

U. S. 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 HENRY COUNTY,
IOWA.

BY

A. H. MEYER, OF THE U. S. DEPARTMENT OF AGRICULTURE,
IN CHARGE, AND T. H. BENTON, OF THE IOWA
AGRICULTURAL EXPERIMENT STATION.

THOMAS D. RICE, INSPECTOR, NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1917.]



WASHINGTON:
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1919.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., December 3, 1918.

SIR: In the extension of the soil survey in the State of Iowa during the field season of 1917 a survey was undertaken in Henry County. This work was done in cooperation with the Iowa Agricultural Experiment Station.

I have the honor to transmit herewith the manuscript report and map covering this work and to request their publication as advance sheets of Field Operations of the Bureau of Soils for 1917, as authorized by law.

Respectfully,

MILTON WHITNEY,
Chief of Bureau.

HON. D. F. HOUSTON,
Secretary of Agriculture.

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MAP.

Soil Map, Henry County sheet, Iowa.

SOIL SURVEY OF HENRY COUNTY, IOWA.

By A. H. MEYER, of the U. S. Department of Agriculture, In Charge, and T. H. BENTON, of the Iowa Agricultural Experiment Station.—Area Inspected by THOMAS D. RICE.

DESCRIPTION OF THE AREA.

Henry County is situated in the extreme southeastern part of Iowa, in the second tier of counties west of the Illinois State line and in the second tier north of the Missouri State line. It forms a rectangle 24 miles in length, north and south, and 18 miles in width. The county contains 12 townships, and comprises an area of 427 square miles, or 273,280 acres.

Henry County was originally part of a smooth plain which has been developed through the agencies of erosion into two distinct topographical divisions. The first consists of an undulating prairie, occupying the northern and northeastern part of the county. Owing to its distance from any stream of considerable size, this region

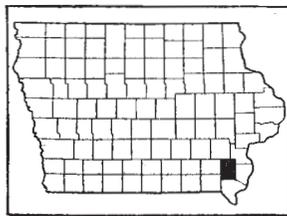


FIG. 1.—Sketch map showing location of the Henry County area, Iowa.

has been very little modified by erosion, and the original surface is intact over 30 per cent of its area. Except for artificial drainage large areas here would still be in a wet, marshy condition. In the northern part of the county the level landscape is broken by two old valleys one-fourth to three-fourths mile in width with floors 15 to 20 feet below the upland surface. One of them enters the county in the northeastern part and, trending toward the west, passes a short distance north of Winfield, where it divides. A branch extends northwestward and leaves the county, but reenters it at Coppock in the extreme northwestern part. This old channel is occupied throughout the greater part of its course by Crooked Creek. The other branch extends almost due west of Winfield and forms a conspicuous valley across the northern part of the county, uniting with the former channel at Coppock. Along the county line east of New London, this topographic region is marked by numerous rounded ridges and irregular hills.

Over the remainder of the county the surface presents the erosional features characteristic of the Kansan drift plain. The topography evidently represents the work of Skunk River, the principal stream of the county, and its major and minor tributaries, which

reach all parts of the region. For the most part the streams have cut their channels entirely through the drift, and in many cases they have carved their beds deep into the underlying limestone. As a consequence the country is rolling to steeply rolling or hilly, but with small smooth isolated prairies, the largest of which occurs in the vicinity of Salem. As a rule the hilltops are flat and appear to have the same general level. Along the main stream courses the slopes are usually steep and dissected, while within the divides the slopes are gentle. In many places along Skunk River and Big Creek the bedrock stands at the top in bold bluffs.

Wind apparently has had a share in determining the topography in some places. In the southwestern part of Jefferson Township and the northwestern part of Trenton Township the level valley is bordered for several miles by a series of sand hills instead of the low ledges of limestone that usually follow the rivers at some distance on each side. These hills vary in height from about 20 to 40 feet. Their long axes trend east and west, almost at right angles to the river valley. The surface material is almost pure, yellow sand, and it is probable that the hills have been slowly built up of material deposited by the winds as they swept over this level river bed of loose sand. In sec. 6 of Jefferson Township, there are similar hills, but the material is finer. In sec. 21, Tippecanoe Township, and in sec. 4, Salem Township, the hills on the east side of Big Cedar Creek Valley consist of sand and are probably of wind origin.

It is noticeable in many parts of the county that the southerly slopes are smooth and gentle, while those facing north are usually broken and rugged.

There are some flat alluvial terraces in the county, but they are of small extent and occur chiefly along Skunk River, Big Cedar Creek, and Little Cedar Creek. They lie from 5 to 20 feet above the present flood plains. The terraces are prevailingly uneroded, but a higher terrace southeast of Lowell has been considerably eroded and has lost its terrace characteristics. The area of first bottom is very inextensive owing to the narrowness of the valleys along the major streams. The surface of the bottom land is level, with only slight inequalities.

Skunk River drains practically the whole county. Its principal tributaries are Big Cedar Creek, Big Creek, and Crooked Creek. All these larger streams are very sluggish and meandering. With the exception of the broad divide running through the northeastern part of the county, drainage is everywhere adequate. All the first bottoms are overflowed annually, but the overflows are rarely destructive, and water seldom remains more than 18 hours on the surface of the flood plain during the growing season.

The upland has an average elevation of about 700 feet above sea level. The highest point in the county, 762 feet above sea level, occurs in the vicinity of New London, at the edge of the Illinoian Moraine. The average elevation of the bottom land is about 600 feet.

The first permanent white settlements in Henry County were made in the spring of 1834, $1\frac{1}{2}$ miles west of Mount Pleasant. The territory of which Henry County forms a part was purchased from the Sac and Fox Indians through their chief, Black Hawk, in 1832, and Henry County was created by the Wisconsin Territorial Legislature in 1836. The early settlers were largely from Ohio, Kentucky, Indiana, Virginia, Pennsylvania, and New York. Later there was an influx of Germans, Swedes, and Irish. In the vicinity of Wayland most of the inhabitants are from Alsace and Lorraine. At present there are only a few foreign-born persons in the county.

The total population of Henry County in 1910 was 18,640, of which 79.2 per cent is classed as rural. The density of the rural population is 34.6 persons to the square mile, and the rural settlement is uniformly distributed throughout the county. There has been a slight decrease in the total population of the county since 1880.

Mount Pleasant, the county seat, with a population of 3,874 in 1910, is a distributing point for farm implements and supplies, and has a canning factory, brick and tile yards, a creamery, several milk stations, and a stone crusher. The State insane asylum is located here and also Iowa Wesleyan College. New London, Winfield, Wayland, Salem, Hillsboro, Mount Union, Rome, and Olds are towns of local importance. An electric power plant is operated at the station of Oakland Mills.

Henry County is well supplied with railroads, few points being more than 8 miles from a station. The Chicago, Burlington & Quincy Railroad crosses the county centrally from east to west and gives direct communication with Chicago and Omaha. From Mount Pleasant the Keokuk & Mount Pleasant Branch of the same system extends southward and connects with the main line at Keokuk. The Ottumwa & Fort Madison Branch touches the southwestern corner of the county. The northern part of the county is traversed by the Oskaloosa Branch of the Chicago, Burlington & Quincy Railroad and the Minneapolis & St. Louis Railroad. The Washington Branch of the Chicago, Burlington & Quincy extends north of Winfield.

There are many excellent graded roads through the county, including a few automobile routes. The roads generally follow section lines or land lines, but in the hillier portions of the county they frequently detour along gentler slopes. All the roads are of earth and little attention is given to the minor roads. The more

important highways are dragged as soon as the ground permits after each rain. There are no toll roads.

Chicago, Peoria, and St. Louis constitute the principal markets for the farm products of Henry County. Cattle and sheep are generally shipped to Chicago, hogs to Cambridge, Mass., and Chicago, and corn and oats to Peoria and St. Louis. The principal markets for chickens are Winfield, in Henry County; Brighton, Iowa; and Keithsburg, Ill. In the local towns there is a small demand for dairy products, berries, and vegetables.

Rural mail delivery routes and telephone lines reach practically all parts of the county. Most of the public schools are well kept, and school facilities are accessible to all communities.

CLIMATE.

The mean annual rainfall, as recorded at Mount Pleasant, is 33.40 inches. From 60 to 70 per cent of the rainfall occurs during the growing season, from April to September, inclusive. About 40 per cent falls during the months of May, June, and July, with the maximum during June. December, January, and February are the driest months, with a total precipitation of 4.38 inches. Most of the summer rainfall occurs in the form of thundershowers, and precipitation is very heavy within short periods of time, ranging from 1 to 6 inches in single storms. The rainfall in May and June usually is well distributed, and droughts in these months are practically unknown. In July and August the rainfall is not as favorably distributed, and periods of drought may occur. The average annual snowfall is about 25.1 inches. Little snow falls before December or after March.

The mean annual temperature is about 50.2° F. January and February are the coldest months, with an average temperature of about 23.5° F. July is the warmest month, with an average of 75.8° F. The lowest temperature recorded at Mount Pleasant is 27° below zero, in February, and the highest, 109°, in July. The average date of the first killing frost in the fall is October 12, and that of the last in the spring, April 24. The date of the earliest recorded killing frost in the fall is September 22, and that of the latest recorded in the spring, May 7. There is an average growing season of about 170 days, which is sufficiently long to mature all the ordinary farm crops.

In the following table are shown the more important climatic data as compiled from the records of the Weather Bureau station at Mount Pleasant:

Normal monthly, seasonal, and annual temperature and precipitation at Mount Pleasant.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year, 1901.	Total amount for the wettest year, 1902.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	27.8	65	-21	1.36	0.23	1.08	5.1
January.....	22.1	68	-24	1.51	.80	.19	5.6
February.....	24.9	66	-27	1.51	.48	.87	7.4
Winter.....	24.9	68	-27	4.38	1.51	2.14	18.1
March.....	36.7	87	- 9	2.21	2.33	1.93	4.4
April.....	51.2	88	12	2.90	1.98	3.29	1.3
May.....	62.6	97	25	4.47	1.37	3.70	T.
Spring.....	50.2	97	- 9	9.58	5.68	8.92	5.7
June.....	71.4	101	36	5.11	2.01	10.96	0.
July.....	75.8	109	46	3.42	2.91	8.70	0.0
August.....	73.4	101	38	3.43	.48	10.06	0.0
Summer.....	73.5	109	36	11.96	5.40	29.72	0.0
September.....	65.4	101	25	3.23	2.64	4.88	0.0
October.....	52.7	91	18	2.46	.79	4.65	0.2
November.....	37.8	80	- 1	1.79	.72	1.82	1.1
Fall.....	51.9	101	- 1	7.48	4.15	11.35	1.3
Year.....	50.2	109	-27	33.40	16.74	52.13	25.1

AGRICULTURE.

Originally the smooth upland of Henry County was covered with a luxuriant growth of prairie grasses, while the more broken areas were timbered. Many of the first settlers established themselves on the timber covered areas adjoining the prairies on account of the availability of building material and fuel and owing to the protection from the fires which swept the prairies annually. During the first few years vegetables, corn, and wheat were grown for subsistence. Since the settlers lacked suitable implements for breaking the prairie sod, they used such lands chiefly as stock ranges. As conditions became more stable the farmers began to break the prairie land for the more extensive production of corn and wheat, as a cash crop, and of oats as stock feed. Flax was grown at one time, but was soon discontinued as a money crop. Yields obtained by the early settlers were in many cases higher than at present, but with poor methods of farming the yields soon decreased. The prices of crops

were very low and the farmers were generally in poor circumstances. Within the last 20 or 30 years agricultural conditions have gradually improved, and to-day most of the farmers are thrifty and prosperous. The dairy industry, the raising of hogs and cattle, and the feeding of beef cattle have doubtless been important factors in this progress, but the improved conditions are due chiefly to better methods of handling the soil.

In 1879 corn was the most important crop. It was grown on 68,057 acres, as compared with 20,594 acres in wheat. Oats were grown on about 16,000 acres. Barley and buckwheat each occupied less than 100 acres. Hay was cut from a total of 29,026 acres. The orchard products in 1879 were valued at \$42,882, the market garden products at \$3,180, and the forest products at \$60,675.

Owing to the prevailing low prices, the area devoted to corn decreased to 53,707 acres by 1889, while oats increased to 29,234 acres to meet the demands for feed for the work stock. Wheat is reported grown on only 6,577 acres in 1889. Hay was grown on 40,385 acres, rye on nearly 1,654 acres, and barley on less than 130. Potatoes are reported on nearly 841 acres, buckwheat on 74 acres, and broom corn on 20 acres. The market-garden products and small fruit had a total value of \$7,880.

From 1889 to 1899 there was a steady advance in the acreage of corn. In 1899 almost 67,000 acres were devoted to this crop, 31,956 acres to oats, and only 456 acres to wheat. The area in rye had declined to 1,483 acres. There had been a slight reduction in the hay crop. Tame grasses were reported on about 30,011 acres, and no wild hay was cut. There were about 66,781 apple trees in the county in 1899, 15,315 grapevines, and 18,157 peach trees. The animals sold or slaughtered in that year were valued at \$1,059,903, the dairy products at \$206,050, and the poultry products at \$108,269. From 1899 to 1909 there was a large increase in the acreage of corn and hay. Wheat showed a small gain, while oats had remained about stationary.

At present the production of grain is the chief type of farming in Henry County. Dairying and the raising of hogs and other live stock are important industries. Corn, oats, timothy, mixed timothy and clover, clover alone, and wheat are the chief general farm crops. The tendency at present is to grow less corn and more hay.

Corn is by far the most extensively grown crop and the principal source of revenue. The report of the State Board of Agriculture for 1916 shows corn grown on 65,980 acres, with an average yield of 34.2 bushels per acre. There are about 2 acres of corn to every acre of all other cereals combined, despite the fact that the acreage has declined about 11,000 acres since the 1910 census. About one-third of the total acreage of improved farm land in Henry County is devoted to the

production of corn. The crop is grown on practically all the soil types of the county, but does best on the Grundy silt loam and silty clay loam. Reids Yellow Dent, Funks Yellow Dent, Little Iowa Silver, and Little Calico are the leading varieties, the first two named being most popular. A few miscellaneous early varieties are grown. Practically all the corn is check-rowed. About one-half the corn is sold and the remainder is fed largely to hogs and cattle. It is a general practice to pasture the corn lands after the ears have been removed. There are about 90 silos in the county, and the number is gradually increasing.

Oats rank second in acreage. In 1916 there were 27,192 acres in oats, with an average yield of 35.2 bushels per acre. About 60 per cent of the crop is fed to horses and mules, and the remainder is shipped, largely to Peoria and St. Louis. Early Champion, Russian Green, Kherson, "Iowa No. 103," and Burt Red are the principal varieties grown. They are early and medium varieties, and are well suited to the climatic conditions. Smut is quite common in this county and causes an annual loss of many thousands of dollars. It can be easily controlled by the formalin treatment. There seems to be a tendency to increase the acreage of the "Iowa No. 103" and the Kherson varieties of oats and to reduce the acreage of the Early Champion.

The other cereal crops are unimportant from a production standpoint. In 1916 there were 2,106 acres in winter wheat, 555 acres in rye, 75 acres in spring wheat, and 37 acres in barley. Obviously, not nearly enough wheat is produced for home use. Turkey Red is the main variety of winter wheat grown, and Marquis and Early Java of spring wheat. A few small patches are devoted to buckwheat.

Timothy and clover mixed constitute the most important hay crop, occupying 13,880 acres in 1909. The report of the State Board of Agriculture does not distinguish between the different hay crops, but reports a total harvesting of hay on 30,700 acres, with an average yield of 1.3 tons per acre. Clover and timothy do well, and, as a rule, little difficulty is experienced in getting a stand. In the 1910 census there are reported 13,013 acres in timothy alone, 3,702 acres in clover alone, 145 acres in other tame grasses, and 45 acres in millet. Some red clover and timothy seed is produced. Ordinarily clover yields 1 to 3 bushels of seed per acre and timothy 4 to 6 bushels. All the hay produced is fed to work stock and cattle, and a small amount is shipped in every year.

The growing of alfalfa is in an experimental stage, and at present there is not enough information available to tell whether this will become an important hay crop. Some farmers report success with the crop and others failure, but on the whole it seems that with

liming and inoculation the crop could be successfully grown. The State Board of Agriculture reports 247 acres in alfalfa, with an average yield per acre of 2.9 tons.

In the vicinity of Mount Pleasant sweet corn is grown for canning. Almost 1,200 acres are devoted to this crop, which gives an average yield of about 3 tons per acre. The waste at the factories is stored in a silo and is chiefly fed to cattle owned by the factory. When sold it brings \$3 a ton. Practically all the land used for sweet corn is rented by the factory on 10 to 12 year leases, at a cost ranging from \$6 to \$10 an acre. A small amount of sweet corn is bought from the farmers directly, and for the season of 1917 the price paid was \$9 a ton.

Potatoes are reported on 323 acres in 1916, and the average acreage yield is given as 65.4 bushels. Not nearly enough potatoes are grown for home use. About 100 carloads were shipped in during the year 1917, when there was a nation-wide movement to produce food for home use.

Trucking receives little attention from a commercial standpoint, owing to the distance to markets. Some vegetables are grown on a commercial scale near the cities and villages to meet the local demand. The 1910 census reports 691 acres in vegetables, and the aggregate value of the production amounted to \$111,720.

Most of the farmers have small orchards of apples, plums, and pears. These fruits do well when properly cared for, especially in the more rolling sections of the county. There are only one or two commercial orchards, but a few are being planted. Several carloads of apples are shipped in every season.

Dairying is steadily gaining in importance. Most of the farmers keep dairy cows, chiefly Shorthorn grades. The Guernsey and Holstein, and in a few localities the Jersey, are gaining in favor as dairy stock. The number of cows per farm varies from 4 to 10, being considerably higher on the dairy farms near the cities and towns. Most of the dairying is done during the summer months, and in the winter not enough milk and butter are produced for home use. Most of the cream is separated on the farm. The bulk of the surplus is gathered by a creamery located in Mount Pleasant, which manufactures butter, ice cream, and cheese. Some is taken to cream stations located at the various railroad points. Some butter is made on the farms and sold at the local markets. The census reports the total value of all the dairy products gathered or made in 1909, excluding those used in the home, at \$151,510.

In several communities of Henry County the beef industry has been given special attention. Most of the beef cattle are raised in the vicinity of Olds, Wayland, and Mount Pleasant. They are

mostly of Shorthorn, Angus, and Hereford breeding, with a few herds of Red Poll. A large number of pure-bred cattle for breeding purposes are shipped out of the county every year. A number of farmers feed one or two carloads of cattle obtained from stockyards, and on most farms a few head are fattened each year to be sold when prices are most favorable. Most of the beef cattle are marketed in Chicago. The census reports 1,272 calves and 17,195 other cattle sold or slaughtered in 1909.

Considerable attention is being given to the breeding of draft horses. Nearly every farmer raises 1 or 2 colts a year and many raise 4, 5, or 6. In this way they supply their own work stock and occasionally have a team to sell. The Percheron is the most popular breed over the county as a whole. About 5 to 10 per cent of the colts are mules. The census reports 2,289 horses and mules sold in 1909. The State Board of Agriculture gives the total number of horses in the county in 1916 as 11,401, and of mules 587.

Sheep raising is gradually becoming a more prominent industry. It is chiefly confined to the southwestern part of the county. The State Board of Agriculture reports 13,886 sheep in the county in 1916. The Shropshire is the most popular breed, but some Delaine, Merino, and Cotswold sheep also are raised. The census reports 15,057 sheep and goats sold or slaughtered in 1909. The value of the wool, mohair, and goat hair produced in that year was \$41,331.

The raising of hogs is the most important live-stock industry in Henry County. Nearly every farmer fattens 20 to 30 head each year, and many of the larger farmers raise several hundred head. On tenant farms not nearly so many hogs are kept. Pork production is profitable, although cholera is prevalent and reduces the profits considerably. Most of the hogs are shipped to Keithsburg, Ill., where they are reshipped in double-decked cars to Cambridge, Mass. Some are shipped to Chicago and other points. Nearly every farmer butchers enough hogs to supply the home with meat the year round. Duroc-Jersey and Poland-China are the leading breeds, though some Chester Whites, Hampshires, and Berkshires also are raised. There are a number of registered herds in the county. According to the State Board of Agriculture, there were 57,450 hogs in the county in 1916, and the census reports 50,416 hogs sold or slaughtered in 1909.

The total value of poultry and eggs produced in 1909 was \$402,992. Practically every farmer keeps from 40 to 150 fowls. The eggs and poultry are mainly handled by the poultry establishments at Winfield and Brighton, Iowa, and Keithsburg, Ill.

The adaptation of soils to crops is not considered closely in the farming operations. It is generally recognized that corn is best adapted to the Grundy soils and hay and pasture grasses to the

Clinton silt loam, but there is little difference in the type of farming followed on the different soils.

Definite crop rotations are followed by only a few farmers. The general tendency is to keep the same field in corn for 2 years, in oats 1 year, and in clover and timothy 1 to 3 years. In the northern part of the county the land is usually kept in hay 1 year. A few farmers plant the same crop on one field for a series of years.

As a whole the tillage operations in Henry County are thorough, as the high price of land makes efficiency necessary. About 30 per cent of the farm land is plowed in the fall and 70 per cent in the spring. Oat stubble is nearly always plowed in the fall. Practically all the corn is check-rowed. It is necessary to exercise considerably greater care in the preparation of seed beds on the heavier soils. Considerable barnyard manure is used, usually being applied on sod ground. In the vicinity of Mount Union a few farmers plow under clover as a green manure, with very beneficial results. According to the census, the total expenditure for fertilizers in the county in 1909 was \$764, only 26 farmers reporting their use.

The farm buildings, especially the houses, usually are well painted and kept in good repair. There are many large, modern houses. The barns are usually small, but as a rule are substantial and well kept. There are only a few hedge fences, and these are largely of Osage orange. Practically all the boundary fences and cross fences are of barbed wire, though woven wire is coming into more general use.

The work stock consists mainly of heavy draft horses. There are only a few gasoline tractors in the whole county. On most farms the 4-horse hitch is used. The farm equipment consists of gang or sulky plows, walking plows, disk harrows, straight-tooth harrows, drills, corn planters, corrugated rollers, mowing machines, cultivators, rakes, hay loaders, and binders. Thrashing machines are available in all sections immediately after harvest.

It is rather difficult to obtain efficient farm help. The usual wage paid is \$30 to \$35 a month, with board and washing. Most of the laborers are hired from March to October 1 or December 1, but a few farmers employ labor by the year, as it is easier in this way to get efficient hands. Where they are hired only to October 1, the laborers are paid additional rates of 6 to 8 cents a bushel for husking corn. The daily wage for transient labor during harvest time ranges from \$2 to \$3 a day, with board. The farmers are beginning to hire married men with families, furnishing them with tenant houses, milch cows, chickens, gardens, and fruit. Under this plan the wages range from \$40 to \$60 a month. Most of the farm work is still performed by the farmers and their families. The total expenditure for labor in 1909 was \$185,135.

Approximately 96.5 per cent of the total area of Henry County is in farms, and 79.3 per cent of the farm land is improved. The average size of the farms is 123 acres. Since 1880 the average size has increased 3 acres. In 1910, 68.3 per cent of the farms were operated by owners, 31 per cent by tenants, and 0.7 per cent by managers. Both the cash and share systems of renting, as well as a combination of the two, are followed, the share system being most popular. Cash rents range from \$6 to \$10 an acre for general farming land, depending on the soil. Where land is leased on shares one-half of the product goes to the owner, and all implements and stock must be furnished by the tenant. In the case of combined cash and share accounting the permanent pasture and wood lots are rented for cash and the grain and hay lands on shares. In any case the tenant is required to deliver the landowner's grain to the elevator.

In 1900 the average assessed value of all farms and improvements except buildings was \$39.50 an acre, and by 1910 it had risen to \$104. Of the total value of all farm property, 74.9 per cent is represented by the land, 13.1 per cent by the buildings, 2.2 per cent by the implements, and 9.8 per cent by domestic animals. At present (1917) the price of farm land ranges from \$50 to \$350 an acre, depending on the soil, improvements, and location.

SOILS.

The upland soils of Henry County have been derived from glacial drift and loess through the agencies of weathering. To understand the relative positions of these materials it is necessary to know their geological history. At the beginning of the present era of soil formation this entire area was covered by two layers of transported material, drift and loess. The drift consists of two distinct sheets known as the Kansan and the Illinoian drift sheets. The loess sheet was deposited later.

With the exception of a narrow strip along the eastern edge of New London and Baltimore Townships, the drift exposed in Henry County belongs to the Kansan stage. This is the second drift sheet which overspread the greater portion of Iowa. The pre-Kansan drift is, as far as known, not exposed anywhere within Henry County, but its presence is revealed in well borings as layers of sand. This stratum of sand is the chief source of water supply for the shallow wells.

The Kansan drift, where exposed in a thick bed, is a bluish clay containing numerous small bowlders, varying in diameter from 1 or 2 to 10 or 12 inches. A few large bowlders also are present. The larger ones are usually of reddish-gray granite, but many of the smaller ones are of dark-colored, fine-grained trap known as greenstone. Fragments of limestone are also found in the clay matrix.

The surface layer of the Kansan drift where it is exposed has been leached of its lime content. The material has a red or reddish-brown color for a depth of 1 to 3 feet, grading downward through yellow to the typical bluish color of the unchanged drift.

At different places in Henry County there is exposed above the Kansan drift a bed of interstratified sand and gravel, known geologically as the Buchanan gravels. Apparently these beds were laid down along the channels of the streams following the melting of the Kansan ice.

The Illinoian drift in Henry County is exhibited by a portion of the terminal moraine which is located in the eastern part of Baltimore and New London Townships. As a rule, there are more red jasper boulders in the Illinoian drift, but otherwise it is very similar to the Kansan in the kind of rock and the absence of calcareous matter. The main difference between the two drifts is brought out by the morainic character which marks the western extension of the Illinoian drifts.

The drift sheets were laid down unconformably over the eroded surface of the Carboniferous rocks, burying them to a depth which in places reached at least 175 feet. The preglacial erosion had developed deep valleys over the entire area.

The loess forms a mantle over the surface of the entire area. In its original unweathered condition it consists of unconsolidated material ranging in texture from silt loam to silty clay loam and in color from light gray to light yellow. It has been leached of its lime content and shows an acid reaction to litmus. The presence of iron is indicated by rusty blotches and streaks.

The bedrock of Henry County is represented by the Carboniferous system, which is subdivided into the upper Carboniferous or Pennsylvanian and the lower Carboniferous or Mississippian. Though these series are closely associated, a long period is represented between their deposition, the lower series having undergone a short cycle of erosion, forming valleys and hills before the upper was laid down. Of the lower series there are present the Augusta and St. Louis stages and of the upper the sandstones of the Des Moines. Of the Augusta stage in Henry County only the Keokuk substage is exposed. The St. Louis stage is represented by the Pella, Verdi, and Springvale formations. The bedrock consists largely of limestones, with some shales and sandstones. It is exposed mainly in the eroded or rather hilly sections of the county. None of the soils of the county have been derived directly from the weathering of these rocks.

The drift material has given rise to the Lindley series of soils and the loess to the Grundy, Clinton, Marion, and Knox series.

The terraces of Henry County are not extensive. They consist largely of silt derived from the upland loess and finely divided drift

débris. The material was deposited on the former flood plains at a time when the streams were flowing at a higher level than at present. The Calhoun, Buckner, and Jackson series of soils are developed on the terraces.

The principal areas of alluvial soil occur along Skunk River and Big Cedar Creek, but small areas are distributed throughout the county. These soils are of recent origin and are constantly receiving additional sediments from the overflow waters of the streams. They largely represent reworked and deposited loessial and glacial material. The alluvial soils are classed in the Wabash and Genesee series.

The types of the Grundy series have dark-brown to black soils, with an average depth of about 10 inches, underlain by a brown, moderately friable layer which passes rather abruptly into a gray or light-gray silty clay mottled with yellow or yellowish brown. When wet this silty clay is plastic, and when dry it is extremely tough and hard. The topography of the Grundy soils is gently rolling to flat.

The Clinton surface soils are prevailingly light brown or grayish brown, and have an average depth of about 8 inches. The upper subsoil is usually yellowish brown, passing rather sharply at about 20 inches into a plastic silty clay. These soils occur mainly in eastern Iowa and western Illinois. The topography is rolling to hilly and the surface drainage is good.

The soils of the Marion series are light gray to almost white. The subsoil consists of two layers, the upper being a pulverulent, white silt loam and the lower a plastic, tough, impervious, darker colored stratum. The change from the upper stratum to the lower is very abrupt in color, texture, and structure.

The Knox soils are prevailingly light brown in the surface and yellow or yellowish brown in the subsoil, which has a loose open structure. The topography is rolling and the surface drainage is excessive.

The Lindley soils are derived through the weathering of glacial till, with little or no modification from loessial deposits. The series is developed largely in the central prairie regions, and consists mainly of timbered soils. The surface soil is generally brown, ranging in some cases to reddish brown. The subsoil is lighter colored, generally being light brown or yellow. The topography is rolling to hilly.

The Calhoun series is characterized by gray soils and gray or drab, heavy clay subsoils. The latter are characterized by a tenacious, waxy, impervious structure, and often contain iron concretions. In places the substratum consists of sandy material. These soils occupy poorly drained, flat stream terraces. They are not subject to inun-

dation, but water stands on the surface for long periods after rains. The material is alluvial in origin and has been derived principally from the silty soils of the prairie regions. Both soil and subsoil are deficient in lime.

The Buckner soils are brown, with lighter colored, friable subsoils. They are composed principally of reworked loessial material, frequently mixed with sediments from glacial and residual soils. The surface is level, but drainage is good and the soils by their position on terraces are protected from overflow.

The Jackson soils are prevailingly light brown to brown, and lower in organic matter than the Buckner soils. The subsoil is moderately friable and yellowish brown. These soils are derived from water-assorted loess and glacial débris deposited in broad, filled-in valleys or as outwash plains and terraces. The topography is mainly flat to undulating and drainage is good.

The Wabash soils are prevailingly black, ranging to dark brown, and contain a high percentage of organic matter. The subsoil is brown or brownish gray. These soils occur in the first bottoms of streams in the central prairie States. The material is derived principally from the loessial and associated soils of the region. The Wabash areas are flat and poorly drained.

The soils of the Genesee series range from light brown to grayish brown or nearly brown. There is usually little variation in texture to a depth of 3 feet, but the subsoils may be either lighter or heavier than the surface soils. The Genesee soils occupy the first bottoms of streams and are subject to annual or frequent overflows.

The following table gives the names and the actual and relative extent of each soil type mapped in Henry County:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Grundy silt loam	107,584	39.4	Genesee fine sandy loam	4,096	1.5
Clinton silt loam	66,560	26.9	Genesee silt loam	2,688	1.0
Broken phase	6,912		Calhoun silt loam	2,304	0.8
Grundy silty clay loam	40,768	14.9	Buckner very fine sandy loam	1,344	.5
Marion silt loam	13,504	4.9	Knox fine sand	1,152	.4
Lindley loam	13,056	4.8	Wabash silty clay loam	960	.4
Wabash silt loam	7,296	2.7			
Jackson silt loam	5,056	1.8	Total	273,280

GRUNDY SILT LOAM.

The soil of the Grundy silt loam as it occurs in Henry County is typically a dark-brown or nearly black, heavy silt loam, 10 to 15 inches deep, with an average depth of 12 inches. It passes gradually into a moderately friable, heavy silt loam or silty clay loam of a

brown to dark-brown color. This subsurface layer may have faint mottling of brown and occasionally may be gray in color where the type approaches the characteristics of the Putnam silt loam. At any depth from 18 to 20 inches the intermediate layer passes rather sharply into a dark-gray or gray mottled with yellow, yellowish-brown, or rusty-brown silty clay. The dominant color as well as the mottlings become lighter with depth. The lower subsoil is compact, hard, and tough, being moderately crumbly when dry and very plastic and impervious when wet. It is locally termed "hardpan." The lower part of the 3-foot section seems to be somewhat lighter in texture and less tenacious in structure. As the color indicates, the soil is high in organic matter. According to the litmus test the material is acid.

In localities where erosion has been very active the lighter colored subsoil is exposed. In the northeastern part of the county the Grundy silt loam has in places a more open structure than typical, in a few cases approaching the Muscatine silt loam.

This is the most extensive type in the county, covering about 170 square miles or about three-sevenths of the total area. It is extensively developed in the northern and northeastern part of the county, and small developments occur throughout all sections.

The Grundy silt loam has a gently undulating to gently rolling topography. The valleys are shallow and as a rule have gentle slopes. Drainage is fairly well established, but on many farms tile drains have been laid to hasten the removal of surface water. The type lies at an elevation of about 650 to 760 feet above sea level.

The Grundy silt loam originally supported a thick growth of the prairie grasses common to this region, but none of the native sod remains. Approximately 95 per cent of the type is under cultivation. It is considered one of the best upland corn soils in southeastern Iowa. From two-thirds to three-fourths of the farm land is devoted to the production of this crop, and the remainder is largely in oats, clover, and timothy. In average seasons corn yields 45 to 60 bushels per acre and occasionally as much as 70 bushels. Oats rank second in acreage. This crop ordinarily yields 35 to 40 bushels per acre. Very little wheat is grown, but the crop ordinarily yields 20 to 30 bushels per acre. Clover and timothy mixed make up the principal hay crop on this soil, but some alsike clover, millet, and sorghum are grown. In favorable seasons clover does well, yielding $1\frac{1}{2}$ to $2\frac{1}{2}$ tons per acre. Very little alfalfa is grown, as a great deal of difficulty is experienced in getting a stand. Small patches of barley and rye also are produced. About one-half of the corn and oat crop is sold. The remainder of the corn is fed largely to hogs and beef cattle and the oats to work stock. Practically all the hay produced is fed on the farms, and occasionally hay is shipped in from points farther west.

No definite crop rotations are followed on this type. The general practice is to keep the land in corn for 2 or 3 years, oats 1 year, and clover and timothy 1 to 2 years, after which it is returned to corn. Tenant farmers pay less attention to the rotation of crops and often use the same field for corn 4 or 5 years in succession.

This soil is friable, free from stones, and comparatively easy to handle. It can be cultivated under a fairly wide range of moisture conditions, though it bakes and clods when cultivated too wet. Though the natural productiveness of the type is high it responds readily to good methods of cultivation, fertilization, and the growing of leguminous crops. Liberal amounts of barnyard manure are applied, but no commercial fertilizer is used.

The value of land of the Grundy silt loam ranges from \$250 to \$350 an acre, depending on the location, improvements, and condition of the land.

It is only in cases where a field has been devoted to the same crop for a series of years that the soil has materially deteriorated in productiveness. Deeper plowing is needed on most farms, and though the type is high in organic matter it is advisable to rotate cereal crops with legumes every 4 or 5 years in order to keep up the content of organic matter. Washing of surface soil should be prevented as far as feasible.

GRUNDY SILTY CLAY LOAM.

The soil of the Grundy silty clay loam, locally known as "gumbo," is a black silty clay loam 6 to 8 inches in depth. It grades into a pitch-black plastic, tenacious silty clay, which breaks down into small cubes when dry. This stratum passes at any depth from 18 to 24 inches into a bluish or yellowish-gray silty clay mottled with yellow, yellowish brown, and rusty brown. The change from one soil horizon to another is gradual and not marked by any distinct change in color, texture, or structure. Some lime concretions may occur below the depth of 4 feet. The soil is high in organic matter.

The Grundy silty clay loam is an extensive upland type. The area in Henry County, extending into Des Moines County, is by far the largest development of this type in the State of Iowa. The largest area of the type mapped occurs on the divide between Crooked Creek and Big Creek. Another important area is encountered north and east of Mount Pleasant. In addition there are several small areas in the northeastern and southwestern parts of the county.

This type lies at an elevation of 700 to 730 feet above sea level. It occupies flat to depressed areas, and its natural drainage is inadequate. In most places, however, artificial drainage has been provided by the installation of tile drains. The "cube" structure of the soil makes these very effective.

This soil originally was prairie. All of it is now under cultivation or in farm lots. Corn is the most important cash crop, though a large part of the corn produced is fed to hogs. About three-fourths of this soil is in corn. Yields average about 50 bushels per acre, though much higher yields are obtained with careful cultivation. Oats rank second in acreage. This crop yields 35 to 40 bushels per acre, but owing to the high fertility of the soil oats are apt to lodge. About one-fourth of the oat crop is sold and the remainder is fed to work stock. Clover and timothy mixed yield $1\frac{1}{2}$ to $2\frac{1}{2}$ tons per acre. Some timothy and clover are grown alone for seed, with very profitable returns. This type is not well adapted to potatoes, as they grow too much to vine, producing only small tubers.

The general practice on this type is to keep the land about 3 years in corn, 1 year in oats, and 1 to 2 years in clover and timothy. The 4-horse hitch is used almost exclusively in the preparation of the seed bed. Owing to the heavy texture of the soil it requires special care in handling. Under favorable moisture conditions the soil is crumbly and a mellow seed bed can be easily obtained, and this will remain all summer if the ground is not puddled by being stirred while wet. When plowed while only slightly too wet the soil balls up before the plow point in such a way that often the best plow can not be kept in the ground, while at the same time the draft is excessive. On the other hand, if the soil becomes too dry it turns up in clods, which can not be worked down during the growing season. Freezing and thawing is about the only process that will restore the loose, crumbly structure. Liberal amounts of barnyard manure are applied, but no commercial fertilizers are used. A few farmers plow under clover, which gives good results in loosening the dense structure.

The price of farm land on the Grundy silty clay loam ranges from \$175 to \$350 an acre.

Artificial drainage systems, with tiles 6 to 12 rods apart, are necessary over a large part of the type. Fall plowing has such an advantage over spring plowing that it should always be done where practicable.

CLINTON SILT LOAM.

The soil of the Clinton silt loam is a light-brown to grayish-brown, smooth silt loam, 8 to 12 inches in depth. It is underlain by a layer, 4 to 8 inches thick, of yellowish-brown or yellowish-gray silty clay, mottled with yellowish brown. This intermediate layer passes rather sharply into a yellowish-gray, silty clay which is mottled with yellowish brown and rusty brown. The subsoil proper is plastic when wet and very compact and hard when dry. It has the "cube" structure common to other loess soils in this region. The type is

deficient in organic matter, as the light color indicates. Some black iron-oxide concretions are found in the subsoil.

The Clinton silt loam is the second most extensive type in Henry County. It is developed in irregular belts, varying from 1 to 2 miles in width, on each side of the Skunk River Valley, and in a narrow belt along each side of Big Cedar Creek and Little Cedar Creek. Small areas occur along most of the larger drainage ways. The type is more or less interspersed with areas of Marion silt loam on the flat hilltops and of Lindley loam on the valley slopes.

The surface is rolling to steeply rolling or hilly, and good drainage prevails over most of the type. Erosion is a serious factor in farm management. Most farmers fill the slight depressions or small gullies with tree branches, straw, or manure in an effort to prevent their spread.

Practically all this type originally was forested. The chief growth was scrubby bur oak, black oak, black and shagbark hickory, elm, and evergreen. Approximately 25 per cent of it is still in forest, but this land is slowly being cleared. Corn, oats, and clover and timothy are the leading crops. Corn ordinarily yields 30 to 40 bushels per acre. About two-thirds of the crop is sold and the remainder is largely fed to hogs. Oats are extensively grown. They ordinarily yield 30 to 35 bushels per acre. A large proportion of the crop is fed to work stock, and the remainder is sold. A few small fields are devoted to barley. Clover and timothy, with small patches of alfalfa, Sudan grass, and millet, are the main hay crops. They ordinarily yield $1\frac{1}{2}$ to 2 tons per acre. Some clover as well as timothy is grown alone, for the production of seed. Potatoes, sorghum, and various vegetables are produced for home consumption, and there are apple and pear orchards, usually of small extent, on nearly every farm. Sheep are raised in larger numbers than on most of the soils, as large areas are only suitable for pasture.

The general rotation practice on this type is to grow corn for 1 or 2 years, oats 1 year, and clover and timothy 1 to 3 years. Owing to its dissected surface the type is hard to farm, notwithstanding its friable surface soil. Liberal amounts of barnyard manure are applied, but commercial fertilizers are not used.

This land is valued at \$50 to \$150 an acre, depending on the topography, location, and improvements.

In improving the Clinton silt loam it is necessary to handle the soil with considerable care in order to prevent erosion and gullying. The steeper slopes should be kept in pasture as much as possible, the cultivated areas should be plowed deeper, and more organic matter should be incorporated with the soil. Where sufficient barnyard manure is applied crops do nearly as well as on the Grundy silt loam. Owing to the poor grade of timber growing on this type

most of it should be cleared and put in permanent bluegrass pasture. Grass crops do well and dairying and stock raising should prove profitable.

Clinton silt loam, broken phase.—Very rough and broken areas of the Clinton silt loam have been indicated as a broken phase on the soil map that accompanies this report. The surface soil is similar in color and structure to the typical soil, but is much shallower. In most places the heavy compact subsoil is quite near the surface and slight erosion exposes it. Except where erosion is very recent, however, there is a covering of weeds and grasses. The tree growth is similar to that of the typical soil.

This phase occurs in association with the typical Clinton silt loam, in small patches and narrow strips along the slopes to the larger streams in the western and southern parts of the county. The phase has resulted from the rapid cutting of the streams by which steep slopes have been exposed to erosion. The surface soil has been removed almost as fast as weathering could take place, and as a result only a thin soil has been left.

On account of the rapid erosion in some areas and the susceptibility of the entire phase to washing and gulying where the soil is plowed, this land has little value for cultivation. Most of it is left in timber and used for pasture for which it has some value.

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

Mechanical analyses of Clinton silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
332025.....	Soil.....	0.4	1.9	0.8	2.0	5.1	75.8	13.8
332026.....	Subsoil.....	.3	1.1	.6	3.8	4.6	60.0	29.0

MARION SILT LOAM.

The Marion silt loam is a light-gray to almost white, floury, smooth silt loam to a depth of 4 to 8 inches. This passes into a still lighter colored, compact, flourlike silt loam, which frequently is faintly mottled with rusty brown. This layer is the characteristic feature of the Marion soils. At any depth from 15 to 18 inches it passes abruptly into a bluish-gray or yellowish-gray silty clay, which is mottled with yellowish and rusty brown. The predominant color becomes lighter and the mottlings brighter with depth. The lower subsoil is tenacious, tough, and hard when dry and plastic and impervious when wet. The subsoil has the characteristic "cube" structure. Numerous black iron-oxide concretions are found throughout

the 3-foot section. The soil is low in organic matter, and on account of its light surface color is locally termed "white ash" or more commonly "chalk" land.

In places the surface soil is darker in color and approaches that of the Putnam series.

The Marion silt loam occurs on flat-topped hills and smooth tongues of upland in association with the Clinton silt loam. It is also encountered as marginal areas between the Clinton and Grundy silt loams. This soil is best developed in Baltimore Township, though numerous small areas are mapped throughout the Clinton silt loam type. The topography is flat to gently undulating, and drainage is not well established.

The Marion silt loam is a forested soil and was originally covered with a growth of black oak, white oak, laurel or shingle oak, shag-bark hickory, black hickory, and black locust, with some elm.

Practically all of the type is under cultivation, devoted to general farm crops. Corn is the leading crop and yields ordinarily 15 to 40 bushels per acre. Oats rank second in acreage. This crop yields 20 to 30 bushels per acre. Some wheat, barley, rye, and millet also are produced. Clover and timothy mixed are generally grown for hay. In normal seasons they yield from 1 to 2 tons per acre. Timothy seems to be the principal hay crop.

Owing to its favorable topography and silty texture, this type is very easy to handle, although when plowed too wet it bakes and clods. Liberal amounts of barnyard manure are applied, and no commercial fertilizers are used.

Land of the Marion silt loam is valued at \$60 to \$90 an acre.

As on all light-colored upland soils, there is general need for the incorporation of organic matter, either by green manuring or the application of barnyard manure. Where the type is developed in broad areas a system of tile drains would prove very beneficial to remove the excess surface water.

KNOX FINE SAND.

As it occurs in Henry County, the Knox fine sand to a depth of 8 to 12 inches consists of a light-brown loamy fine sand to fine sand. This is underlain by a slightly cohesive, yellowish-brown fine sand. At 24 inches the material changes to a brownish-yellow or yellow sand. Both soil and subsoil are of a loose, open structure. The surface soil is very low in organic matter and is acid according to the litmus test.

The type is inextensive, occurring in small areas along the eastern bank of Skunk River in Jefferson and Trenton Townships and along the eastern bank of Big Cedar Creek. It lies about 30 to 40 feet

above the valley floor. The surface is gently rolling or rolling, and the drainage is excessive.

About 80 per cent of the type is under cultivation. It is largely devoted to the production of the general farm crops, and owing to its leachy and droughty character yields are low. Northwest of Trenton a few small fields are devoted to the production of watermelons and muskmelons, to which it is excellently adapted. Irish potatoes are also admirably adapted to this soil.

The Knox fine sand is very easy to handle and can be worked under any moisture conditions. When plowed too dry it is subject to more or less blowing, but no "sand blows" were observed during the progress of the soil survey. Liberal amounts of barnyard manure are applied to the fields, but no commercial fertilizers are used. Land values range from \$50 to \$60 an acre.

For the improvement of this type it is recommended that barnyard manure and green crops be turned under to increase the organic content. Trucking should be sufficiently developed to meet the demand of the local market. The growing of Irish potatoes and other special crops should prove profitable.

LINDLEY LOAM.

The surface soil of the Lindley loam consists of a silty loam to loam, reddish brown to light brown in color, extending to a depth of 8 to 12 inches. The soil is very high in silt, and the type actually includes areas of silt loam which were too small to map separately. The surface soil is underlain by a light-brown, or reddish-brown, tenacious, gritty clay. Below 28 to 30 inches the subsoil is less dense and the texture is somewhat lighter. The color here is brownish yellow mottled with light gray.

This type has been more or less influenced by wash from higher lying loess areas. In places on the steeper slopes the surface soil has been removed by erosion, exposing relatively small areas of the heavier textured subsoil. Numerous fragments, some irregular and some water worn, of chert, limestone, sandstone, quartzite, and granite, with some large boulders, are found on the surface and throughout the 3-foot section. The content of organic matter is low.

The Lindley loam occurs in small areas scattered throughout the Clinton silt loam. It occupies slopes approaching stream courses, the areas lying between the stream bottoms and the loess soils of the upland. It is consequently developed in narrow strips along the larger, more or less steep slopes, with projecting areas following the ravinelike valleys of the smaller branch streams. Where the subsoil is typical the soil withstands drought well. The type is subject to destructive erosion, gullies 5 to 15 feet deep, with numerous branching laterals, being very common.

The Lindley loam is derived from the Kansan drift sheet, and in the eastern part of New London Township and Baltimore Township from the Illinoian drift sheet.

Owing to its unfavorable topography, the Lindley loam is not in general cultivation. Much of it is used as pasture for live stock, including cattle, horses, and sheep, and to some extent hogs. Some of the rougher slopes support a growth of oak, hickory, and elm. The gentler slopes are farmed, with satisfactory results. Corn yields 20 to 40 bushels and oats 20 to 35 bushels per acre. Clover and bluegrass do well, and the latter is the chief pasture grass.

Land values on the Lindley loam range from \$50 to \$70 an acre.

In the improvement of this type considerable care is necessary to prevent gullyng on the steep slopes. These should remain in permanent pasture or be occupied by cover crops as much of the time as possible. The content of organic matter should be maintained by turning under green crops and growing legumes.

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

Mechanical analyses of Lindley loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
332018.....	Soil.....	1.0	6.0	5.9	25.5	12.0	34.1	15.2
332019.....	Subsoil.....	2.1	6.2	6.0	23.3	12.4	24.6	25.1

CALHOUN SILT LOAM.

The surface soil of the Calhoun silt loam is composed of about 8 to 10 inches of brownish-gray to light-gray floury silt loam. This passes gradually into the upper subsoil, which is a light-gray to almost white silt loam. The upper subsoil changes abruptly at about 20 inches into a tenacious, plastic, yellowish-gray silty clay, mottled with yellowish brown and rusty brown. Small iron concretions are nearly always present in the subsoil and occasionally in the soil.

The Calhoun silt loam is very inextensive. It occurs chiefly along Little Cedar Creek and Big Cedar Creek. Two areas lie along Crooked Creek. The type occupies terrace positions 10 to 15 feet above the present flood plain. It is not nearly so well drained as the Jackson silt loam.

Most of the type is now under cultivation, being devoted to corn, oats, and hay crops. Corn ordinarily yields 25 to 40 bushels per acre, oats 30 to 40 bushels, and clover and timothy 1 to 2 tons. Timothy is well adapted to this type.

Owing to its silty texture this soil is easy to handle under favorable moisture conditions, but it bakes and clods if handled too wet. Lib-

eral amounts of barnyard manure are added, and no commercial fertilizers are used. The type is in need of more organic matter, and in most cases would be benefited by artificial drainage.

The selling value of this land ranges from \$80 to \$125 an acre, depending on the improvements.

BUCKNER VERY FINE SANDY LOAM.

The surface soil of the Buckner very fine sandy loam consists of about 12 to 15 inches of brown to dark-brown, in places nearly black, very fine sandy loam. As a rule the content of organic matter is moderately high. The surface soil passes gradually into the subsoil, which consists of an open, friable, very fine sandy loam, of yellowish-brown color. The type includes an area of typical Buckner loam in sections 6 and 7, Jefferson Township.

The Buckner very fine sandy loam is very inextensive. It occurs on terraces along Skunk River in the western part of the county. The largest area is found northwest of Trenton. The type lies 10 to 15 feet above the first bottoms. Its surface is nearly level or only slightly undulating, but owing to the open structure of the soil the drainage is excessive and it is inclined to be droughty. In a few instances the material has been more or less drifted by winds.

Practically all of the type is under cultivation, and in seasons of favorable rainfall the general farm crops as well as truck crops do well. Most of the type is devoted to corn and oats. Watermelons and strawberries give excellent yields.

Land of the Buckner very fine sandy loam is valued at \$80 to \$150 an acre.

This type requires special study as to the feasibility of developing the trucking industry and the growing of special crops. The soil is in need of liberal application of barnyard manure.

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

Mechanical analyses of Buckner very fine sandy loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
332031.....	Soil.....	0.1	1.2	4.9	65.0	12.9	11.6	4.3
332032.....	Subsoil.....	.0	.9	4.5	67.6	12.9	10.6	3.5

JACKSON SILT LOAM.

The soil of the Jackson silt loam is a light-brown, smooth silt loam 8 to 12 inches deep, passing gradually into a yellowish-brown silty clay loam to silty clay. The subsoil is compact but moderately fri-

able. Iron concretions occur in the lower subsoil. In a few places the surface material approaches a very fine sandy loam or fine sandy loam in texture. Where the type adjoins the upland soils the material is more or less of a colluvial nature and occasionally somewhat sandy in texture.

The Jackson silt loam is the most extensive second-bottom type in the county, covering about 8 square miles. It occurs on low terraces along Skunk River, chiefly below Rome. The areas are distinctly benchlike, though modified to some extent by stream erosion. They lie 5 to 15 feet above the flood plain. Part of the area southeast of Lowell lies 20 to 30 feet above the river bottom and has been considerably modified by erosion. Drainage is practically everywhere adequate.

Nearly all the Jackson silt loam is under cultivation to the staple crops. Only a few farms consist entirely of this type. Corn yields 40 to 50 bushels per acre and oats 35 to 40 bushels. Hay crops do well. The methods of cultivation and the system of rotation are similar to those on the Clinton silt loam.

The value of farm land on the Jackson silt loam varies from \$100 to \$150 an acre.

To improve this soil there is a general need for more thorough cultivation and the growing of leguminous crops to increase the organic content.

Small areas of a dark-colored silt loam are included with the Jackson silt loam in mapping. If these areas had been of sufficient extent they might have been separated as the Bremer silt loam. The surface soil is a dark-gray, heavy silt loam, 12 to 15 inches deep, passing into a very dark gray silty clay, faintly mottled with rusty brown. At 28 to 30 inches the subsoil changes to a gray or light gray, and is mottled with rusty brown. It has a characteristic granular structure, though it is plastic when wet. There are numerous black iron-oxide concretions in the subsoil. In places the surface soil is almost black. As its color indicates, it is high in organic matter. Near Sugar Creek Church and along Big Creek the soil has a 3-foot profile similar to that of the Wabash silt loam. This soil is of small extent, being developed near Sugar Creek Church, and along Big Creek, Little Cedar Creek, and Fish Creek. It lies 5 to 15 feet above the first bottoms. The surface is nearly level or only very gently sloping, and owing to the dense structure of the subsoil the drainage is deficient. Practically all of this soil is under cultivation, devoted almost entirely to the production of corn, which yields 45 to 60 bushels per acre. Some oats and hay also are grown. Oats yield 30 to 40 bushels per acre and clover and timothy $1\frac{1}{2}$ to $2\frac{1}{2}$ tons. Under proper moisture conditions this soil works into a very mellow seed bed, but the range of favorable moisture conditions is rather narrow.

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

Mechanical analyses of Jackson silt loam.

Number.	Description.	Fine gravel.	Coarse sand.	Medium sand.	Fine sand.	Very fine sand.	Silt.	Clay.
		<i>Per cent.</i>						
332027.....	Soil.....	0.0	0.6	0.5	3.2	13.2	72.9	9.1
332028.....	Subsoil.....	.0	.2	.3	1.5	12.4	66.6	18.8

WABASH SILT LOAM.

The Wabash silt loam to an average depth of about 18 inches consists of a nearly black, heavy, smooth silt loam. This is underlain by a slightly heavier and more compact silt loam, which usually is somewhat lighter in color, though often there is little difference in color or texture in the 3-foot section. A high content of organic matter is characteristic of the surface soil.

This type is inextensive, although it is the most important bottom-land soil in the county. It occupies the first bottoms along Crooked Creek, Big Creek, Skunk River, and the smaller streams of the county.

The surface is generally flat, relieved only by old cut-offs. Originally the drainage was poor, but by clearing and straightening the channels of the streams conditions have been very much improved. Practically all of the type originally was forested with cottonwood, willow, elm, black walnut, and ash, and along the smaller streams most of the timber remains.

About 65 per cent of the soil is devoted to the production of the staple crops, and the acreage in cultivation is rapidly being extended. Corn is the dominant crop, there being about 5 acres of corn to 1 acre of all other crops combined. Corn ordinarily yields 50 to 60 bushels per acre, and with good cultivation, in favorable seasons, as much as 90 bushels has been obtained. Kherson oats do fairly well, yielding 30 to 40 bushels per acre. The long-strawed varieties of oats are likely to lodge. No crop rotation is practiced owing to the high natural productiveness of the soil. In many cases it is reported that fields have been in corn continuously for eight years or longer.

The flat topography, silty texture, and mellow structure of this soil make it very easy to handle. In the areas of heavier texture, however, the soil may tend to form hard lumps when cultivated too wet. No barnyard manure or commercial fertilizers are used on this type.

Land of the Wabash silt loam ranges in selling value from \$150 to \$250 an acre, depending on the location and drainage conditions.

The most important problem confronting farmers on this type is that of improving the drainage. The installation of a general drainage system to remove the excess soil moisture as well as the

overflow water is needed. In the better drained situations ditches would serve the purpose, but in low, poorly drained areas tile drains should be laid.

WABASH SILTY CLAY LOAM.

The soil of the Wabash silty clay loam is a black silty clay loam, 6 to 8 inches in depth. It passes gradually into a black silty loam to silty clay, and below 24 inches into a dark-gray silty clay, faintly mottled with brown or rusty brown. The subsoil is plastic and sticky when wet, and hard and granular when dry. The type locally is called "gumbo." A high content of organic matter is characteristic of the surface soil.

The Wabash silty clay loam has a total area of less than 2 square miles. It is developed in the first bottoms of the headwaters of Crooked Creek and Big Creek. The surface is flat to depressed, and owing to the low position and impervious subsoil the type is naturally poorly drained. It is rarely overflowed, however, except after very heavy showers.

Practically all the type has been reclaimed, and it is devoted largely to the production of corn, oats, and clover and timothy. Corn is by far the most important crop. It yields from 40 to 60 bushels per acre. Oats do fairly well, but are likely to lodge. Clover and timothy make a very rank growth and ordinarily yield 2 to 2½ tons per acre. Owing to the natural productiveness of this soil, the rotation of crops receives little attention, and the fields usually are planted in corn for a series of years.

This soil is much harder to handle than the Wabash silt loam. Under favorable moisture conditions it granulates and works up into a mellow seed bed, but when worked too wet it bakes and forms intractable clods. The type receives no fertilization of any kind.

This land is valued at \$150 to \$250 an acre, the price depending largely on the drainage conditions.

GENESEE FINE SANDY LOAM.

The Genesee fine sandy loam consists of a light-brown to brown fine sandy loam, underlain at 12 to 15 inches by yellowish-brown to rusty-brown fine sandy loam which contains light-gray mottlings in the lower part. Both soil and subsoil have a loose, open structure. As the color indicates, the soil is only moderately high in organic matter.

This type occurs mainly along the banks of the Skunk River and in the first bottoms of the smaller streams. It is very inextensive. The surface is flat, and subject to frequent overflows, but owing to the sandy subsoil the drainage is adequate between stages of high water. Only a small part of the type is under cultivation, devoted largely to the production of corn. The soil works up into a very mellow seed

bed and can be tilled under any moisture conditions as long as there is no water standing on the surface. Land values on the well-drained portion of the type range from \$60 to \$130 an acre.

The most productive part of the area mapped with this type really consists of a very fine sandy loam which would be mapped separately if it were of sufficient extent. The soil is a brown very fine sandy loam, 15 to 18 inches deep, underlain by a lighter colored material which is apparently lighter in texture. Below 30 inches the subsoil is mottled with light gray. It has a loose, open structure. The soil carries a fairly high percentage of organic matter. This very fine sandy loam soil has a total area of less than 1 square mile. It occurs along Big Cedar Creek, and along the Skunk River in the southeastern part of the county. The topography is flat, but owing to the sandy subsoil drainage is adequate. Originally this soil was timbered, but practically all of it is now under cultivation. Corn, the principal crop, ordinarily yields 40 to 55 bushels per acre. The soil is easy to handle and can be worked under a wide range of moisture conditions.

GENESEE SILT LOAM.

This soil of the Genesee silt loam is a light-brown to brown silt loam, 15 to 18 inches deep, containing as a rule a high percentage of very fine sand. The subsoil is a lighter colored silt loam containing streaks of gray very fine sand to fine sand. Generally the lower subsoil is mottled with gray. The change in color between the soil and subsoil is not marked by a distinct line, and often there is no apparent change. The soil as well as the subsoil has a loose, open structure. It is not nearly as high in organic matter as the Wabash silt loam.

The Genesee silt loam occurs mainly along Skunk River, Big Cedar Creek, Little Cedar Creek, and their tributaries. It has a flat surface, but owing to its sandy subsoil is well drained between stages of high water. The type lies only 8 to 15 feet above the normal flow of these streams and owing to the high water table it is very drought resistant.

The greater part of this type is under cultivation, devoted mainly to corn and oats. Corn yields 40 to 60 bushels per acre, and oats 30 to 40 bushels. The selling value of the land ranges from \$90 to \$150 an acre.

For its improvement the Genesee silt loam needs the incorporation of organic matter. Liberal applications of manure should be made.

SUMMARY.

Henry County is situated near the southeastern corner of Iowa. The topography ranges from almost flat or plateaulike to steeply roll-

ing. As a whole the county is well drained. The greater part of the drainage is carried off through the Skunk River.

According to the census of 1910 Henry County has a population of 18,640, of which 79.2 per cent is classed as rural. The principal town is Mount Pleasant, the county seat. Railway facilities are good, and in general the county is provided with excellent dirt roads. Chicago, Peoria, and St. Louis are the principal markets. All parts of the county are provided with rural mail delivery routes, telephone service, and good schools.

The average growing season is about 170 days in length. The mean annual precipitation is about 33 inches and the mean annual temperature about 50° F.

Grain farming is the main type of agriculture. Corn, oats, and mixed clover and timothy are the principal crops, ranking in acreage in the order named. The raising of hogs and beef cattle and dairying are important industries. The farm improvements are substantial and present an appearance of thrift and prosperity.

Systematic crop rotations are followed to some extent. Liberal quantities of barnyard manure are applied to the soils, but scarcely any commercial fertilizer is used. Efficient farm labor is very scarce and often impossible to obtain.

The average size of the farms is 123 acres. About 68 per cent of the farms are operated by owners and practically all the remainder by tenants. About 96.5 per cent of the total area of the county is in farms, and of the land in farms over 79 per cent is improved. The value of farm land ranges from \$50 to \$350 an acre.

The soils of Henry County are mainly derived from glacial drift and loess. The loess material has given rise to the Grundy, Clinton, Marion, and Knox soils, and the drift material to the Lindley soils. The second bottoms along the streams are occupied by the Jackson, Calhoun, and Buckner soils, and recent alluvial deposits along the streams are classed with the Wabash and Genesee series.

The Grundy silt loam is the most extensive soil type in Henry County. It is well suited to the production of corn, oats, and clover and timothy. The Grundy silty clay loam is used in the same way as the silt loam. The Clinton silt loam and the Marion silt loam are less extensively used for the growing of corn, and more extensively for oats and hay crops. The Knox fine sand is largely used for corn and truck crops. The Lindley loam, owing to its steep topography, is mainly used for pasturage. The second-bottom and first-bottom soils are best suited to corn, though considerable oats and hay are also produced on these types.

[PUBLIC RESOLUTION--No. 9.]

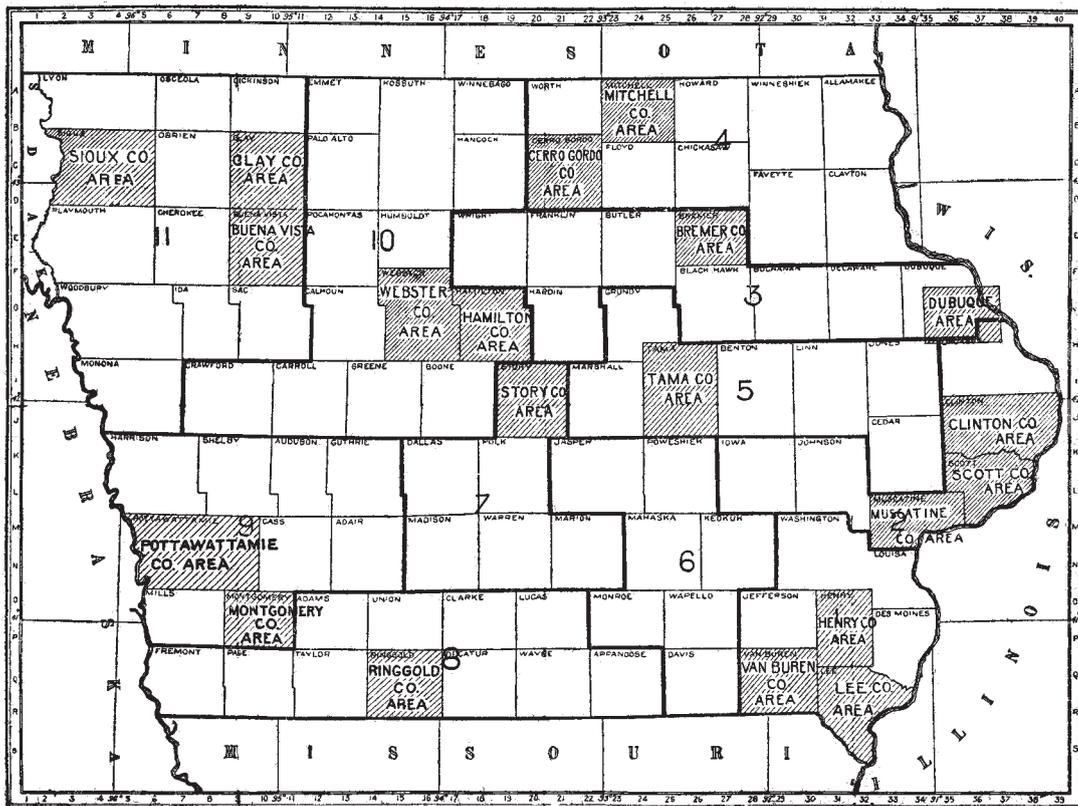
JOINT RESOLUTION Amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture "

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.]



HENRY CO. IOWA.

NOTE.

Henry County adjoins Lee County on the south and a part of Van Buren County on the west. In certain cases the maps of these counties do not appear to agree along the boundaries. This is due to changes in correlation, resulting from a fuller understanding of the soils of the State. The brown silty woodland soils mapped in Lee and Van Buren Counties as Memphis, and formerly believed to be the same as certain silty soils on the lower Mississippi in Tennessee, Kentucky, and Mississippi, are now known to be Clinton, and are so shown in Henry County; the light-colored silt loam mapped as Putnam in the earlier surveys is now the Marion silt loam; and the Wabash fine sandy loam, being too light in color for typical Wabash, is shown as the Genesee fine sandy loam. Where boundary differences appear in these maps, therefore, the names used in Henry County should be applied to the abutting soils in the earlier surveys.

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