mounds, steep stony slopes bordering the ravines tributary to the Wisconsin River, and all other land which is too rough and stony for cultivation. It includes steep wooded slopes that furnish some pasture, and such rocky and precipitous mounds and bluffs as Friendship Mound and Roche a Cri, whose steep sides are so sandy or stony that very little grass will grow. The tops of some of the larger mounds are wooded and have a covering of soil. Where the ridge top comprises but a few acres it is included with the Rough stony land, but where the acreage is larger the ridge-top area is separately mapped, as the flat-topped ridge in section 35, Easton Town, and section 11, Springville Town. Many of the mounds mapped as Rough stony land have jagged, saw-tooth tops of bare rock, without vegetation or soil covering of any kind, and have no agricultural value.

IMPROVEMENT OF SANDY SOILS.

Wisconsin has extensive areas of extremely sandy soil, which is generally considered as having a low agricultural value. Where this soil is farmed the yields are rather low, and in many sandy regions of the State abandoned farms are not uncommon. The low yields and abandoned farms are not entirely due to the low state of fertility but, in part at least, to the fact that few people are thoroughly familiar with the best methods of handling sandy soil.

The State has established several experimental tracts for the purpose of determining the best methods of improving sandy soil, and it has been found that by proper methods of cultivation, fertilization, and crop rotation, much of this sandy soil can be improved and farmed successfully. The capital invested is much less than on heavy soils, and owners of sandy farms can, therefore, afford to expend more for fertilizers, and compete with the owner of naturally more productive land in cost of production.

Inasmuch as over 90 per cent of the upland in Adams County is of a sandy nature, the question of farming sandy soils is one of very great importance in this region. From a number of chemical analyses that have been made, it is found that the supply of mineral plant-food elements in the Plainfield sand, for example, the most extensive type in Adams County, is low. The supply of phosphorus ranges from 500 to 800 pounds per acre. The supply of potassium averages about 25,000 pounds per acre, and the supply of nitrogen from 1,000 to 1,400 pounds per acre. These quantities are less than half the quantities often existing in many of the heavier soils of the State, such as the Miami silt loam. Some of the sandy loam types have a higher content of plant food, but all of the sandy lands are more or less deficient in the three important elements of plant food—nitrogen, phosphorus, and potash. The system of farming which should be followed, therefore, in the improvement of this land, must provide for supplying these elements in sufficient quantities to meet the demand of the growing crops.

The first step in the improvement of this soil is to increase the supply of organic matter through the growth of legumes, which obtain their nitrogen supply from the atmosphere. But before legumes can be grown with the greatest success, liming and inoculation of the soil are necessary. The growth of a good crop of mammoth clover or

soy beans through the use of lime and mineral fertilizers containing nitrogen, phosphorus, and potassium is the cheapest means of supplying this nitrogen and organic matter. In most cases the first legume crop should be plowed under as a green-manure crop.

Probably the best way to get clover started is to seed with a small grain. By using a light seeding of rye, disked or harrowed in and seeded to clover in the spring, a good stand can usually be obtained. The seed should be drilled in a little deeper than on heavy soils, and the drill should be followed by a corrugated roller, or if this is not practicable, by an ordinary roller, followed by a light harrow. When clover is seeded with a small grain in this way the growing grain helps to hold the soil in place and prevents blowing of the loose soil by the wind.

Careful experiments on very sandy soils show that the best crop rotation for this class of land consists of rye, clover, and corn. If the fertility is extremely low, it will be advisable to plow under the entire clover crop. If the fertility is fair, the first crop may be cut for hay and the second plowed under; or a four-year rotation, including corn, rye, clover, and soy beans or serradella for green manure may be practiced.

Although potatoes are extensively grown on extremely sandy soils, they are not as well adapted to the sand soils as to sandy loam types. It has been shown by field tests that the yield of corn, for example, can be more readily increased on very sandy soil than can the yield of potatoes. The potato on sandy soil responds less readily to methods of soil improvement than when grown on soils which contain somewhat more silt and clay. Since sandy loams, fine sands, and fine sandy loams are much better adapted to potato culture, it is advisable to reduce. where possible, the acreage of potatoes on sand soils.

By increasing the acreage in corn, it will be possible to put up enough silage so that it may be used for summer feeding, and less pasture will be necessary. This would be good practice, as the sand soils do not supply good natural grazing and are not well adapted to any of the tame grasses, and this system would make possible the keeping of more stock, thereby increasing the supply of manure.

The legumes which may be used in improving sandy soils are clover, soy beans, serradella, lupines, alfalfa, and vetch. Alfalfa can be grown successfully where the soil is limed, inoculated, and fertilized, but the yields are never as large as on the heavier soils. Special bulletins of the Wisconsin Agricultural Experiment Station on the growing of these crops should be consulted by those interested.

In the fertilization of sandy soils, it is, of course, desirable to use legumes to as great an extent as possible in supplying the nitrogen and organic matter, but while these are being started other sources of nitrogen must be used, and for this purpose mixed commercial fertilizers are important. Where the supply of phosphorus and potash is also low, a commercial fertilizer analyzing 2 per cent nitrogen, 10 per cent phosphorus, and 4 per cent potassium can be used with profit. A saving of $8 to $10 a ton can usually be made by buying the ingredients separately and mixing them as desired. Applications of 200 to 400 pounds per acre should be made on small grains and corn.

Experiments with Peat as a fertilizer for sandy land have given profitable returns where the Peat is in a partly dry condition and

easily obtained, but it must be supplemented with phosphate and potash fertilizers.

In the improvement of the sandy soils care should be used to prevent the sand from blowing, particularly where the supply of organic matter is low and the soil left exposed. Jack pines or other trees along the roadsides and fence lines afford considerable protection, but probably the most effective plan is to lay out in long narrow fields such lands as are subject to strong wind action and have strips planted with crops that cover the ground in the early spring, such as clover or rye, alternate with fields used for cultivated crops. A strip of fall rye sown around each field will be quite effective in preventing blowing.

Another important factor in the cultivation of sandy soil is the use of a roller. The corrugated roller is the best for this purpose. It should follow the seeding of small grain, and especially of clover, to get the soil in close contact with the seed as well as to stimulate the rise of moisture from below. If the ordinary roller is used it should be followed immediately by a harrow. This loosens the surface and forms a mulch which retards evaporation.

When the methods of soil improvement outlined above have been well established on the sandy lands of Adams County, and consistently followed from year to year, yields of from 45 to 50 bushels of corn, 2 tons of clover hay, 18 bushels of rye, and 15 bushels of soy beans per acre may be reasonably expected.

IMPROVEMENT OF PEAT SOILS.

One of the problems in the development of agriculture in Wisconsin is the improvement of marsh soils. With the exception of the unglaciated part of the State, nearly every county has from 10 to about 40 per cent of poorly drained land within its boundary. In Adams County there are over 75,000 acres which need drainage before the land can be farmed successfully. A considerable part of this land has been laid out in drainage districts, but comparatively little of it has been drained sufficiently or cropped long enough to determine its actual value. In the majority of cases only the main outlet ditches have been dug and the final system of lateral ditches and of tiles remains to be installed.

The actual value of marsh land depends on several factors. In the first place, the farmer whose land is largely upland and well drained can use a small amount of marsh land to better advantage than can the farmer whose land is essentially all marsh land. But probably the most important factor determining the value of marsh land will be the kind of crops that can be grown upon it. This depends on two things: First, the degree of drainage, and second, the danger from frost. Where only the main outlet and lateral ditches have been installed, hay crops in most cases are the only ones which can be safely grown, and the character of the hay will also depend a good deal on the character of the drainage. Where Peat land is underlain by sand, drainage by well-constructed and sufficiently deep ditches 40 to 80 rods apart will, in most cases, be adequate. Where the Peat soil is underlain by silt or clay, however, ditches not more than 20 rods apart will be necessary, and these must lower the water in the ditch to a point 4 to 5 feet below the surface during part of the

growing period. When tilled crops, such as corn, cabbage, or potatoes, or small grains are to be grown, the drainage must be more certain, and over the greater proportion of marsh land this will mean the installation of drainage systems in the form of open ditches supplemented by tile drains that are not more than 10 and sometimes not more than 5 rods apart on the average.

The cost of reclaiming and building up marsh land will, of course, depend largely on the thoroughness of the drainage system installed, but it will also vary with local conditions. Assuming a first valuation of from $10 to $20 an acre for the raw land, $10 for the main outlet ditch, and a cost of clearing and breaking of $10 to $15 an acre, the cost of marsh land fitted for growing tame hay will vary from $30 to $45 an acre. If the drainage is made sufficient for the growing of tilled crops, by tiling as above mentioned, the additional cost will run from $15 to $25 an acre, making a total cost in this case of $45 to $70 as the value of the land when brought to a productive condition, not including buildings and fences.

The question now is, what is its value in comparison with upland soil which has been cleared? It may be said that when fairly well decomposed Peat is thoroughly drained by tile or by lines of tile supplementing open ditches, and when the land is otherwise improved, it will have a value equal approximately to two-thirds the value of good clay loam or silt loam upland soil, when used for general farm crops.

Generally speaking, a killing frost is as likely to occur on marsh land at any given point as it is on upland soil having good air drainage about 150 miles farther north; in other words, frosts which will kill corn are likely to occur as early on the marshes of Adams County as on the upland regions in the northern part of the State. This means that corn, although a comparatively safe crop and adapted to the marsh lands of southern Wisconsin, is less certain in Adams County on marsh areas.

Another factor which must be considered in comparing marsh and upland soils is their fertility. Marsh lands are abundantly supplied with organic matter containing nitrogen, but are relatively low in phosphorus and potassium. Peat land frequently does not show a marked need for fertilizers containing phosphorus and potassium for a few years after being first broken, especially if it has been burned, but it will inevitably need these elements later. In estimating the cost of farming on marsh and upland soils, therefore, the farmer should allow at least $2 additional per acre annually for fertilizers for marsh land above what would be required for upland soil, when his system of farming includes the maintenance of livestock.

In the cultivation of Peat the use of a heavy roller is essential. Compacting the soil enables it to absorb more heat during the day, and there is less danger from frost. It also firms the soil about the seed and hastens germination, and, when followed by a light harrow, leaves a mulch which checks excessive evaporation.

All marsh soils in Adams County are acid, and liming is essential in the highest development of these lands. When lime is used on marsh soils, it should be worked in to a depth of several inches. Spreading ground limestone on the surface and disking it in thoroughly while getting the land ready for planting is the best method of appyling it. Two tons of ground limestone is a fair

application, but in some cases more may be needed. Acidity tests should be made on each area to determine the amount required.

As Peat is deficient in potash and phosphorus, these elements must be supplied to make Peat farming successful, preferably in the form of commercial fertilizers rather than stable manure. Manure contains a large proportion of nitrogen, which the Peat does not require, therefore, it should be reserved for the upland soils.

Two methods of applying fertilizer are in use: (1) It may be spread broadcast on the plowed ground and disked in before planting or seeding, or (2) in the case of crops planted in drills or hills, it may be applied near the drill or hill by the use of planters carrying fertilizer attachments. When applied broadcast, from 300 to 400 pounds of acid phosphate and 150 pounds of muriate of potash should be used for all staple crops, such as hay, grain, or corn. For truck crops such as cabbage, sugar beets, and onions, which make much heavier demands, these amounts should be increased from 50 to 100 per cent. When applied in the hill or drill the acreage application should be decreased or there is danger of injury to the young seedlings; 100 pounds of acid phosphate and 50 pounds of muriate of potash applied in this manner will often give nearly as much increase in yield during the first year as the larger application made broadcast, but yields on the land to which the heavier application is made broadcast will be greater in succeeding years. When applying fertilizer in the hill or drill the planter used should be one which carries the fertilizer in a separate box from which a separate tube runs to the soil. In this way some soil is allowed to fall between the seed and fertilizer.

When potash salts or wood ashes are not available, very good results can be obtained by using a 0–10–10 mixed fertilizer, applied in the hill or drill with a fertilizer attachment, at the rate of 150 pounds (when dropped in the hill) to 300 pounds (when dropped in drills) per acre. In case of truck crops 300 to 400 pounds per acre of mixed fertilizer is often applied broadcast, in addition to 100 to 200 pounds applied in the drill.

When Peat is first placed under cultivation, only a few crops can be grown successfully, especially if the soil is undecomposed and tough. Soy beans, buckwheat, flax, timothy, and alsike clover are commonly the best crops. Rye will also do well and is frequently used as a nurse crop for grass and clover seeding.

Corn and potatoes are sometimes grown on Muck and well-decomposed Peat, but there is some danger to such crops from frost. However, as drainage is perfected, this danger will doubtless become less. In addition such crops as rape, pasture grasses, and hardy root crops can be grown. Sugar beets, cabbage, and onions may also be grown successfully where transportation and market conditions are favorable. Dairying, truck farming, or stock raising, or combinations of the three, are the best types of farming to follow on Peat. The Peat of Wisconsin is not well adapted to grain farming.

SUMMARY.

Adams County, Wis., is situated a little south of the center of the State. The Wisconsin River forms its western boundary. The county has an area of 670 square miles, or 428,800 acres. Except for the glaciated southeastern corner, where the surface is undulating or

rolling, the topography is that of a wide plain broken by scattered abrupt sandstone mounds or ridges and by extensive marshy tracts. Elevations range from 890 feet in the southern part to 1,050 feet in the northeast corner.

The first settlers came to the county in 1844 and 1845. The population, which is 9,287 according to the 1920 census, is thinly distributed in the interior and thickest in the southern, western, and eastern parts, the regions of the best soil.

One railroad, the Chicago & North Western, traverses the central part of the county in a northwest and southeast direction.

The mean annual rainfall is about 31 inches, and the mean annual temperature 46.1° F.

The agriculture of the county consists chiefly of dairying, with general farming and special crops predominating in some sections. Rye, buckwheat, corn, oats, potatoes, hay, and some wheat and barley are the main crops.

There are a considerable number of abandoned farms in the more remote and sandy sections of the county. The total number of farms in the county has decreased, and their average size has increased, in the last 30 years. In the areas of better soil modern equipment is in common use.

The soils vary in texture from heavy red clay to sand, the latter being very extensive. The soil materials were accumulated by various agencies, including the weathering from sandstones, wind action, transportation and mixing by glacial ice, and deposit from the waters of glacial Lake Wisconsin. The soils are classified in 10 series, comprising 21 types and 9 phases. In addition, Peat and Rough stony land are mapped.

The Plainfield series includes the most extensive areas of level sandy soils. The rolling phases have been blown by the wind. Rye, corn, and potatoes are the chief crops.

The Superior series includes the areas of better soils where red clay is found at varying depths within the 3-foot section.

The sandy soils derived from the decomposition of sandstone rocks are included in the Boone series.

The Union silt loam includes the fine silty soil of the southwestern part of the county. It is a very good soil for grain, hay, and pasture.

The Coloma and Miami series include the glacial soils, the sandy types being in the Coloma and the areas of heavier texture in the Miami.

The Waukesha series includes the dark-brown level prairie soils, most of which are sandy.

The first-bottom or river flood plain soils are included in the Genesee fine sandy loam.

The Poygan and Granby series include the low-lying dark-colored soils associated with the red clay and the sandy soils, respectively.

Peat includes the extensive marshy areas and brushy swamps where the soil consists of organic matter of varying depth and stage of decomposition. A large area in the northeast corner of the county has been dredge-ditched.

Rough stony land includes stony and steep bluffs, ridges, and slopes unfit for cultivation.

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