UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF SOILS—MILTON WHITNEY, Chief.

IN COOPERATION WITH THE IOWA AGRICULTURAL EXPERIMENT STATION
C. F. CURTISS, DIRECTOR; W. H. STEVENSON, IN CHARGE SOIL
SURVEY; P. E. BROWN, ASSOCIATE IN CHARGE.

SOIL SURVEY OF CEDAR COUNTY, IOWA.

BY

A. M. O'NEAL, JR., IN CHARGE, AND D. S. GRAY.

THOMAS D. RICE, INSPECTOR, NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1919.]

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1921.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., September 7, 1920.

SIR: I have the honor to transmit herewith the manuscript report and map covering the soil survey of Cedar County, Iowa, and to recommend that they be published as advance sheets of Field Operations of the Bureau of Soils, 1919, as authorized by law. This work was done in cooperation with the Iowa Agricultural Experiment Station.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

Hon. E. T. MEREDITH,
Secretary of Agriculture.

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MAP.

Soil map, Cedar County sheet, Iowa.

SOIL SURVEY OF CEDAR COUNTY, IOWA.

By A. M. O'NEAL, Jr., In Charge, and D. S. GRAY.—Area Inspected by THOMAS D. RICE.

DESCRIPTION OF THE AREA.

Cedar County is situated in the eastern part of Iowa, in the second tier of counties west of the Mississippi River, and nearly midway in the State north and south. The extreme southeast corner is about 30 miles from Davenport, Iowa. The county is 24 miles square and contains 16 full townships, with a total area of 570 square miles, or 364,800 acres.

The county comprises two distinct types of topography: (1) that of the more or less rolling uplands and (2) that of the terraces and first bottoms along the streams.

The uplands consist of a broad loess-covered plain whose original surface has been modified in varying degrees by erosion. The topography of the greater part of this plain is undulating to smoothly rolling, this being the character of surface throughout the greater part of Inland, Fairfield, Red Oak, and Springdale Townships, the southern parts of Sugar Creek and Gower Townships, and the northeastern part of Center Township. In the vicinity of Sunbury and Durant the plain retains much of its original level surface. Along both sides of the Cedar River and some of the larger streams erosion has been quite active, and the surface has been carved into a maze of steep hills and rounded narrow divides. This rougher country extends back from 1 to 2 miles from the stream courses and merges abruptly with the areas of smoother topography.

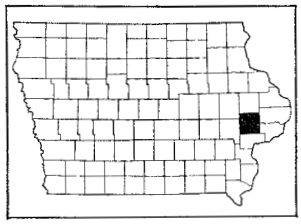

FIG. 1.—Sketch map showing location of the Cedar County area, Iowa.

North of the Chicago & North Western Railroad, where the Clinton lobe of the Iowa drift plain is developed, the topography differs from the upland sections described above. Here it consists of a succession of high, smoothly rolling hills, called by McGee "paha," extending in a general northwest-southeast direction across the county and separated by level to undulating lowland belts.

Second terraces are developed along the Cedar River from Cedar Bluff north to the Johnson County line, and from Rochester south to the Muscatine County line, while a few isolated areas are found on the west side of the Wapsipinicon River north of Massillon. These terraces scarcely ever exceed a half mile in width and are level to gently sloping. First-bottom land is found along nearly all the streams of the county, except where they flow in deep, narrow gorges.

The elevation of Cedar County above sea level ranges from about 675 feet southeast of Downey, where the main line of the Chicago, Rock Island & Pacific Railroad leaves the county, to 900 feet north of Mechanicsville, the elevation of the greater part being between 720 and 850 feet.[1] The elevations at various points are: Tipton 805 feet, Buchanan 750 feet, Downey 683 feet, Durant 720 feet, Bennett 742 feet, Lowden 721 feet, Clarence 829 feet, Stanwood 851 feet, and Mechanicsville 899 feet. The prevailing slope of the county is toward the south.

The greater part of the drainage is carried by the Cedar River, which flows diagonally across the southwestern quarter of the county. The stream from the Johnson County line to a point west of Buchanan and from Rochester south to the Muscatine County line meanders down a flood plain from a quarter to 1 mile wide and from 50 to 100 feet below the adjoining uplands. The escarpment along the western side is generally abrupt, rising from 90 to 100 feet above the valley floor, while on the east the hills are from 15 to 20 feet lower and the slopes not so steep. From a point where the Chicago, Rock Island & Pacific Railroad crosses the river west of Buchanan to Rochester the stream cuts through a narrow gorge from 100 to 140 feet deep, bordered in many places by steep palisades of limestone. A small area along the northern boundary of the county is drained by the Wapsipinicon River, which cuts for a short distance across the extreme northeast corner, and its tributaries. The tributaries of these rivers, with the many intermittent drainageways, ramify the uplands, affording in general excellent drainage for the greater part of the county. In the rougher sections the run-off is inclined to be excessive. Where the topography is flat and in a few depressed areas drainage is generally inadequate and tiling necessary. All the first bottoms are subject to overflow and in many places are marshy and wet the greater part of the year.

Cedar County was formed from Dubuque County in 1837. The first settlement was made some six years before that date, and a trading post operated on the Cedar River near the mouth of Rock Creek. The early inhabitants came from the neighboring States to the east.

The 1920 census gives the population of the county as 17,560. It is almost exclusively native born, though in the eastern half a large

[1] Bul. 274, U. S. Geol. Survey. Dictionary of Altitudes in the United States. Gannett.

percentage is of German descent. A large Bohemian settlement is found in the vicinity of Cedar Bluff. The entire population is classed as rural. The agricultural population is quite uniformly distributed, and averages 30.8 persons to the square mile. The county, according to the United States census reports, showed a decrease in population of 1,606 from 1900 to 1910, and 205 from 1910 to 1920.

Tipton, situated in the center of the county, is the county seat and largest town, having a population in 1920 of 2,142. Mechanicsville, with a population of 812, Stanwood with 556, Clarence with 693, Lowden with 655, Bennett with 362, Durant with 775, and West Branch with 688 are other towns of importance. Sunbury, Centerdale, Buchanan, Massillon, Downey, and Plato are smaller railroad towns. There are several smaller villages in the county.

The main line of the Chicago & North Western Railroad, from Chicago to Omaha and points west, runs in an east-and-west direction across the northern part of the county and furnishes excellent service for that section. The main line of the Chicago, Rock Island & Pacific Railroad, between Chicago and Denver, passes through Durant, in the southeastern corner of the county, then crosses into Muscatine County, and runs just south of the line, again entering the county near Downey, in the southwestern corner. A branch of this system running from West Liberty to Cedar Rapids cuts in a northwesterly direction through the southwest corner. The central part of the county is served by the Cedar Rapids-Davenport and Bennett-Clinton branches of the same system.

Cedar County has a complete system of graded dirt roads. The principal ones are dragged after rains and during dry weather are good. Throughout the greater part of the county the roads follow land lines. In the rougher parts, especially along the river, they usually wind along the crests of ridges. Only in a few cases have they been surfaced. The transcontinental Lincoln Highway enters the county east of Lowden and crosses it from east to west, following closely the tracks of the Chicago & North Western Railroad. Rural mail routes serve all parts of the county. Schools and churches are conveniently located and in a number of places the schools have been consolidated, the pupils being carried back and forth in school wagons. Telephones are in general use, and electric transmission lines extend to some parts of the county, furnishing current for light and power.

The towns of the county furnish a market for most of the products. The principal outside markets are Chicago, Omaha, Davenport, and Cedar Rapids.

CLIMATE.

Cedar County has a healthful climate characterized by marked annual variations in temperature. High temperatures are the rule during the summer months, with a recorded maximum of 108° F. in July.

Hot spells accompanied by winds are occasionally experienced, but are of short duration and seldom do any material damage. The winters are long and quite cold, with a recorded minimum of —22° F. in January. The mean annual temperature is 48.9° F.

The average growing season—that is, the period between the average date of the last killing frost in the spring and the earliest killing frost in the fall—is 168 days. Crops are injured only occasionally by early frosts. The average date of the last killing frost in the spring is April 26 and of the first in the fall is October 11. The latest recorded killing frost in the spring occurred on May 7 and the earliest in the fall on September 12.

The mean annual precipitation is 34.5 inches, the greater part of which falls during the growing season. The average for the fall months is low, the weather generally being excellent for harvesting. Once in a great while late spring rains interfere with planting and winds and hail occasionally cause damage. Severe droughts are rare.

The following table, compiled from records of the Weather Bureau station at Tipton, gives the normal monthly, seasonal, and annual temperature and precipitation for Cedar County:

Normal monthly, seasonal, and annual temperature and precipitation at Tipton.

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year (1910).	Total amount for the wettest year (1902).
	°F.	°F.	°F.	*Inches.*	*Inches.*	*Inches.*
December	25.4	62	—21	1.50	0.78	1.70
January	20.6	57	—22	1.40	2.07	1.10
February	21.8	61	—21	1.50	0.39	0.55
Winter	22.6	62	—22	4.40	3.24	3.35
March	36.6	85	— 6	2.57	0.17	3.25
April	48.9	87	20	3.28	2.51	2.45
May	60.5	95	31	4.93	4.35	5.85
Spring	48.6	95	— 6	10.78	7.03	11.55
June	69.9	102	40	3.92	0.46	8.35
July	74.8	108	47	3.67	0.95	8.90
August	72.6	101	38	4.28	5.44	9.40
Summer	72.4	108	38	11.87	6.85	26.65
September	65.8	98	30	3.32	5.00	5.50
October	52.9	85	21	2.15	0.80	5.90
November	37.0	76	3	1.98	0.77	2.72
Fall	51.9	98	3	7.45	6.57	14.12
Year	48.9	108	—22	34.50	23.69	55.67

AGRICULTURE.

Agriculture has been practically the sole industry since the first settlement. The early pioneers, who came in from the East, took up land along the streams, where timber was abundant, avoiding the more fertile prairies. Small fields were cleared and a few crops grown to supply the needs of the home. Game was abundant and hunting and trapping were important, supplying meat and an income from the sale of pelts. Prior to the building of the railroads the growth in population was slow. Corn, wheat, oats, barley, and some rye were grown, and, owing to the excellent prairie pastures, cattle raising was engaged in to a limited extent. In 1853 the first agricultural society was formed, and from then on the growth was more rapid. With the coming of the railroads conditions became more favorable for the growing and marketing of general farm products, the use of machinery became more general, more land was cultivated, and a larger number of cattle and hogs kept on each farm. Most of the grain was fed to stock.

The early inhabitants scarcely ever improved their land by the application of manure, and lime was never used, crop rotations were not practiced, and after a time the yields decreased. The prosperous conditions of to-day are largely due to the growth of the dairy industry and the feeding of cattle and hogs, resulting in the upbuilding of the soil through the use of manure and better farming practice.

A few years back Cedar County was among the leading horse-breeding sections of the State. Fine driving and coach horses were raised, and buyers came from all sections of the country. The growing popularity of the automobile has made this industry unprofitable, and it has been abandoned. On the majority of the farms only a few draft animals are now raised to supply the local demand.

According to the census of 1880, the corn acreage of Cedar County in 1879 was 107,035 acres and the production 5,180,808 bushels. The oat acreage was 23,657 acres, with a production of 874,524 bushels, and there were 22,925 acres in wheat, producing 156,167 bushels. In addition to these, considerable barley and some rye and buckwheat were grown. Hay was cut from 33,254 acres, which yielded 53,187 tons. The value of orchard and forest products amounted to $78,445. The census 10 years later shows a slight decrease in the corn acreage, practically a doubling of the oat acreage, and a decided falling off in the area devoted to wheat.

During the next two census periods the acreage in corn was increased to 106,000 acres, while the oat acreage expanding to 47,870 acres in 1900, fell off to 32,507 acres in 1910. The growing of small

fruits and orchard fruits greatly increased. In 1910 the value of animals sold and slaughtered amounted to $3,884,820, dairy products, exclusive of home use, to $279,118, and poultry and eggs to $378,233.

Agriculture at the present time consists of the production of general farm crops for sale, for feeding stock and for home use, the raising and fattening of beef cattle and hogs for sale, and dairying. Market gardening and fruit growing is carried on to help supply the home demand.

The principal crops in the order of their importance are corn, oats, hay, barley, wheat, and potatoes. Rye, sweet corn, pop corn, buckwheat, and truck crops are also grown to some extent.

Corn occupies the largest acreage and is the most important crop Practically all of it is used on the farms for fattening beef cattle and hogs and for feeding the work stock and dairy cattle. Some years a few of the farmers sell a small part of the corn to the elevators in the county and they in turn ship it to outside markets. A small part of the crop is cut for ensilage.

Oats, the crop of second importance, occupy a place in the general rotation on practically every farm. In 1918, 41,362 acres planted in oats produced 1,873,823 bushels, an average of 45 bushels per acre. The crop is thrashed and fed to the work stock, dairy cattle, hogs, and beef cattle on the farms.

Hay ranks next in importance. According to the county crop statistics of 1918, 41,309 acres were in hay, producing 55,909 tons. The hay crop consists principally of clover and timothy grown separately or together. A small acreage is devoted to alfalfa, but owing to the difficulty of securing a stand alfalfa has not proved profitable and only 78 acres were in this crop in 1918. Practically all the hay is fed on the farms.

The acreage in barley increased from 16,641 acres in 1910 to 18,565 acres in 1918, producing, respectively, 320,338 and 557,709 bushels. The crop takes the place of oats in rotation. Nearly all the grain is fed on the farms, only a small percentage being shipped out of the county.

Wheat is grown on a number of farms. The best results are obtained from spring wheat. In 1918, 4,598 acres were planted to this crop and the production was 91,468 bushels. This is a decided increase over the acreage reported in the 1910 census, the result of the war demand. All the wheat is sold to the elevators scattered throughout the county, and by them shipped to outside markets.

Nearly every farm has a patch of potatoes. The census of 1910 reported 1,600 acres in this crop, with a production of 135,725 bushels. The entire crop is used locally.

The growing of sweet corn is becoming a considerable industry in the county. In 1918 approximately 5,000 acres were devoted to this

crop. The product is absorbed by the canning factory at Tipton, and nearly all is shipped out of the county.

The raising and feeding of beef cattle is an important industry. There are a number of breeders who raise purebred stock for sale, and part of the stock is bought by the farmers in the county, but a great many animals are sold and shipped to outside points. On practically every farm in the county some beef cattle are fed, the herds ranging from 7 to 30. The smaller herds are either raised or bought locally, while the larger operators bring in carload lots from St. Paul, Sioux City, and Omaha. The young feeders usually are bought in the fall and kept till the next fall, while the older cattle are bought in the fall, put on a heavy feed, and resold the same winter mainly in Chicago.

There were 173,272 hogs in the county in 1918. Almost every farmer raises sufficient hogs for his own use and a surplus for sale. A few are sold locally to help supply the home demand, the rest are shipped in carload lots to outside markets.

The value of dairy products, excluding home use, as reported in the 1910 census, amounted to $279,118. The industry has been on the increase for the last few years and at present creameries are operated at Tipton, West Branch, and Massillon. In addition, some cream is shipped to outside markets from nearly every town in the county. There were 9,506 milk cows in the county in 1918, the average farm having from 3 to 4, while larger operators keep many more. The Jersey and Holstein are the favorite breeds.

Poultry is raised on every farm, and according to the census of 1910 the value of poultry and poultry products amounted to $378,233. The chickens and eggs are sold to the merchants and produce men, who ship to outside points after supplying the local demand.

Rye, buckwheat, and sorghum are crops of minor importance. Strawberries and raspberries are grown on a few farms, while gardens are maintained by practically every family to supply the home needs. In the extreme southern end of the county, along the terraces of the Cedar River, a few watermelons and cantaloupes are grown. Apple orchards are found on a number of farms, but very little care is given them.

The farmers of Cedar County recognize that the more extensive soil types, mainly the Muscatine silt loam, Tama silt loam, and Carrington silt loam, are well adapted to the production of general farm crops, such as corn, oats, wheat, and hay. The Wabash silt loam is recognized as a good corn soil, but less desirable for oats which have a tendency to lodge. Most of the bottom soils are left in pasture, as under present conditions they are better used for grass than for cultivated crops. The Buckner fine sandy loam, Buckner fine sand,

and Knox fine sand are best adapted to the production of melons, cantaloupes, and vegetable crops. The Clinton silt loam, where gently rolling, is considered a good farming soil, but the rougher areas are left in pasture and devoted more largely to dairying.

Crop rotations are in general use throughout the county, especially on the better improved farms. The two most popular are corn, corn, oats, and hay; and corn, corn, oats, and clover.

More than half the corn land is plowed in the fall. When corn follows corn the land in most cases is disked and plowed in the fall. The next spring it is disked twice before planting. A practice that is growing in favor is to disk after plowing in the fall, in order to form a mulch. If corn follows clover, the land is pastured late in the fall and plowed and disked the following spring. Corn is all planted in checkrows and usually spaced 3 feet 6 inches apart. It is cultivated from three to four times. Most of the crop is husked in the field, though a steadily increasing acreage is hogged down each year. In many places soy beans are planted with the corn and the crop cut for ensilage.

Clover occupies an important place in the general cropping practice. It is either planted alone or with timothy. In the latter case the clover disappears the second year and the timothy is cut for hay. Where the clover follows small grain, it is seeded with the grain as a nurse crop. The first crop of clover usually is cut for hay and the second pastured, but occasionally the second is cut and thrashed for seed.

Manure is used wherever available. A common practice is to scatter it over the grass land in the fall before plowing or on the stubble land in the spring before disking or plowing. Commercial fertilizers are scarcely ever used. The application of lime is increasing.

The farm buildings throughout the larger part of the area are substantial and up to date. Many of the houses are constructed of stone, brick, or stucco, and are modern in every respect. The barns are large, with plenty of room for housing the work stock and cattle, as well as for a large part of the hay and grain. Silos are common; there were 264 in the county in 1918.

Few mules are used for farm work, the work stock consisting of medium and heavy horses. The farm machinery in general use includes disk plows, gang plows, reapers, binders, hay loaders, walking and riding cultivators, harrows, drills, and manure spreaders. There are many tractors and several corn harvesters in use. Windmills for pumping water are found on nearly every farm. Independent lighting plants are being installed and many farms have small gas engines for power work.

Farms are leased both for cash and on shares. In the former case the rent ranges from $4 to $5 an acre in the rough, poorer sections

along the river to $12 or $15 and occasionally $20 in the better parts of the county. On a share-rent basis, the tenant furnishing the labor, horses, and machinery, the produce is divided equally between the landlord and tenant. When cattle are fed, half the expense is assumed by the landlord.

The scarcity of farm labor is becoming a serious problem and in many cases is being met by the use of improved machinery. Day labor receives from $2.50 to $7 a day, the average being $4. Monthly wages run from $55 to $60 [2] with board, and in case of married men a house and often a cow and garden in addition. For husking corn the rate is 8 to 10 cents a bushel, the laborers also receiving board.

According to the 1910 census, 96.1 per cent of the county was in farms, the average size being 157.3 acres, of which 89 per cent, or 140.7 acres, was improved land. In some sections of the county there are a few farms of 500 to 800 acres, of which only 2 per cent of the land is under cultivation. According to the 1910 census, 61 per cent of the farms were operated by owners and 37.3 per cent by tenants.

In 1918, as reported by the county census, 46 per cent of the farms in the area were free from mortgage and on the rest the indebtedness is only 29 per cent of the total value.

Land values vary according to improvements, topography, and location with respect to towns, railroads, and highways. The census of 1910 reported the average assessed value as $107.49 an acre. During the present year values have increased greatly and selling prices range from $150 to $500 an acre.

SOILS.[3]

Upon the basis of origin of the soil material the soils of Cedar County fall into three main divisions: (1) Soils derived entirely from loess; (2) soils derived from the Iowan drift, sometimes modified to a slight degree by loess; and (3) alluvial soils derived from reworked loessial and glacial materials.

The first group occupies by far the largest part of the county. The soils are derived from the Mississippi loess, a yellow siliceous silt which mantles the Kansan plain. In the interior, as shown by the outcrops of till in the deeper cuts, the loess deposit is from 10

[2] Wages those paid in 1918.

[3] Cedar County joins Muscatine County on the south and Scott and Clinton Counties on the east. In certain cases the maps of these counties do not appear to agree along the boundaries. This is due in most places to changes in correlation resulting from a fuller understanding of the soils of the State. The Memphis silt loam mapped in the adjoining counties is now known to be the Clinton silt loam. The rolling phase of the Muscatine loam is now considered a separate type and called Tama silt loam. The Carrington loam in Clinton County has been mapped as Carrington silt loam on account of its small area in Cedar County and for the same reason the Cass loam has been combined with Meadow. The Buckner silt loam of Muscatine County has been subdivided and a part of it in this area has been mapped as Wabash silty clay loam, while the Meadow of that area is now called Wabash silt loam.

to 15 feet thick, and it reaches its greatest thickness along the boundary of the Iowan drift area. Outcrops of glacial till occur on sharp points and hillsides where erosion has washed away the soil covering, but the areas are small in extent. Where the larger streams have cut deep channels the underlying rocks outcrop. These rocks and glacial strata, however, have had no effect on the soils, except along the foot of the steeper stream slopes upon which the outcrops occur.

The Iowan drift, from which are derived the soils of the second group, enters the county from the west in two lobes. The smaller, known as the Tipton lobe, enters from Johnson and Linn Counties, passes south along the left bank of Cedar River to Cedar Bluff, and then east in a constantly narrowing wedge to within a few miles of Tipton. The larger, known as the Clinton lobe, extends across the northern townships and covers most of the area lying north of the main line of the Chicago & North Western Railroad. Throughout this section the loess is either lacking or has had very little influence on the soils. The surface is smoother, showing that the materials are younger in geological age.

Along the southern boundary of the Iowan drift plain and the northern part of the Kansan are found elongated rounded hills having a general northwest-southeast trend, or the pahas already referred to. Some of these hills are capped by a thick mantle of loess, while others have been eroded to such an extent that the loess has been removed or the layer so thinned that the till is encountered within the 3-foot section. In the vicinity of Cedar Bluff and Rochester the hills are often capped with fine sand and are dunelike in appearance.

Soils of the third group, alluvial soils, are well distributed throughout the county. Some of these occur on terraces and some in the stream bottoms. Second terraces are found only along the Cedar and Wapsipinicon Rivers. They are formed of relatively old materials washed from the glacial and loessial uplands and deposited during overflow when the streams flowed at higher levels. The first bottoms of the rivers are composed of more recent alluvial deposits that have come for the most part from a distance, while the alluvial material along the smaller streams is of more local origin.

The original surface materials in the uplands have been greatly modified by weathering and erosion, and on the terraces and bottom lands by reworking, giving rise to a number of types of soil. These soils are divided into series on a basis of color, texture, origin, and structural characteristics, the series being subdivided into types, on a basis of texture. Fifteen soil types, including Meadow, occur in the county.

The soils derived from loess are of the Muscatine, Tama, and Clinton series, while those derived entirely from glacial drift are classed

as Carrington. The series comprising soils derived from loess and glacial till are the Lindley and Clyde, and loessial material influenced by lakes or ponds is classed with the Scott series. The soil of a few wind-formed hills and ridges has been classed with the Knox series. The older alluvial deposits lying above overflow give rise to the Buckner and Calhoun series, while the more recent material, still subject to overflow, is classed with the Wabash series.

The types of the Muscatine series are characterized by dark-brown to black surface soils and yellowish-brown to grayish-brown upper subsoils. In the lower part of the 3-foot section the subsoil is mottled with gray, brown, and yellow, iron concretions being abundant in many places. This is particularly noticeable in the more level areas. Neither soil nor subsoil is calcareous. The topography is level to gently undulating. One type, the Muscatine silt loam, is mapped.

The surface soils of the types included in the Tama series are dark brown to almost black. The subsoils are generally loose and friable in structure and have a yellowish-brown to light-yellow color. The topography is gently rolling to rolling. The soils of this series do not give a reaction for lime. The Tama silt loam is the only type mapped.

The surface soils of the Clinton series are gray to grayish brown. The subsoils are light yellow, yellowish brown, or light brown and compact, with faint gray feathery streaks in the lower part of the 3-foot section. The series is derived from the loess, and the topography is rolling to broken, with drainage well established. One type, the Clinton silt loam, is mapped.

The types of the Carrington series are characterized by dark-brown surface soils and yellowish to light-brown subsoils. They are derived from the glacial drift, but may be modified in some cases by admixture of loess. The Carrington silt loam is the only type mapped.

The Lindley series includes types with brown, yellowish-brown to gray surface soils, as a rule shallow, and yellowish-brown subsoils. The subsoils are normally free from mottling, though in a few cases faintly splotched with gray. Sand and gravel is sometimes encountered in the lower part of the subsoil. This series is derived through weathering from the Kansas drift modified by the admixture of loess. The topography is generally rough and broken and drainage excessive. The only type mapped is the Lindley silt loam.

The surface soils of the types correlated in the Clyde series are dark gray to black. The subsoils are gray or yellow, in most places mottled with yellow or gray. Glacial till is encountered within the 3-foot section. The topography is level to gently sloping, the areas occupying depressions or broad poorly drained stream channels. The silty clay loam is the only type of this series mapped in the county.

The Scott soils are dark brown to black, rich in organic matter, and underlain by an upper subsoil layer of ashy-gray silt loam from 4 to 6 inches thick resting on a stratum of heavy compact drab to dark-gray silty clay. The material is of lacustrine origin found in basins throughout the uplands. Drainage is often restricted and water stands on the surface after rains. One type, the Scott silt loam, is mapped.

The Buckner series includes types with dark-brown soils and lighter colored friable subsoils. The subsoils normally differ little in texture from the surface soils. The material is derived from reworked loessial and glacial material that has been brought down by the streams and deposited during periods of overflow. The topography is level to gently sloping. The series occupies terraces lying above overflow, and the drainage is generally well established. Three types—the silt loam, fine sandy loam, and fine sand—are mapped.

The surface soils of the types in the Calhoun series are light gray to brownish gray. The subsoil to 15 or 20 inches is a light-gray to almost white floury silt loam, and below that depth a gray to drab, heavy clay. The lower subsoils are characterized by an impervious waxy structure and the presence of iron concretions and iron stains. These soils occupy poorly drained areas on terraces lying above overflow. The material is alluvial in origin and is derived from the silty soils of the prairie regions. Both soil and subsoil are deficient in lime. The Calhoun silt loam is the only type mapped.

The Wabash series includes types with dark-brown to black surface soils rich in organic matter and dark-drab to dark-gray heavy subsoils. The series is developed in first bottoms, the material being derived from the loessial and silty glacial soils of this region. The Wabash silt loam, with a colluvial phase, and the Wabash silty clay loam are mapped.

The following table gives the name and the actual and relative extent of the various soils mapped in Cedar County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Muscatine silt loam	108,608	29.8	Buckner fine sand	1,280	0.4
Tama silt loam	96,000	26.3	Wabash silty clay loam	1,152	.3
Clinton silt loam	88,448	24.2	Lindley silt loam	1,088	.3
Carrington silt loam	39,424	10.8	Clyde silty clay loam	896	.2
Wabash silt loam	15,616	4.9	Buckner fine sandy loam	704	.2
Colluvial phase	2,304		Calhoun silt loam	256	.1
Knox fine sand	4,352	1.1	Scott silt loam	256	.1
Meadow	2,752	.8	Total	364,800	
Buckner silt loam	1,664	.5			

MUSCATINE SILT LOAM.

The surface soil of the Muscatine silt loam is a brown to dark-brown mellow silt loam 17 to 20 inches deep, high in organic matter. The subsoil consists of a lighter brown to yellowish-brown heavy silt loam to silty clay loam, passing at 24 to 30 inches into light-brown to yellowish-brown moderately compact silty clay loam to silty clay, mottled with brown, gray, and yellow. Variable quantities of iron concretions are present in the lower subsoil.

Except for a few very small areas this type is quite uniform in color, texture, and depth of soil and subsoil throughout the county. One and one-half miles south of Bennett the surface soil has a dark-brown to almost black color and grades at a depth of 10 to 12 inches into a light-brown silty clay, which extends to a depth of 16 to 18 inches. The subsoil is a yellowish-brown silty clay, which passes at 24 inches into a lighter brown silty clay mottled with gray and yellow and streaked with iron stains. Throughout the flatter areas in this vicinity the gray mottlings are more pronounced in the subsoil and frequently gray is the dominant color. Areas having similar characteristics are found in sec. 34, T. 79 N, R. 1 W., and in sec. 34, T. 79 N., R. 3 W. Three miles due south of Bennett, where the surface is flat and drainage insufficient, the surface soil is separated from the subsoil by a mottled gray and brown gradational layer 8 to 12 inches thick.

The Muscatine silt loam includes very small depressed areas and areas adjacent to incipient drainageways, which could have been separated on the map as a distinct soil type had they been sufficiently large.

In the northern part of the county, in the vicinity of Clarence, Lowden, and Massillon, and in the northwestern corner, near Mechanicsville, where the drift plain approaches near enough the surface to influence the soil, the line of demarcation between the Muscatine and Carrington silt loam is difficult to locate. Both soils are similar in color and texture and occupy practically the same elevation, so that often the only basis for separating the Carrington silt loam is the presence, in the lower subsoil, of small amounts of gravel and sand.

The Muscatine silt loam is developed in all parts of the county, the largest connected bodies occurring in the eastern part in the vicinity of Durant, Sunbury, Bennett, Clarence, and Stanwood. In the western part of the county, which has greater relief, the type occurs as small isolated areas. It normally occupies the crests of the broader divides and ridges, though in a number of areas it extends down the gentler slopes to the streams. The topography is level to gently rolling. Surface drainage in most cases is adequate, though in the

flatter areas it is not sufficient for best results. The subsoil is retentive of moisture.

The Muscatine silt loam is an extensive and valuable agricultural soil. Practically all of it is either in cultivation or devoted to pasture, the only forested areas consisting of small groves planted as windbreaks for farm dwellings. Corn, oats, hay, barley, and wheat are the most important crops. Corn occupies the largest acreage, and practically all is fed on the farms either as grain or silage, though a small amount is shipped out of the county annually. Soy beans are grown on a few farms and are cut with the corn for silage. Wheat occupies a small acreage, but is the principal money crop. The entire crop is sold and shipped out of the county. Oats, hay, and barley are all fed on the farms. Irish potatoes are grown on a small scale for home use and to help supply the local demand, and small gardens are maintained. Apples, raspberries, and strawberries are grown for home use.

Corn yields from 40 to 90 bushels per acre, with an average around 42 bushels; barley, 18 to 35 bushels; hay, 1 to 2 tons; oats, 28 to 60 bushels; and wheat, 15 to 25 bushels. Irish potatoes average 125 bushels per acre.[4]

Clover is generally planted with oats as a nurse crop, then in the fall, after the oats have been harvested, timothy is seeded with the clover. The next spring the clover is cut for hay and the second crop pastured. Clover disappears after the first year, and the timothy is left for hay the second year. Commercial fertilizers are never used. Ground limestone is used, and during the year of the survey a number of carloads were shipped in. Manure is used on all farms and is generally applied to the corn land. In a number of places the farmers are exercising more care in protecting the manure piles from leaching. The better improved farms on the Muscatine silt loam are those where cattle and hogs are fed each year and the manure returned to the land.

Alfalfa is grown on a few farms, and when the soil is carefully limed, inoculated, and prepared, excellent results are obtained. The yields range from 2 to 4 tons per acre per season. Apples would do well if properly sprayed and cared for, as shown by the condition of a few orchards observed during the survey. The industry could be extended and developed on a commercial scale.

The principal live-stock industries consist of the feeding of beef cattle, hog raising, and dairying. A number of purebred herds are kept for breeding, but as a rule feeders are brought in each year from outside markets. Dairying is on the increase, the milk being

[4] Yields given in this report for the different soils are based on statements of farmers, gathered during the course of the survey.

sold to creameries located at Tipton, West Branch, and Massillon. The raising and feeding of a few head of sheep is not uncommon, but the usual practice is to bring in western sheep each fall. They are turned into the cornfields to graze for a short time, after which they are put on a feeding ration, fattened, and sold.

This soil is very productive and easily tilled. Most of the land is plowed in the fall, and a growing practice among the more progressive farmers is to disk after plowing, in order to secure a good mulch. Definite crop rotations are in use, and one that is popular is corn for two years, followed by oats. The fourth year the land is seeded to clover or clover and timothy, which is left for one or two years, after which the land is returned to corn.

The Muscatine silt loam at present (1918) sells at from $300 to $475 an acre, and in one case has reached the high mark of $525 an acre. The price varies according to location and the condition of the improvements.

The Muscatine silt loam is probably the best soil type in the county. Owing to the strong character of the soil, excellent yields are obtained even under poor farming methods. By raising and feeding cattle and hogs and by careful rotations in which legumes play a part, the fertility can be easily maintained. Deep plowing and thorough preparation of the seed bed are necessary for best results. Lime will improve the physical condition of nearly all areas of this soil. Throughout the flatter areas tiling would prove beneficial.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the typical Muscatine silt loam.

Mechanical analyses of Muscatine silt 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.*
333225	Soil	0.6	1.2	0.8	1.3	8.1	63.2	25.5
333226	Subsoil	.0	1.4	0.5	2.7	13.1	55.4	26.9

TAMA SILT LOAM.

The surface soil of the Tama silt loam is a brown to dark-brown mellow silt loam 10 to 15 inches deep. The subsoil is a light-brown to yellowish-brown heavy silt loam grading at 24 inches into a yellowish-brown friable silty clay loam. Faint gray mottlings are sometimes found in the lower subsoil.

Although in general this type is uniform both in color and texture of soil and subsoil, some minor variations occur. Over the larger

part of the area 2 miles south of Sunbury the surface soil is not so deep as in the typical areas, ranging from 6 to 9 inches, and along some of the lower slopes, where drainage is poor, the surface soil is a light-brown silt loam 6 inches deep, underlain by a grayish-brown floury silt loam which grades at 18 to 24 inches into a grayish-brown silty clay loam to silty clay mottled with brown and yellow. These areas were too small to separate on the map. Near the boundaries of the Tama and Clinton silt loams there is often a transition belt where the surface soil varies from light brown to grayish brown, and in such cases the boundary lines are more or less arbitrary, some true Clinton being included with the Tama. There are also some small areas of Muscatine silt loam which could not be mapped separately without too great exaggeration.

The Tama silt loam is developed throughout all parts of the county, the largest connected bodies lying 2 miles southwest of Stanwood and between West Branch and Springdale. In other places it occurs either as narrow belts bordering the stream courses or as small isolated areas. The soil generally is developed on moderately rolling slopes descending to stream courses, and occupies a position intermediate between the Muscatine silt loam and the bottoms, though there are exceptions to this rule. The topography is strongly undulating to rolling, and drainage is well established.

Practically all the type is under cultivation or in pasture. The only forested areas are small windbreaks, mostly of evergreens and maple, which have been planted to protect the farm dwellings, and small tracts of catalpa grown for fence posts.

The Tama silt loam is a highly prized and valuable soil type. Corn, oats, hay, and wheat are the principal crops. Some of the corn and all the wheat are sold to the elevators and shipped out of the county, while the rest of the farm crops are used on the farms. Some barley and rye are grown and used for feeding hogs. Clover, sweet clover, and sometimes alfalfa are given a place in the rotations, while soy beans are often planted with the corn. The production of fruit is confined to small home orchards, mainly of apples. Dairying and the feeding and raising of cattle and hogs have practically the same importance as on the Muscatine silt loam, and more sheep are pastured.

The crop yields are in general slightly lower than on the Muscatine silt loam, though on some of the better farms they average about the same.

Crop rotations are in general use. The systems are practically the same as on the Muscatine silt loam, except that more land is kept in pasture each year. Clover is an important crop. Ordinarily the first crop is cut for hay and the second pastured, although both may be used for hay. Timothy is sometimes planted with the clover, and in such case is left on the land two or three years. Bluegrass grows

luxuriantly and affords excellent pasturage. Alfalfa and sweet clover are grown on a few farms. Owing to the difficulty of securing a good stand of alfalfa, only a small area is planted in this crop. Alfalfa is cut three or four times a year, yielding from 3 to 4 tons per acre per season. It is never pastured, while the sweet clover is exclusively a pasturage crop. In preparing the land for alfalfa manure and lime should be applied freely. After thoroughly preparing the seed bed it is best either to broadcast soil from another alfalfa field or to inoculate the seed. From 15 to 20 pounds of seed per acre should be sown. When planted in the spring it is better to sow with small grain as a nurse crop. After securing a stand a spring-tooth harrow should be used once a year to subdue as far as practicable the growth of weeds and grass.

Stable manure is used wherever available, generally being applied to corn and pasture land with a spreader. The use of ground limestone is increasing. During the year of the survey a number of car loads were shipped in. Commercial fertilizers are never used.

Farm lands of the Tama silt loam usually sell for $250 to $400 an acre according to the improvements and location. When well located and sold in conjunction with the Muscatine silt loam it brings a still higher price. The Tama silt loam should be handled more carefully than the Muscatine silt loam. The strongly undulating to rolling topography causes more active erosion and it is necessary to protect the surface by growing cover crops, while the steeper slopes should never be plowed in the fall. Clover and alfalfa should be grown more extensively. The methods recommended for the improvement of the Muscatine silt loam apply equally well to this type. The raising and feeding of more cattle and hogs and the additional manure thus obtained will do much to maintain the fertility of the soil.

CLINTON SILT LOAM.

The surface soil of the Clinton silt loam consists of a light grayish brown to light-brown floury silt loam 7 to 12 inches deep. The subsoil is a yellowish-brown to light-yellow friable silty clay loam to silty clay, faintly mottled with gray in the lower depths. The lower subsoil is comparatively tough. On the steeper slopes the surface soil is thinner than typical, and on the broader flats, especially just south of Rochester, it is from 10 to 15 inches thick. In the timbered areas the upper 2-inch layer is dark brownish gray to brown, the dark color being due to the accumulation of organic matter.

The Clinton silt loam is developed on both sides of the Cedar River along its entire course, the belts having a width of 1 to 5 miles. Other areas lie along some of the larger creeks and on the west side

of the Wapsipinicon River. In addition to these areas, there are a few small isolated bodies along the heads of some of the intermittent drainageways.

The Clinton silt loam is prevailingly strongly rolling to rough and broken. Along the Cedar River it consists of a succession of narrow, rounded, tortuous divides and deep, narrow stream channels. The slopes here are very steep but rather even, and are not badly eroded. Along the creeks and throughout the isolated areas the topography is not so rough. Here the hillsides have a more gentle slope and the crests are more rounded and broader. Just south of Rochester the type occupies the crest of a rather broad, flat-topped ridge.

Drainage is good and often excessive. The subsoil, owing to its silty character, is retentive of moisture.

The Clinton silt loam, which covers a large total area, is developed widely over the county. The more smoothly rolling areas are in cultivation, but the larger part is devoted to pasture. The original forest growth consists mainly of oak, walnut, and hickory, with some elm, ash, and basswood.

Land of this type is used in the production of corn, oats, wheat, and hay, with the largest acreage in corn. All of the products are used on the farm. Owing to the large area best suited to pastures and to the excellent grazing found in this rougher country the feeding of beef cattle and dairying are carried on more extensively than on the Muscatine or Tama silt loams. Small fruits and apples are grown more extensively and better results obtained than in the smoother parts of the county. Two or three small areas are devoted to the raising of ginseng.

Corn yields from 35 to 60 bushels per acre, oats 18 to 50 bushels, barley 15 to 36 bushels, wheat 15 to 20 bushels, and hay 1 to 2 tons. Clover returned as much as 4 tons of hay per acre during the year of the survey, but such high yields are rare. Bluegrass grows well and affords excellent pasturage.

The Clinton silt loam is handled in practically the same way as the Muscatine and Tama silt loams. Owing to its rougher topography, cultivation is more difficult, and the use of improved machinery less advantageous. Commercial fertilizers are not used, but manure is scattered over the corn and pasture land, and ground limestone is often applied.

This type, while it is not considered as valuable a soil as the Muscatine silt loam, can be brought to a high state of productiveness by careful handling, including the use of proper rotations. The methods recommended for the improvement of the Muscatine silt loam can be equally well applied. As a rule, the soil is deficient in organic matter, and manure and green-manuring crops should be

turned under. Deeper plowing, more thorough preparation of the seed bed, and the use of lime would increase the yields and keep the soil in better tilth. Cover crops should be grown to prevent erosion. Alfalfa would prove a valuable crop, and the methods employed to secure a stand on the Tama silt loam are applicable here. The growing of apples and small fruit should prove profitable, and, it is believed, could be developed on a commercial scale if modern methods were adapted. The Clinton silt loam sells at $150 to $250 an acre.

KNOX FINE SAND.

The surface soil of the Knox fine sand is a brown to dark-brown fine sand to loamy fine sand, 12 to 16 inches deep, underlain to 3 feet by a yellowish-brown to yellow incoherent fine sand. In depressed areas between hillocks, where there is an accumulation of organic matter and silt, the surface is often a brown to almost black light fine sandy loam, passing at 10 to 12 inches into a yellow fine sand. On knolls and hill crests where leaching has been excessive, the soil is generally a pale-yellow to gray fine sand extending to 3 feet or more without change in color or texture.

The largest development of this type occurs along the Cedar River in the vicinity of Cedar Bluff, Rochester, and in the bend west of Trinity Reformed Church. Other smaller areas are found along the Wapsipinicon and Cedar Rivers.

The topography varies from undulating to rolling. Near Cedar Bluff it consists of a succession of small hillocks and intervening shallow swales. Drainage is excessive, and crops suffer from drought except during wet seasons.

The Knox fine sand is not considered a strong agricultural soil, and only a small area is farmed. The greater part is in pasture, but it supports an indifferent growth of grass.

The type is generally farmed in conjunction with the Clinton and Muscatine silt loam and the same crops are grown. Watermelons, cantaloupes, and garden truck are grown in some sections, and the yields of these crops are excellent. A few dairy cows and beef cattle are kept. Crop yields are lower than on the Clinton silt loam. The Knox fine sand is handled and farmed in practically the same way as the Clinton silt loam, except that more manure is applied to the sand spots.

Suggestions for the improvement of the Clinton and Muscatine silt loam are applicable to this type. The soil is deficient in organic matter, and green-manure crops should be grown more frequently. The growing of melons, sweet potatoes, and garden truck is profitable and should be extended.

The Knox fine sand is always sold in connection with the adjoining types. It has a much lower value than the Clinton silt loam.

CARRINGTON SILT LOAM.

The surface soil of the Carrington silt loam is a dark-brown mellow silt loam, 15 to 18 inches deep. The subsoil is a yellowish-brown friable silty clay loam, passing at 28 to 30 inches into a fine sandy clay. Mottlings of gray and brown are found in the lower part of the 3-foot section. In the flatter areas the surface soil is generally deeper and darker in color, often consisting of a black silt loam rich in organic matter. North of Massillon along the county line there are a few small bodies of Carrington loam which extend into the area from Clinton County and which have been included with the Carrington silt loam. If these areas had been larger they would have been shown separately on the map.

The larger part of the type is underlain by gravel and numbers of bowlders occur. On top of some of the hills the till is encountered within the 3-foot section and in places outcrops, giving rise to small areas of sand and loam soils, too inextensive to map separately. Along the boundaries between the glacial and loessial uplands difficulty was experienced in separating the Carrington silt loam from the Muscatine silt loam, and in places the only basis of differentiation was the presence in the lower subsoil of a very little glacial till material, the particles of which still retain their angular outline.

The type is developed exclusively in the northern half of the county, the largest development being found in the extreme northeast corner.

The topography ranges from almost level to undulating. Drainage is sufficient, except in the flatter areas, where tiling is necessary.

The Carrington silt loam is an important agricultural soil, and practically all of it is in cultivation. It is a prairie soil and the only forested areas are the windbreaks, which have been planted near the dwellings.

Corn, oats, and hay are the principal crops. Corn occupies by far the largest acreage and is the most important crop. All of the corn, oats, and hay are used on the farms to feed the work stock, beef cattle, dairy cows, and hogs. Silos are in general use, and a considerable acreage of corn is required to fill them. Soy beans are sometimes grown with the corn when intended for ensilage. The shortness of the growing season demands an early maturing corn and care should be given to the selection and protection of the seed. The varieties that give best results are Reids Yellow Dent, Silver King, Goldmine, Silvermine, and Johnson County White. The varieties of oats best adapted to this section are the Iowa 105 and 103.

Some wheat, rye, and barley are grown. Wheat is a cash crop and is all shipped out of the county; rye and barley are fed on the farm. Rape is often planted in cornfields and used for hog pasture. Most

of the corn is husked, but a considerable acreage is hogged down. The principal live-stock industries consist of the feeding of a few beef cattle, dairying, and hog raising. Chickens are raised on nearly every farm.

Under ordinary methods of cultivation corn yields from 35 to 65 bushels per acre, oats 30 to 60 bushels, barley 20 to 30 bushels, and hay 1 to 3 tons.

The Carrington silt loam is handled in practically the same way as the Muscatine silt loam, with which it is closely associated. Crop rotations in which the clovers play an important part are in general use. Manure is carefully saved and applied to the land. Fall plowing is customary.

The price of land of the Carrington silt loam type varies from $250 to $450, depending on the location and on the character of the improvements.

Deeper plowing in the fall is essential, as a deeper, well-cultivated seed bed is better able to withstand periods of drought as well as excess of rainfall. Systematic crop rotations, including the legumes, are essential for the best results. Green-manuring crops should be grown more extensively. Tiling the flatter areas would prove beneficial.

LINDLEY SILT LOAM.

The surface soil of the Lindley silt loam is a gray to grayish-brown friable silt loam 7 to 10 inches deep. The subsoil is a yellowish-brown fine sandy clay which in many places passes into a gritty sandy clay at 30 to 34 inches. Mottlings of gray are sometimes found in the lower part of the subsoil. Along the lower, more gentle slopes, where the inwash of silt is greater, the surface soil is deeper and has a brown to dark-brown color. On some of the slopes rock outcrops occur. In a few areas, where erosion has been quite active, the bedrock lies within the 3-foot section.

The Lindley silt loam is confined to the northwestern part of the county and is developed along the steeper slopes bordering the streams, occupying a position intermediate between the Clinton, Carrington, and Tama silt loam and the bottoms. The topography is rolling to strongly rolling and drainage generally excessive.

The Lindley silt loam is largely used as pasture, although a part of it supports a forest growth consisting mainly of oak and hickory. Very little of the land is cultivated. On some of the more gentle slopes corn, oats, and hay are grown and cattle are fed and hogs raised on a small scale. The yields on this type are smaller than on the Clinton silt loam and Carrington silt loam.

The Lindley silt loam is handled in practically the same way as the Clinton and Carrington soils, and the methods recommended

for the improvement of these types can be applied as well to the Lindley. The steeper slopes should be left in pasture or forest and methods employed to improve them. The excellent results obtained by a few farmers in growing orchard fruits would indicate that this industry could be profitably extended.

The value of the Lindley silt loam is quite a little below that of the Clinton silt loam.

CLYDE SILTY CLAY LOAM.

The surface soil of the Clyde silty clay loam is a black silty clay loam 9 to 15 inches deep. The subsoil consists of a mottled gray, brown, and yellow silty clay loam to silty clay. Small iron stains and fragments of the parent till generally occur in the lower part of the soil section. Where the drainage is poor, gray is the predominant color in the subsoil and the material is plastic and sticky. The content of organic matter in the surface soil is in many places high.

The Clyde silty clay loam, whose area is relatively small, is confined to that part of the county lying north of Stanwood. It occupies flat to depressed areas about the heads of streams, where drainage is sluggish.

In its natural state very little of the Clyde silty clay loam is cultivated, most of it being pasture land. Artificially drained areas produce excellent yields of corn and hay. Small grains grow too rank and, owing to the tendency to lodge, are not as profitable as corn. The yields are as follows: Corn, from 60 to 90 bushels per acre; oats, 35 to 40 bushels; and hay, 1½ to 2 tons.

The Clyde silty clay loam is handled in the same way as the Muscatine silt loam with which it is closely associated. Care should be used to plow under proper moisture conditions. If broken when too wet the soil clods badly, and if the harrow does not follow the plow while the soil is still moist the surface bakes and the preparation of a good seed bed is difficult. Drainage ditches should be dug and tile drains laid in the areas not yet in cultivation. The application of lime would improve the physical condition of the soil when drained, and its use is recommended not only for this purpose but to correct any acidity that may have resulted from its poorly drained condition.

The value of land of this type, owing to its poor drainage condition, is less than that of the Muscatine loam, averaging from $150 to $250 an acre, according to location and improvements.

SCOTT SILT LOAM.

The surface soil of the Scott silt loam consists of a black silt loam high in organic matter, grading abruptly at 10 to 15 inches into a gray floury silt loam, faintly mottled with yellow, which extends to

a depth of 18 to 20 inches. The subsoil is a gray tenacious silty clay mottled with brown, gray, and dark orange. Iron concretions are found in the lower part of the soil section. In many places the upper part of the soil, in a layer 2 or 3 inches thick, is peaty.

The Scott silt loam is inextensive. It is developed as small isolated areas in Inland Township, occupying depressions in the flatter parts of the Muscatine silt loam, and in Rochester Township, where it forms the soil of depressions in the Knox fine sand. The type is lacustrine in origin. The depressions are the filled-in beds of lakes or ponds, and drainage outlets are in many cases lacking or poorly defined. The impervious nature of the lower subsoil also impedes drainage, and water stands on the surface after rains.

The Scott silt loam is unimportant and is left in natural grasses and weeds. If properly drained and cared for, it should prove a valuable soil for corn and hay. Liming would be profitable, as the soil is acid. Owing to its small extent the type is never sold separately, but always in connection with the Muscatine silt loam.

BUCKNER FINE SAND.

The Buckner fine sand consists of a brown to light-brown fine sand to slightly loamy fine sand, 8 to 10 inches deep, underlain to a depth of 3 feet or more by a brown to yellowish-brown fine sand. In a few places, especially near Rochester, the surface soil is a pale yellowish brown to grayish-brown fine sand passing at 10 to 12 inches into a pale-yellow fine sand. Included with this type are a few small areas of fine sandy loam too small to be outlined on the map.

The Buckner fine sand is developed on the second terraces of the Cedar River. The largest bodies lie north of Cedar Bluff, at Rochester, and east of the river, near the Muscatine County line. The total extent is small. The type is above overflow and is excessively drained, crops suffering from drought except in years of more than average rainfall.

Owing to its lack of productiveness it is not often cultivated, but is left with its cover of native grasses and used for pasture. Some corn is grown and in wet seasons gives fair yields. Watermelons, cantaloupes, and potatoes also are grown to a small extent. The melons are of excellent quality and find a ready market in the towns of the area, and a few are sent to outside markets.

The type is farmed in practically the same way as the Buckner silt loam, with which it is closely associated. The yields, however, are somewhat lower. Farm buildings are not as substantial and well kept as on the Muscatine and Tama silt loam.

Land of this type has a much lower value than the Buckner and Muscatine silt loam areas. It is never sold except in connection with other types.

The Buckner fine sand is deficient in organic matter. This condition can be corrected by applying stable manure, and by growing and turning under green-manuring crops. The excellent results obtained from the growing of watermelons on this type of soil would indicate that this crop could be profitably grown on a commercial scale.

BUCKNER FINE SANDY LOAM.

The surface soil of the Buckner fine sandy loam is a brown light-textured fine sandy loam, 8 to 10 inches deep. The subsoil is a light-brown to yellowish-brown heavy fine sandy loam to fine sandy clay loam. Included with the type are a few areas of Buckner silt loam and fine sand too small to separate on the map.

The Buckner fine sandy loam occupies second terraces along the Cedar River. It is beyond the reach of ordinary overflow, having an elevation of from 12 to 20 feet above the normal level of the water. The largest areas lie near the junction of Baldwin Creek with the river and south of Cedar Bluff. The topography, as a rule, is level to gently sloping, and the drainage is good.

Practically all of this type is cleared and used in the production of corn, oats, and hay. Corn occupies the largest acreage. In the rotation generally followed on this type the land is left in pasture a much shorter time than is the case on the upland soils. Watermelons, cantaloupes, potatoes, and all kinds of garden truck are grown on a small scale for home use.

The type is farmed in practically the same way as the Buckner silt loam and Muscatine silt loam. Its light texture renders it easy to cultivate. It is a warm soil and matures crops earlier than the heavier types. The yields are somewhat lower than on the Buckner silt loam.

The Buckner fine sandy loam is well suited to the production of melons, potatoes, and vegetables, and the growing of these crops could be profitably extended, provided markets are found. The farm dwellings are not as up to date and well kept as on the upland soil types. The methods recommended for the improvement of the Muscatine and Buckner silt loam are applicable to this type.

The Buckner fine sandy loam, which is generally sold in connection with the adjoining soils, has a lower value than the Buckner silt loam.

BUCKNER SILT LOAM.

The Buckner silt loam consists of a dark-brown mellow silt loam 17 to 20 inches deep, underlain by a lighter brown to faintly yellowish brown heavy silt loam to silty clay loam which extends to a depth of 3 feet or more.

In the vicinity of Downey the surface soil is brown to almost black, while the subsoil at 30 to 33 inches grades into a yellowish-brown silty clay loam mottled with brown and gray. Near Massillon a few small areas are found which would have been separated as a different type had they been larger. The surface soil of these areas consists of a dark-brown to black silt loam, passing abruptly at 8 to 12 inches into a yellowish silty clay which extends to 24 or 30 inches. The lower subsoil is a yellowish-brown silty clay, mottled with brown and yellow, often grading at 3 feet into an impervious bluish-gray to dark-drab clay. Along both sides of the Cedar River, at the Johnson County line, some of the borings approached closely those of the Waukesha silt loam, but as they were not consistent over any considerable area and as the Buckner soil formed by far the more extensive type, no effort was made to separate them.

This soil is confined to the terraces along the Cedar and Wapsipinicon Rivers and a few of the larger creeks. The largest bodies occur in the vicinity of Cedar Bluff and in the bends of the river south of Rochester. The surface is nearly level and lies about 10 feet above the first bottom and 15 feet above the level of the stream, or above normal overflows. Drainage is adequate.

The Buckner silt loam, while of small extent, is considered a valuable soil, practically all of it being in cultivation. It is devoted to the growing of general farm crops, with very little seeded down or left in pasture. Corn occupies the largest acreage. Oats and hay come next, in the order named. Some wheat and rye are grown. All the grain excepting the wheat is fed to stock. A few dairy cattle are kept, and the surplus cream and butter is sold to the creameries and produce houses in the county. Corn yields from 38 to 80 bushels per acre, oats 30 to 60 bushels, and hay 1½ to 2 tons.

The methods of handling this soil are similar to those employed on the Muscatine silt loam, except that not as much manure is applied.

The price of land of this type ranges from $250 to $350 an acre.

The Buckner silt loam can be improved in the same way as the Muscatine silt loam. The greater part of the type is acid and should receive applications of lime at regular intervals. The growing of soy beans with the corn is recommended. Rape, planted with the corn, makes excellent pasturage for hogs.

CALHOUN SILT LOAM.

The surface soil of the Calhoun silt loam consists of a light-brown to grayish-brown silt loam, 14 to 16 inches deep. The subsoil is a gray floury silt loam passing at 20 to 22 inches into a gray silty clay mottled with brown, gray, and yellow. Iron concretions are often found in the lower subsoil. When dry the surface soil has

a grayish cast and floury feel. Southeast of Downey the soil is a brown to dark-brown mellow silt loam, 15 to 16 inches deep, passing into a gray layer having a silty clay loam texture.

The Calhoun silt loam is developed on terraces lying 2 to 6 feet above the first bottoms and 8 to 10 feet above the normal level of the streams. The topography is level to gently sloping, and drainage is adequate. Only two small areas occur in the county—one along the west side of the Cedar River south of Rochester and the other southeast of Downey.

Approximately half of this type is in cultivation and is devoted to the production of general farm crops. The part left in pasture supports a growth of grass, which affords good grazing for the few head of cattle usually kept. The tree growth consists mainly of a few oaks, elm, and maple. The Calhoun silt loam has a slightly lower value than the Buckner silt loam.

The soil when well cared for and cultivated should prove a valuable one. It is deficient in organic matter, and the growing and turning under of green-manuring crops is recommended. Stable manure also should be applied. The use of lime would improve the physical condition of the soil.

WABASH SILT LOAM.

The surface soil of the Wabash silt loam is a dark-brown to black silt loam high in organic matter and 15 to 20 inches deep. The subsoil is a dark-drab to dark-gray or grayish-brown silty clay loam to silty clay, mottled in the lower depths with rusty brown and yellow. A few iron concretions are found in the lower part of the soil section. In a number of places the upper layer, 2 or 3 inches thick, is lighter in color, ranging from brownish gray to light brown. This layer is of more recent origin than the typical soil, and is lighter because sufficient time has not elapsed since its deposition for the accumulation of organic matter.

The Wabash silt loam is developed in the first bottoms along the rivers and streams of the county. It occupies a position from 2 to 6 feet above the normal level of the streams and is subject to overflow. The surface is flat or slopes very gently toward the streams. Drainage is adequate when the streams are normal, but during wet seasons is poor.

The type is developed throughout all parts of the county, the largest areas occurring along Yankee Run in the vicinity of Lowden, where the bottoms in places spread out to a width of 1 mile. In other places the belts are from a few yards to a quarter of a mile wide.

Very little of the type is in cultivation, the greatest part being left in its natural state and used for pasture. A very small area is in forest, consisting principally of willow.

The type affords excellent pasturage. Corn is the principal cultivated crop. Yields range from 35 to 80 bushels per acre. A few beef cattle, dairy cattle, and hogs are kept by most of the farmers.

No farms are located wholly on the Wabash silt loam and it is sold only in connection with the adjoining types. It is recognized as a valuable soil for general farm crops, provided it can be drained and protected from overflow. The stream channels should be straightened and in places deepened and lateral tile drains laid. When well drained the fertility of the soil can be improved by the use of systematic crop rotations, deeper plowing, and more thorough preparation of the seed bed. The use of lime is also recommended.

Wabash silt loam, colluvial phase.—The surface soil of the Wabash silt loam, colluvial phase, consists of a dark-brown to black silt loam, 10 to 12 inches deep, underlain to 3 feet by a black silty clay loam to silty clay. In a number of places the soil extends to depths of 3 feet or more without any change in color or texture.

This phase is colluvial in origin, being derived from material accumulated along the upper reaches of the smaller drainageways by wash and creep from the adjoining slopes. It lies from 1 to 4 feet above the stream levels and as a rule is poorly drained, with places at the foot of the slopes where water stands the greater part of the year. Like the typical soil, most of the phase is left in pasture and supports a luxuriant growth of grass. Where cultivated, corn is the principal crop. Oats are grown, but make too rank a growth and have a tendency to lodge. The land is handled in practically the same way as the silt loam areas. No fertilizer or manure is used. When well tilled it is a valuable soil, especially for corn. The methods suggested for the improvement of the Muscatine silt loam apply equally well to the Wabash silt loam, colluvial phase.

The following table gives the results of mechanical analyses of samples of the soil and subsoil of the Buckner silt loam:

Mechanical analyses of Buckner silt 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.*
333223	Soil	0.0	0.0	0.0	1.5	28.5	51.2	18.8
333224	Subsoil	.0	.1	.1	.8	17.7	61.8	19.2

WABASH SILTY CLAY LOAM.

The surface soil of the Wabash silty clay loam is a very dark brown to black silty clay loam rich in organic matter and 12 to 17 inches deep. The subsoil is a dark-drab to dark-gray plastic silty clay, faintly mottled with brown. Iron stains are not uncommon and a few concretions are generally found in the lower depths. As is the case in nearly all first-bottom types, this soil is variable both in color and texture. The first 4 to 5 inches is often a black silt loam with a high content of organic matter. The dark-drab subsoil at places passes at 30 inches into a gray silty clay containing a quantity of iron concretions, while in other areas the soil extends from the surface to 3 feet without change. The degree and color of mottlings also vary widely.

The Wabash silty clay loam is not an extensive type. It is developed along the first bottoms of the Wapsipinicon River, the middle and east branches of Wapsinonoc Creek and along Rock and Pioneer Creeks. The surface is flat and lies from 2 to 4 feet above normal water level. It is thus subject to overflow and poorly drained. The areas along the Wapsipinicon River are swampy.

About 10 per cent of the area of this soil is in cultivation. With the exception of a few forested areas, in which the principal trees are oak and willow, the land supports a good growth of grasses and weeds, which make good pasturage. Corn is the principal cultivated crop, the yields comparing favorably with those obtained on the Muscatine silt loam.

The Wabash silty clay loam is naturally very productive, and if drained and protected from overflow it would prove one of the best corn soils in the county. Grasses also make an excellent growth. Owing to its heavy character the type is more difficult to handle than the silt loam, and care must be exercised to plow under proper moisture conditions. A more thorough preparation of the seed bed would no doubt increase the yields.

MEADOW.

Meadow as mapped in the county includes a heterogeneous mixture of Riverwash, Cass, and Wabash soils too intricately associated to separate. It represents recent alluvium and is composed principally of dark-brown to black surface soils and subsoils ranging from sands to clays. Under existing conditions it has little or no agricultural value. The largest part of the type is marshy and supports a luxuriant growth of grass and weeds. Along the stream banks are often found clumps of willow. It is used as pasture for the few cattle and hogs.

SUMMARY.

Cedar County is situated in east-central Iowa. It has an area of 570 square miles, or 364,800 acres. The county comprises two topographic divisions, the uplands and the terraces and first bottoms along the streams. The greater part of the county lies between elevations of 720 and 850 feet above sea level.

The drainage is carried by the Cedar and Wapsipinicon Rivers and their tributaries. Numerous small creeks and intermittent drainageways ramify throughout all parts of the county and afford excellent drainage.

Cedar County was formed in 1837. The population of the county is reported in the 1920 census as 17,560. It is almost exclusively native born. The entire population is classed as rural.

The county is served by the main lines of the Chicago & North Western and the Chicago, Rock Island & Pacific Railroads, and branches of these systems. The transportation facilities are good. A complete network of public roads covers the county. During the summer the roads are generally good. Churches and schools are located at convenient places throughout the county.

The climate of Cedar County is temperate and favorable for the growing of general farm crops. There is an average growing season of 168 days. The mean annual temperature is 48.9° F., and the mean annual precipitation 34.5 inches.

Agriculture has been practically the sole industry since the first settlement. Corn, oats, and hay are the principal crops. Wheat, barley, rye, potatoes, and garden truck are also grown on a small scale. Most of the farm products, with the exception of wheat, are used within the county either as human food or as food for farm animals.

The live-stock industry, which is important, consists of the raising and feeding of beef cattle, dairying, and hog raising.

The farm buildings are substantial and up to date. The farm equipment is good. Crop rotations are in general use. Manure is saved and applied to the land. The use of lime is increasing. Fertilizers are not used.

The work stock consists of draft horses of medium and heavy weight and a few mules. Tractors are in general use.

Farm labor is not as plentiful as it has been, and supplying this factor in production is becoming a serious problem.

The census of 1910 reported 96.1 per cent of the county in farms, the average size being 157.3 acres. Sixty-one per cent of the farms were operated by owners and 37 per cent by tenants.

The value of land ranges from $150 to $500 an acre, according to location and improvements.

The soils of Cedar County fall into three main divisions: (1) Soils of loessial origin, (2) soils of glacial origin, and (3) alluvial soils. The soils of the Muscatine, Tama, and Clinton series are of loessial origin; the Carrington soils are derived entirely from drift; the Lindley and Clyde soils are derived in part from drift and in part from loess; the Scott soils are of lacustrine origin; and the Buckner, Calhoun, and Wabash soils are of alluvial origin, the material being derived from loess.

The Muscatine silt loam is extensively developed in the county and is probably the most important agricultural soil. Corn, oats, barley, hay, and wheat are the principal crops. Practically all of it is in cultivation.

The Tama silt loam is extensively developed in the county. It is an important agricultural soil and well adapted to growing general farm crops.

The Clinton silt loam which occupies a large area, is developed principally in the rougher belts of country bordering the rivers and larger streams. Owing to its unfavorable topography, it is not considered as valuable a soil as the Muscatine and Tama silt loams. Dairying is carried on to a larger extent than on the smoother types.

The Carrington silt loam is an important agricultural soil, but not as extensively developed as the three preceding types. Corn, oats, hay, wheat, and barley are the principal crops.

The Lindley silt loam occupies a comparatively small area in the northwestern corner of the county. A very small percentage is in cultivation.

The Clyde silty clay loam is inextensive. Very little is in cultivation, the greater part being left in its natural state and devoted to pasture. Where cultivated it produces fair yields of corn. When well drained it is considered a valuable soil.

The Scott silt loam occupies a very small total area in the county. It occurs in poorly drained depressions and is seldom cultivated.

The Buckner silt loam is developed in the terraces along the Cedar and Wapsipinicon Rivers and some of the larger creeks. While inextensive, it is a good agricultural soil and nearly all of it is in cultivation. Corn is the principal crop.

The Buckner fine sandy loam is inextensive, but practically all of it is under cultivation. Corn, oats, and hay occupy most of the cultivated area. Watermelons, cantaloupes, and all kinds of garden truck are successfully produced on a small scale.

The Buckner fine sand occupies a very small area. It is not considered a valuable soil and the larger part of the type is used for pasture.

The Calhoun silt loam is relatively unimportant. Approximately 50 per cent of the type is under cultivation. It is used for the production of general farm crops.

The Wabash silt loam is developed throughout all parts of the county. It occupies a first-bottom position and is subject to overflow. Very little of the type is in cultivation. Where well drained it is considered a strong agricultural soil, especially adapted to the production of corn.

The Wabash silt loam, colluvial phase, resembles the main type except in origin. It is of small extent.

The Wabash silty clay loam is of small extent. It is subject to overflow and is poorly drained. When protected from overflow, it is considered a valuable agricultural soil.

Meadow, as mapped, includes areas of Wabash and Cass soils too intricately mingled to separate. It is poorly drained and in many places marshy. It supports a luxuriant growth of water-loving grasses and is ultilized for pasture.

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[PUBLIC RESOLUTION—No. 9.]

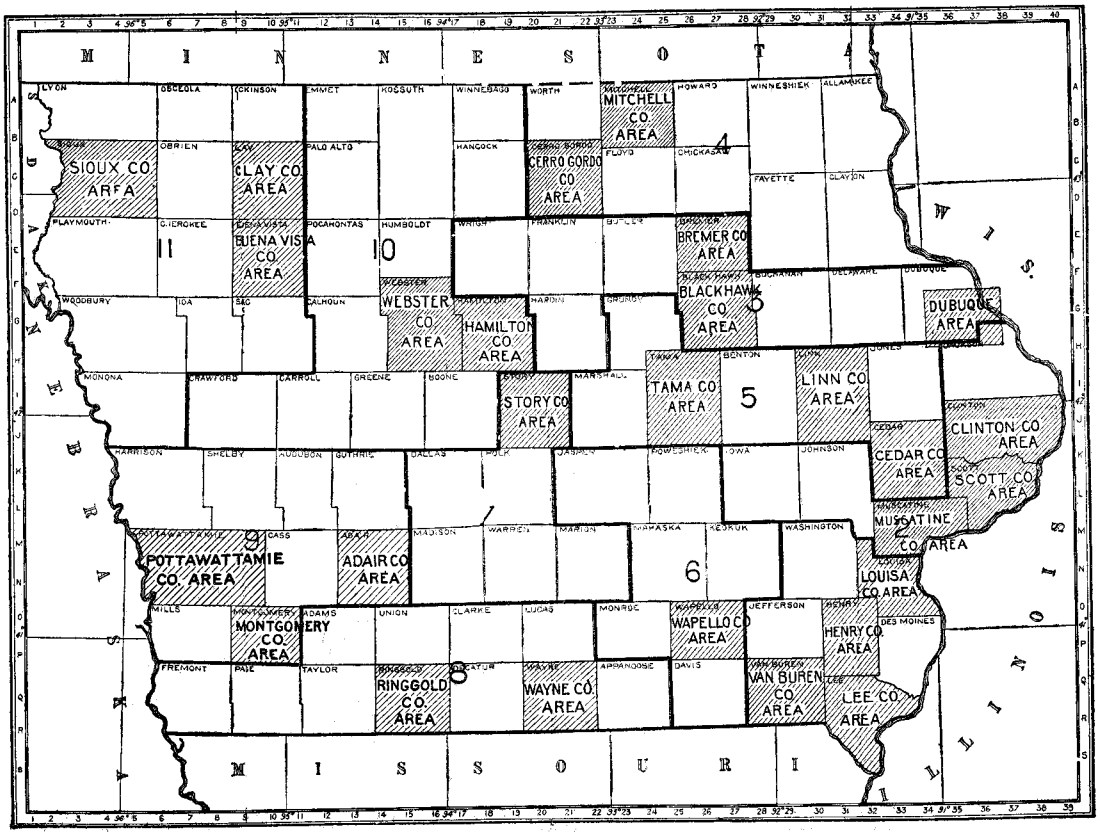
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for the use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided,* That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets, bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]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