

Issued October 20, 1913.

U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF SOILS—MILTON WHITNEY, Chief.

SOIL SURVEY OF NEW LONDON COUNTY,
CONNECTICUT.

BY

W. E. McLENDON.

J. E. LAPHAM, INSPECTOR IN CHARGE NORTHERN DIVISION.

[Advance Sheets—Field Operations of the Bureau of Soils, 1912.]



WASHINGTON:
GOVERNMENT PRINTING OFFICE,
1913.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF SOILS,
Washington, D. C., April 1, 1913.

SIR: The accompanying report and soil map cover the survey of New London County, Conn., one of the projects undertaken by the Bureau during the field season of 1912. Requests for this survey, bearing the indorsement of the Hon. Edwin W. Higgins, were received from prominent citizens of the county, and the work was undertaken to meet the local demands as well as to extend the general knowledge of the soils of the State of Connecticut.

I recommend the publication of this report and map as advance sheets of Field Operations of the Bureau of Soils for 1912, as provided by law.

Very respectfully,

MILTON WHITNEY,
Chief of Bureau.

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

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MAP.

Soil map, New London County sheet, Connecticut.

SOIL SURVEY OF NEW LONDON COUNTY, CONNECTICUT.

By W. E. McLENDON.

DESCRIPTION OF THE AREA.

New London County is situated in the southeastern corner of the State of Connecticut. It is bounded on the north by Windham County, on the east by the State of Rhode Island, on the south by Long Island Sound, and on the west by Middlesex and Tolland

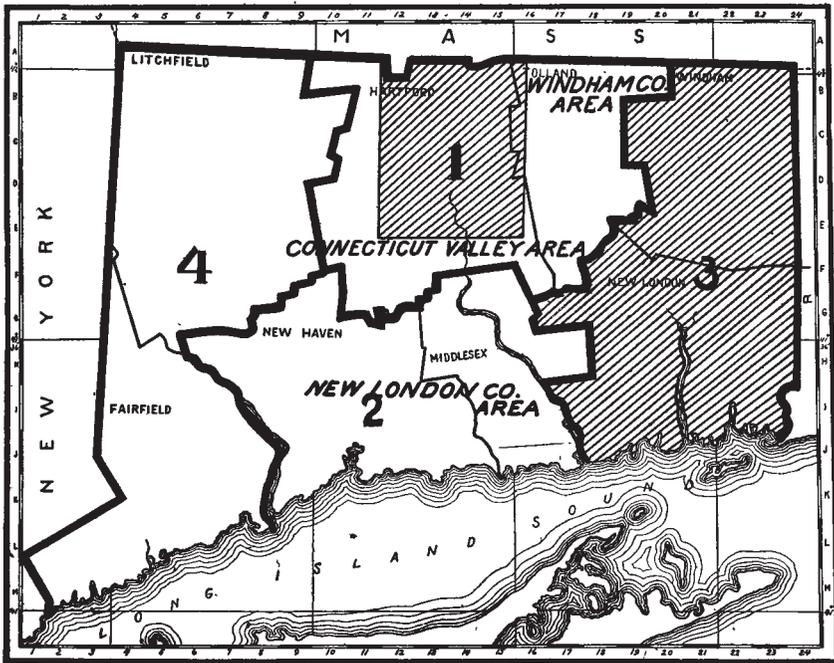


FIG. 1.—Sketch map showing areas surveyed in Connecticut.

Counties. The northern, eastern, and southern boundaries are fairly regular in general outline, but the western boundary follows an irregular course from near Willimantic in a southwesterly direction to the Connecticut River, thence in a southeasterly direction down the river to its mouth. East and west the county has an average length of about 31 miles, and north and south a width of 22 miles. It is composed of 21 towns¹ and has an approximate area of 659 square miles, or 421,760 acres.

¹ The word "town," as used in this report, is synonymous with township.

Considered in a general way, the topography of the county would be classed as hilly and rugged, although there are considerable stretches of gently rolling country, and many of the valleys, widened by glacial flood waters, although lying at an intermediate elevation, include level to undulating terrace land. Viewing the county from any elevated point, it appears as an uneven, hilly country without any orderly arrangement of the hills or valleys. A very noticeable feature is that here and there throughout the county are hills and ridges, usually rough and broken, which rise prominently above the intervening, more gently rolling areas. These ridges rise one after another for a great distance, or until they appear as a continuous ridge forming the sky line, and outline an extensive plain that no doubt existed in ancient geological times. Considering this old plain in its entirety it would have a gentle southeastward slope from an elevation of about 600 feet at the northwestern corner of the county to near sea level along the sound.

The topography in detail shows no systematic arrangement, owing partly to the many different kinds of rocks and their differences in structure, composition, and resistance to weathering, and partly to glaciation. The softer, more easily decayed rocks produced the lower, gently rolling areas, while those which are very resistant have been left in the many rugged hills and ridges.

Before the glacial period the weathering and erosion of the rocks had continued until a comparatively smooth, rolling country was formed.

The effects of the glaciation on the topography were not very great. It seems to have rounded and plowed down some of the hills, filling in valleys, and in other places building up hills to higher levels. Yet the modification brought about by the ice sheet itself was not very perceptible. On the other hand, the flood waters resulting from the melting of the ice sheet, especially upon its retreat, wrought many changes. It was mainly these flood waters that washed away most of the soil covering along many of the valley slopes and left little else than bare rock exposed. The many areas of Rough stony land are evidence of this process. Many new valleys were cut and many of the old ones widened and partly filled in with gravel and sand deposits, and near the coast some broad, flat areas were built up. The valleys are narrow, and except through the lower rolling upland areas they are steep-sided and become gorgelike in some of the roughest sections.

The filled-in valley areas or terraces, which are in striking contrast to the highlands proper, lie intermediate in elevation between the highlands and the first overflow bottoms. Such areas occur in all sections of the county, but the largest are in Griswold, Voluntown, North Stonington, Groton, Waterford, Old Lyme, East Lyme, Lyme,

Sprague, and Franklin Towns, extending for the most part along the rivers and larger brooks.

The Quinebaug and Shetucket Rivers, flowing southwest and southeast, respectively, unite in the north-central part of the county. About 4 miles farther south the Yantic River, flowing from the west, joins the Shetucket to form the Thames River. The latter is a deep tidewater stream extending almost due south to the coast. These streams, with a number of tributaries, drain nearly all of the northern and central sections of the county. A strip along the coast drains directly into the Sound through several short streams, among which may be mentioned the Mystic and Niantic Rivers. The southeastern corner is drained by the Pawcatuck River, and some of the extreme western towns drain into the Connecticut River, mainly through Salmon and Eight Mile Rivers. The brooks and smaller streams are not used to any extent; but there are several dams on the Shetucket, Quinebaug, Pachaug, Yantic, and Little Rivers for the development of power for manufacturing purposes.

New London County, like other sections of southern New England, was settled to a very large extent by English people, and until about 1840 there were but few other nationalities represented. From about 1850 to 1880 there was a continuous influx of immigrants to the county, consisting for the most part of French and English Canadians, Irish, and smaller numbers from practically every European country. While they were attracted mainly to the mills and factories, a considerable number of the Irish, Poles, Swedes, and Germans have gone to the farms. The negro population is small and confined largely to the cities. The foreign element is by far the most conspicuous in the manufacturing villages and cities, while on the farms and in the country villages it is safe to say that at least 50 per cent of the population is English, the direct descendants of the early settlers.

The county was organized in 1766, but at that time extended beyond its present limits, including several of the towns west of the Connecticut River. In 1870 the population was 66,570, while now it has increased to 91,253. It may be noted, however, that a very large proportion of the population is engaged in manufacturing enterprises, and the increase has been confined very largely to the cities and factory towns.

Norwich and New London, the two county seats, with 20,367 and 19,659 inhabitants, respectively, are the only cities in the county. Westerly, in the southeastern corner, is partly in New London County and partly in Rhode Island, and Willimantic, a town of 11,230, is just outside of the county at the northwestern corner. New London lies about 3 miles above the mouth of the Thames River and has a large harbor. Norwich is in the north-central

part of the county, at the head of the Thames River, and can be reached by boats of considerable draft. Both Norwich and New London are important manufacturing centers. In addition there are a large number of factory towns, especially throughout the northern and central sections of the county. Among these may be mentioned Taftville, Occum, Versailles, and Baltic between Norwich and Willimantic; Yantic and Fitchville just out of Norwich to the west; Jewett City and Voluntown in the northeastern part of the county; and Montville and several other places between Norwich and New London. Among the villages, Lebanon, Colchester, Lyme, Niantic, Willimantic, Mystic, and North Stonington are among the most important. Noank, Mystic, and Stonington are seacoast towns.

The county has exceptionally good transportation facilities, although a few points are from 7 to 10 miles from the railroad. The Shore Line of the New York, New Haven & Hartford Railroad, between New York and Boston, crosses the southern part of the county through Lyme, Niantic, New London, Groton, Noank, Mystic, Stonington, and Westerly. Another branch of the same system extends from Groton along the east bank of the Thames River to Norwich, thence in a northerly direction out of the county and into Massachusetts. Jewett City, about 9 miles north of Norwich, is on this line. The Willimantic and Providence line of the New York, New Haven & Hartford enters the county just west of the Quinebaug River, leaving it again at the point where the Shetucket River enters. The Air Line between Willimantic and New Haven passes along the western edge of Lebanon and Colchester Towns, giving an outlet to Colchester village by a spur line from Turnerville. The Central Vermont Railroad extends from New London to Norwich on the west side of the Thames River, and thence in a northwesterly direction to Willimantic, on across Tolland County, and through Massachusetts into Vermont. Both railroads operate boat lines from Norwich and New London to New York and other points. Independent boats also ply between these cities.

In addition to the steam roads, the county has an extensive system of trolley lines centering at Norwich and New London. One line extends from Norwich to Jewett City and on north; one from Norwich to Willimantic, passing through Taftville, Occum, and Baltic; another from Norwich to New London; and still another from Norwich to Westerly. There is also a line from Westerly to Groton, which is just across the river from New London, and another from New London to East Lyme and Niantic. Old Mystic is on a short line from Mystic, while Yantic is reached by both the Central Vermont Railroad and a trolley line from Norwich. All of the interurban lines, in addition to affording cheap and quick passenger service, operate express cars, which are especially convenient for shippers of milk and other farm products.

The county has an extensive system of roads, but the majority of them are not very well cared for and have steep grades. Increasing interest is being taken in their improvement, however, and good macadamized roads are now being constructed between all of the cities, towns, and outlying villages. Roads of this kind are now found between New London, Norwich, and Willimantic and both east and west from New London, besides shorter ones connecting some of the smaller villages with the cities. Some of them are oiled and kept in the best of condition. Ample church and school facilities are found throughout the county and all sections are reached by rural free-delivery mail service.

The markets are exceptionally good, both locally and outside of the county. New York, Boston, Providence, New Haven, Hartford, Worcester, and many other places of importance are within a few hours of Norwich, New London, and other points. The demand for all kinds of farm produce is much greater than the supply. The bulk of the products is sold for local consumption. Of the products marketed the most important are hay, milk, poultry, eggs, and potatoes.

CLIMATE.

The climate of New London County is characterized by long, cold winters, with heavy snowfall, and short, rather cool summers. The more important features are shown in the appended table, which was compiled from reports of the Weather Bureau station at New London. The mean annual temperature is 49° F., but the extreme variation is from -10° in February to 95° in June and July. By seasons the mean temperatures are: 30° F. for winter, 46° F. for spring, 68° F. for summer, and 52° F. for fall. The mean annual precipitation is about 44 inches, the distribution being fairly even throughout the year and generally sufficient to meet the requirements of the different crops grown.

The first killing frosts in the fall occur between September 15 and October 20, and cold winter weather may be expected about the latter part of November, continuing until about April 1. Through the months of December, January, February, and March the ground is rarely clear of snow and remains frozen to a depth of 1½ to 2½ feet, the average depth of snow being about 10 inches. April is milder, but much of the time the weather is too cold and disagreeable for farm work. May is a very pleasant month, with an occasional cool snap, and during the months of June, July, and August the weather is quite pleasant, except for one or more brief periods, when the temperature rises to about 95° F., and the humidity of the air is high. The fall months are mild and pleasant, although the nights are cool after the middle of September. The growing season is about five months long.

Not only is the climate of the region favorable to a variety of agricultural pursuits, but it is healthful and exhilarating, and the line of resorts along the sound front accommodate thousands of tourists every summer.

The following table gives statistics of the salient climatic features of the region:

Normal monthly, seasonal, and annual temperature and precipitation at New London.

Month.	Temperature.			Precipitation.			
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount for the driest year.	Total amount for the wettest year.	Snow, average depth.
	° F.	° F.	° F.	Inches.	Inches.	Inches.	Inches.
December.....	33	60	— 6	3.4	2.7	1.8	13.4
January.....	28	65	— 4	4.0	0.5	4.4	10.6
February.....	29	67	—10	4.0	3.1	4.0	12.0
Winter.....	30			11.4	6.3	10.2	36.0
March.....	36	67	4	4.2	3.0	3.7	7.3
April.....	46	83	17	3.4	1.5	4.5	0.3
May.....	57	93	31	3.7	2.2	8.1	T.
Spring.....	46			11.3	6.7	16.3	7.6
June.....	65	95	43	2.6	1.7	1.1	0.0
July.....	70	95	52	3.7	3.6	4.7	0.0
August.....	70	93	47	3.6	3.6	7.8	0.0
Summer.....	68			9.9	8.9	13.6	0.0
September.....	60	93	35	3.4	2.5	3.3	0.0
October.....	53	83	27	4.0	3.4	8.5	T.
November.....	43	72	10	3.8	2.3	7.4	11.0
Fall.....	52			11.2	8.2	19.2	11.0
Year.....	49	95	—10	43.8	30.1	59.3	54.6

AGRICULTURE.

The agricultural development of New London County and the surrounding country dates back over 250 years. There were some settlers in the area before 1640, but they carried on an almost continuous warfare with the Indians, and several years elapsed before much was done in the line of agriculture. The tendency of the pioneers was to settle in small communities on the ridges, partly on account of the better lands and more healthful conditions and partly, no doubt, to protect themselves from the Indians. These communities formed the nucleus of many of the villages scattered through the section. While methods have improved and some crops have been substituted for others, the agriculture introduced by the early settlers has

never undergone any radical changes. Chief among the first crops were rye, buckwheat, potatoes, oats, and hay. Considerable attention was given to the raising of hogs, cattle, and poultry, which were the chief products marketed. At present the most extensive acreage is devoted to hay and pasture, the chief cultivated crops in the order of their extent being corn, potatoes, oats, rye, and buckwheat. The sale of milk and cream is the source of greatest revenue. Other products marketed are poultry, eggs, apples, potatoes, and miscellaneous vegetables, also a small number of beef cattle, work oxen, sheep, and hogs.

Agricultural development was slow, but progressed steadily until 1840, when the first railroad built into the county was opened for traffic. Before the coming of the railroad it was necessary to haul most of the produce long distances through the county to the market, some of it going directly to Providence and other outside points and some to Norwich, New London, and other points along the coast, whence it was shipped. Conditions improved rapidly with the coming of the railroads and steadily grew better until 1875, and probably in no other period of the county's history were the farmers more prosperous. But the farming then began to decline rapidly and continued to do so until about 1895. This decline was in a large measure due to important economic changes throughout the country. The rapid development of manufacturing industries after 1870 attracted great numbers from the farms. Many of the younger farmers went to the cities seeking better opportunities, while others went west to take up cheap lands. As a result some of the farms were abandoned outright, especially in the sections most remote from the railroads, and many of those not abandoned could not be kept up on account of a scarcity of labor.

In the last 15 years agricultural conditions have improved. The increasing demand for all kinds of farm produce at good prices is the chief cause of the change in the general attitude toward farming. In the more remote sections there are still to be found some farms without occupants, but most of the abandoned places nearer the railroads have been taken up in recent years, some by native Americans and some by immigrants from foreign countries. Russian Jews have taken many of the farms in the western and southern parts of the county from Colchester to New London.

The rapid development of the dairying industry represents the greatest change from the earlier system of agriculture. There are a number of dairy farms near Norwich, New London, and the smaller towns, and small herds are kept by many of the farmers several miles away from the railroads or trolley lines. The proprietors of the smaller dairy farms frequently cooperate in having the milk hauled. Practically all of the milk is now marketed as

fresh milk and cream, while formerly it was used almost entirely to make butter and cheese. Some of the milk is sold in the nearby cities and towns, but a great deal of it is shipped to Boston and other large cities. While the dairying industry has grown rapidly, there is still room for much greater development along this line, as the demand for all kinds of dairy products is increasing more rapidly than the supply. The principal breeds of dairy cattle are the Jersey, Guernsey, and Holstein. There are also some Devon and grade cattle. In 1910 there were 13,746 milch cows in the county, and the milk production for the previous year was 4,763,140 gallons. Of this, 3,323,558 gallons was sold as milk and 49,527 gallons as cream.

The census of 1910 reported a total farm area of 318,371 acres, as against 324,706 acres in 1900 and 312,288 in 1890. The improved land in farms is given as 163,683 acres in 1890, 127,331 acres in 1900, and 129,526 acres in 1910. It appears that while the total area in farms has decreased somewhat, the acreage of improved land has increased slightly during the last decade. The value of farm property, on the other hand, has increased from \$10,436,511 in 1900 to \$12,541,114 in 1910—a gain of 20 per cent. The average value of all property per farm was \$4,139 in 1910, as against \$3,395 in 1900, and the average value of the land for the same years was \$16.61 and \$14.33 per acre, respectively.

About half of the land classed as improved is used for permanent pasture. The more stony upland areas, except where there is little else than rock outcrop, can best be used for pasture lands.

Hay and forage crops rank second to pasture in extent, with 53,441 acres producing 62,770 tons. Timothy and redtop are the principal hay grasses. Clover by itself is not grown to any extent, but mixed with timothy and other grasses constitutes an important crop. Hay continued to be gathered from many of the farms for several years after they were practically abandoned, so this crop was the last to show a marked decrease in production. In 1879 there were 75,800 acres in grass, producing 59,882 tons of hay, while in 1889 there were but 65,149 acres, producing 64,374 tons. The low yield in 1879 may have been due to a poor season, but aside from this the acreage figures show that this crop is much less extensive than it was 20 and 30 years ago. The lands in the county best suited to hay and forage crops are the Gloucester fine sandy loam and Merrimac fine sandy loam.

The raising of sheep, beef cattle, and hogs was more important in the early agriculture of the region than it is now. The total number of sheep in the county in 1900 was about 7,500, while in 1880 the number, exclusive of lambs, was 16,845. The total number of swine dropped from 8,242 in 1880 to 5,485 in 1910. At least

a few hogs should be kept on every farm, as they can be raised on products which otherwise go to waste. The extensive areas of stony land offer good opportunities for raising sheep and cattle, and both industries should prove profitable.

Practically all of the cultivated crops show a decrease in acreage after 1880. Corn dropped from 7,273 acres in 1879 to 4,795 acres in 1889, then climbed to 5,225 acres in 1899 and 6,242 acres in 1909. Probably the actual increase in the last 10 years is greater than indicated by the figures, because a considerable acreage is now grown for ensilage. The average yield of corn, according to the 1910 census reports, is about 48 bushels per acre.

Potatoes rank next to corn in acreage and ahead of it in money value. The acreage devoted to potatoes has not varied much for the last 30 years. In 1909 there were 2,306 acres, producing 249,876 bushels, or an average of 108 bushels per acre. Among the other field crops may be mentioned oats with 1,253 acres producing 33,498 bushels, buckwheat with 445 acres producing 7,543 bushels, and rye with 449 acres producing 6,437 bushels. The acreage devoted to buckwheat is less than half of that for 1880. The field bean is not grown to any extent, but it is probable that it could be made profitable on any of the smoother fine sandy loam areas where improved machinery could be used in cultivating and gathering the crop.

The raising of vegetables for the local market is a source of revenue with a number of farmers. Small tracts near the cities are devoted exclusively to trucking, and are proving very profitable. Considering the great demand for all kinds of garden produce, there is still room for expansion along this line. Beginning in midsummer the market could be kept supplied with home-grown vegetables until late fall. Beans, peas, lettuce, carrots, turnips, asparagus, onions, cabbage, spinach, and many other garden crops can be grown very successfully. Excellent raspberries, blackberries, and strawberries are produced. The best soils for trucking are the Merrimac fine sandy loam and the least stony areas of the Gloucester fine sandy loam.

Small apple orchards, or at least a few apple trees, are found on practically every farm throughout the county. Generally the orchards were fairly well kept and the fruit was of good quality until the decline of agriculture set in. Then through neglect the trees became badly diseased and a large part of the fruit unfit for market.

At present renewed interest is being taken in the apple industry; some of the old orchards are being pruned and otherwise cared for, and where the trees are not too old and badly diseased they are bearing good fruit. Spraying is not generally practiced. This should be done for protection against insect and fungus pests. The apple trees growing wild should be top-worked and cared for, or else destroyed, as they afford breeding places for insects and fungi. A

great deal can be done to control the cedar rust by destroying all cedar trees near the orchards. The Baldwin is by far the most common variety, though there are several others, including the Northern Spy, Rhode Island Greening, and Fall Pippin. The apples put on the market bring from \$1.50 to \$3 a barrel.

Comparatively little commercial orcharding has been practiced. A number of small peach orchards have been put out within the last eight years. Where the trees are properly sprayed and otherwise cared for the industry has proved profitable. The growing of peaches and apples for commercial purposes is just now receiving increased attention. The soils of the Gloucester series are best adapted to orcharding, the lighter areas being preferable for peaches and the heavier areas for apples.

The wet areas, some of which are mucky and now lying idle, if drained would produce heavy crops of hay, forage, corn, and truck crops such as cabbage, onions, potatoes, celery, etc. Some of the mucky areas are peculiarly adapted to the production of cranberries.

Several of the farmers have tried growing alfalfa, but generally in small patches. Most of the attempts have not proved successful, owing to the fact that the farmers did not understand the requirements of the crop or paid too little attention to its soil adaptation. Alfalfa can be grown successfully on the best areas of the Gloucester fine sandy loam. The main requirement is to have the soil in a high state of cultivation, well fertilized, and limed before the crop is planted. Heavy applications of well-rotted barnyard manure when the land is being prepared will prove very beneficial. The inoculation of the soil may also be necessary in order to get a good stand.

A number of the farmers have trouble with clover, probably because their soils are deficient in lime, and it is not grown as extensively as it should be, either as a forage crop or as a soil improver. This is the best leguminous crop of the region to build up the soil, although there are others which can be substituted for it with fairly good results.

Nearly every farmer places some poultry on the market, and some are devoting practically all of their time to poultry farming, with good results. The great demand for poultry of all kinds and eggs at good prices no doubt will stimulate further effort along this line. A number of the standard breeds are raised. The total value of all poultry raised in 1909 was \$428,550, and poultry products to the value of \$296,050 were marketed.

Forestry is not receiving much attention aside from the adoption of precautions to prevent forest fires. Much of the land in the county is better adapted to forestry than to any other purpose, and where there are no trees it should be reforested, possibly with white pine. Much of the forested area supports a good growth of chestnut,

some of which is now large enough for crossties, telegraph poles, etc. This is a valuable tree, and steps should be taken to check the chestnut blight, which has made its appearance.

All of the farmers practice some system of crop rotation, although not always with the idea of keeping the soil in a highly productive state. Those who have established the practice of scientific methods are finding it very profitable. The use of commercial fertilizers is becoming more general from year to year. Improved implements and machinery are gradually displacing the cruder types, which require much hand labor. The rougher stony areas will not permit the use of labor-saving machinery, but these sections can be used to best advantage for pasture. On nearly all of the smoother ridge lands and the flat terraces machinery can be used, and so, while much of the cultivation on such lands is intensive, there is much less need for manual labor than formerly.

In the 1910 census 2,226 farms in the county reported the use of commercial fertilizer, the amount expended for the purpose being \$121,767. High-grade mixtures generally containing the three elements of plant food—nitrogen, phosphorus, and potash—are commonly used. The applications range from 200 to 600 pounds per acre. As in some other sections of the country, the tendency is to rely too much upon the use of commercial fertilizers to increase the yields, regardless of any systematic rotation of crops, and the results are often disappointing. The better the state of cultivation the land is in the more satisfactory are the results from the use of commercial fertilizers. It will thus be seen that instead of eliminating the necessity for crop rotation, the use of fertilizers should supplement this practice. Except for very quick-growing crops, nitrogen, which is the most expensive constituent of fertilizers, could best be supplied by plowing under clover and other leguminous crops at frequent intervals. This would also keep the soil well supplied with humus.

Farm labor is scarce and difficult to obtain at any reasonable price. This, however, is a less serious problem on the small farms than on the large ones, as the farmer can depend almost entirely upon his family for the necessary help. Wages paid for farm labor range from \$1.50 to \$2 a day, or \$20 to \$30 a month with board and lodging. The amount expended for labor according to the census of 1910 as reported from 2,125 farms was \$418,345, exclusive of rent and board, amounting to \$133,308.

According to the census of 1910 the total number of farms in the county was 3,030, and the average size of farms was 105.1 acres. There has been a slight increase in the size of the average farm, owing to the fact that some of the abandoned places have been bought in by owners of adjacent farms and are operated in connection with them. By far the larger number of farms range from 50 to 500

acres, but there are several of 10, 20, and 30 acres and a few of over 1,000 acres. About 83 per cent of the farms are operated by the owners, and 15 per cent by tenants or managers. The rental is usually a stipulated cash sum per farm, to be paid when the crops are gathered in the fall.

Land values vary widely, depending upon the nature of the soil, nearness to railroads and towns, improvements, and forest growth. The best highland areas of the Gloucester fine sandy loam and the more level terrace areas of the Merrimac fine sandy loam command as high as \$100 an acre near Norwich and other towns. In small tracts this price is asked for the land alone, and on tracts of 50 acres or more the buildings are included. Away from the towns the same land sells for \$25 to \$50 an acre. The stony loam areas where cleared are valued at \$10 to \$25 an acre. The so-called "sprout lands," or cut-over areas, command a very low price—\$5 to \$10 an acre. The forested areas are valued very largely on the basis of the standing trees.

The comparatively low price of land, the adaptation of the soils to a variety of crops, and the ease with which they can be tilled and kept in a productive state, with unlimited markets at hand for all farm produce grown, combine to make agricultural opportunities in New London County very attractive, especially to those willing to practice scientific farming. By using the best lands for corn, grass, and other grain and forage crops and the stony lands for pasture, the raising of sheep, beef cattle, and hogs should prove profitable. That dairying may be made profitable is evidenced by the number of well-to-do farmers engaged in that business. Poultry farming as a specialty on small tracts should prove profitable. Apples and peaches do well, and where the trees are properly cared for they produce fruit of excellent quality. There seems to be no reason why practically all of the farm produce consumed in the county can not be raised on the local farms. At present about two-thirds of the produce is imported from other sections.

SOILS.

The rocks underlying New London County consist mainly of granite and gneiss, with intrusions of other highly crystalline rocks, such as syenite. By far the most extensive rock is a gray gneiss varying from massive and granitelike to highly micaceous and schistose. Large bodies of medium-grained to coarse-grained granite are found, especially through the southwestern and eastern portions of the county. Possibly the greatest variation from the general run of the rocks is a dark slaty schist, occurring in very narrow strips, one of which skirts the east edge of the hill just north of Fitchville, and possibly extends on through Franklin Hill and farther north.

While the different rocks vary considerably in texture and structure and some offer greater resistances to weathering agencies than others, the resultant soil material from all of them is very much the same. Disintegration and decomposition had continued for a long time before the glacial period, covering the rocks with a mantle of soil. Erosion had been active until a rolling country with well-defined valleys had been formed. With the advent of the ice sheet a different order was established. The glaciation, however, seems to have been very feeble, so that instead of all of the soils from the hills being scoured off and carried for long distances, the process was more that of plowing through and mixing up the soil material with more or less rock fragments, leaving most of it in place. The areas of the harder rocks, which are very resistant to weathering agencies, have only a thin mantle of soil material over them and have been left practically bare in a number of places. The softer rocks, on the other hand, which generally form the lower lying and more gently rolling country, are deeply covered with glacial debris, or till.

The soils of the uplands proper bear a close relation to the underlying rocks, and although in places not directly overlying the rocks from which they were derived, they have not been removed far from their source of origin. In the terraces referred to in the description of the area a more modified condition is represented. The material here consists of stratified sands and gravel laid down by flood waters resulting from the melting of the ice sheet upon its retreat. No doubt similar valleys were carved out and terrace areas built up in a similar manner preceding the ice sheet in its advance over the region, but these were subsequently overrun by the ice and buried under till. Of more recent origin than the terraces are the narrow strips of alluvial land along the streams, the mucky accumulation in depressed swampy areas, the Tidal marsh lands, and the strips of Beach sand immediately along the coast.

In the uplands there is only one group or series of soils, the Gloucester. The greatest difference between the upland soils is in the stone content, although the texture of the soil material varies somewhat. The coarser grained granites and areas of gneiss, tending to a coarse texture, give a somewhat coarser soil than the finer grained rocks, but nowhere in the county were these differences of sufficient extent to warrant the mapping of a separate type. The best areas, where all of the stone has been or can be removed from the surface, are classed as the Gloucester fine sandy loam, though small areas of loam are included. The more stony areas, generally occupying rougher topography and too stony to be farmed, are classed as the Gloucester stony fine sandy loam, and the very stony areas unsuitable for any cultivated crops are classed as Rough stony land.

On the terraces another group or series of soils is found, although only two types in the series were recognized. The smoothest areas with little or no gravel on the surface are mapped as the Merrimac fine sandy loam, while those of a more gravelly nature and ranging from undulating to irregular and hillocky in topography are classed as Merrimac gravelly sandy loam.

Some of the streams along which the terrace lands are developed are bordered by narrow strips of alluvial soil consisting for the most part of a fine sandy loam. Areas sufficiently uniform to be given a type name are classed as the Podunk fine sandy loam. Swampy areas where a mucky soil has accumulated to a depth of a foot or more are mapped as Muck, except where subject to tidal overflow, in which case they are designated as Tidal marsh. All of the other poorly drained areas along streams and in depressions are classed as Meadow. Coastal beach includes the strips of sand along the beach that are swept by the waves and drifted by the winds.

All of the upland and terrace soils have a rich brown color and are quite mellow and easily kept in good tilth. Another noticeable characteristic, in striking contrast to the residual soils of the southern Piedmont Plateau and other regions, is that the soil material is heaviest at the surface and becomes gradually lighter with depth instead of being light at the surface, becoming heavy in the subsoil, with occasionally a heavy clay subsoil. From the dark-brown soil there is a rapid change beneath to a yellowish-brown, and frequently at a depth of 2 to 2½ feet to a gray color. Where the color is gray it usually indicates a slight deficiency in drainage. All of the soils contain a rather high percentage of silt. That they are all from rocks of a granitic nature suggests a deficiency in lime, applications of which would be beneficial.

Including Rough stony land, Meadow, Tidal marsh, and Coastal beach, ten types of soil were classified and mapped in the survey of New London County. Their names and extent are given in the following table:

Areas of different soils.

Soil.	Acres.	Per cent.	Soil.	Acres.	Per cent.
Gloucester stony fine sandy loam ..	172,480	40.9	Muck.....	7,680	1.8
Gloucester fine sandy loam.....	105,600	25.0	Tidal marsh.....	3,648	.9
Merrimac gravelly sandy loam....	49,280	11.7	Podunk fine sandy loam.....	1,024	.3
Rough stony land.....	48,640	11.5	Coastal beach.....	768	.2
Meadow.....	19,840	4.7			
Merrimac fine sandy loam.....	12,800	3.0	Total.....	421,760

GLOUCESTER FINE SANDY LOAM.

The soil of the Gloucester fine sandy loam is a brown fine to very fine sandy loam from 6 to 9 inches deep. On account of the comparatively large content of silt, ranging as high as 40 per cent, the soil has the properties of a light loam, being very mellow and in most places carrying enough vegetable matter to impart a rich brown color. The sand content is mostly of the fine and very fine grades, except in some areas in the southwestern part of the county where there is enough coarse sand to give a somewhat gritty feel. The subsoil is a fine sandy loam, yellowish brown to a depth of about $2\frac{1}{2}$ feet and brownish gray or gray beneath. In practically all areas the subsoil material becomes somewhat coarser with depth and it is not an unusual thing to find a sandy loam at depths of 3 feet or more.

The type in its original condition carries large quantities of stone strewn over the surface and some stone, mostly gneiss and granite, scattered through the soil material. In clearing it is necessary to remove a great deal of stone from the surface. In places some of the very large boulders have been left here and there over the fields.

In some of the smoother areas of the type the soil and subsoil are almost stone free, but from this it varies to the condition of a true stony loam. The stone removed from the fields has been used in building fences, there being enough in places to fence every 5 to 10 acre tract.

The Gloucester fine sandy loam is an extensive type occurring in all sections of the county. Some of the largest bodies, forming excellent farming country, are found in the Town of Lebanon and the western and eastern parts, respectively, of Franklin and Colchester Towns. All through the central, eastern, and southwestern parts of the county the type is confined largely to the smoother hills, in places occupying the entire hill or again only the crest of the ridge and the smoother slopes.

The surface varies from nearly level and gently undulating to rolling. The more level areas as a rule are found along the crests of the ridges where there may be just enough relief for good surface drainage.

The natural drainage of the type is good, except in local spots affected to some extent by seepage. Inadequately drained areas may be expected in the shallow swales about the heads of streams and in places on hillsides where the shallow depth to bedrock causes some seepage. Such areas are characterized by a dark-gray to black soil, high in organic matter, and have a brownish-gray subsoil. They could be easily drained and converted into good farming land. Very little effort, however, has been made along this line.

The Gloucester fine sandy loam is derived from glacial till overlying gneiss, granite, and other highly crystalline rocks. The soil material

is largely of local origin and bears a close relation to the underlying rocks. Where the rocks are a coarse granite or a gneiss with coarse quartz crystals through them the soil shows a corresponding grittiness.

A very large part of the land under cultivation in the county consists of the Gloucester fine sandy loam. Possibly as much as 80 per cent of its total acreage is cleared, being used for pasturage, hay, and forage crops, corn, oats, potatoes, and in fact for all crops grown in the section. It is a good apple soil and every farmer has a small orchard, although there are but few commercial orchards in the county. Several peach orchards have been planted on the type in the last five or six years. Where the trees have been cared for the industry has been profitable. Numerous dairy farms are located on this type. Clover is not grown to any great extent, although it does well and is probably the best soil improver adapted to the section. Alfalfa could probably be grown on the smoothest, least stony areas, where the soil mantle is deep. The field bean, buckwheat, and a variety of vegetables, small fruits, and berries do well, and most of them can be grown profitably.

Corn yields from 30 to 50 bushels, oats from 20 to 50 bushels, and grasses from three-fourths ton to 1½ tons per acre. Both the yield and quality of Irish potatoes are very good. Ordinarily from 100 to 250 bushels per acre are obtained.

The type is easy to handle and all of the smoother areas will permit the use of machinery. It is valued at \$25 to \$100 an acre, depending upon location and improvements.

GLoucester Stony Fine Sandy Loam.

The soil of the Gloucester stony fine sandy loam, to a depth of 6 to 8 inches, is a brown fine sandy loam carrying a rather high percentage of silt. Large quantities of stone are mixed with the finer soil material, and the surface is strewn with angular fragments of gneiss or granite, ranging from a few inches to several feet in diameter. The subsoil is a yellowish-brown or brownish-yellow fine sandy loam, which becomes brownish gray in its lower depths where drainage is in any way impeded. In places the lower subsoil is medium rather than fine in texture. Outcrops of bedrock occur in many areas, but in most places the soil covering extends to a depth of 3 to 10 feet or more. The subsoil contains large quantities of stone.

The type occurs in two phases which differ somewhat in texture. In one, by far the most extensive, the soil is a brown to dark-brown, fine to very fine sandy loam having the properties of a light loam, owing to a very high percentage of silt, with a subsoil of fine sandy loam. The other phase occupies the hills and ridges and in some areas is confined to the lower steep slopes. The coarser phase is confined to portions of the southwestern corner of the county, south

of a line from Colchester to Montville. All areas of the type have good drainage.

The type is derived from a thin layer of till overlying granite, gneiss, and other highly crystalline rocks. The material is very largely from the underlying rocks, although it has been moved short distances and modified by glacial action. Numerous small areas, which are very rough or where rock outcrops occur, are similar to the Rough stony land.

Nearly half of the type is covered with forest. Small areas without much stone are under cultivation, while the other cleared areas are used for pasture land. The best uses of the rougher parts are for pasture and forestry, while smoother areas that have good elevation are well adapted to growing apples, and where local climatic conditions are favorable peaches are also grown with success. This type can be cultivated to advantage where associated with the Gloucester fine sandy loam and other types suited to cultivated crops. Here the subsoil is typical in color, but there is a perceptibly larger amount of the medium and coarse grades of sand present, which gives the soil a gritty feel. The subsoil is a sandy loam, becoming coarser and more gritty with depth and extending to 3 feet or more.

The type differs from the Gloucester fine sandy loam mainly in the much larger quantity of stone on the surface and throughout the soil material. Very little attempt has been made to clear the type for cultivation, though numerous small areas, too small to be shown on the soil map, are planted to crops. Most of these are, according to a strict classification, the same as the Gloucester fine sandy loam. After all of the stone which can be carried off the land has been removed the fields are often left studded with large boulders, making cultivation difficult and unsatisfactory. To clear the land of stone in most places would cost more than the soil is worth.

The Gloucester stony fine sandy loam is the most extensive type in the county. It occurs in all sections, generally occupying rolling to rough hilly and broken topography. Much of it is used as pasture lands for dairy cows, sheep, or sometimes beef cattle.

Near Norwich and other cities it is valued as high as \$30 an acre if cleared, but in more remote areas it sells for \$10 to \$20 if cleared, and \$5 to \$10 if cut over or so-called "sprout land." A large proportion of the type is quite valuable on account of the forest it supports, consisting mainly of second growth chestnut trees now large enough to furnish cross ties and telegraph poles.

ROUGH STONY LAND.

Rough stony land includes those areas of the county so rough and stony as to be unsuited to agricultural use except as pasture. There is a variation in the type from areas composed almost entirely of

rock outcrop to areas of very stony fine sandy loam. Even in the better areas the soil is shallow. The fine earth consists of a brown fine sandy loam 6 to 8 inches deep, resting upon a yellowish-brown fine sandy loam to sandy loam. This may give way to bedrock within 3 feet of the surface or grade at a depth of 2 to 2½ feet into a brownish-gray fine sandy loam or sandy loam. The numerous rock outcrops throughout the type and the loose stones on the surface consist for the most part of granite and massive gneiss.

The topography varies from irregular and rolling to very rough, the type in many places occupying precipitous slopes.

Areas of Rough stony land are found in all sections of the county, but it is much less extensive than either the Gloucester fine sandy loam or Gloucester stony fine sandy loam, with which it is associated. Some of the largest areas occur in the east-central and southwestern sections of the county.

Some small areas are cleared and used for pasture lands. The remainder of the type is forested, although in many places all of the commercial trees have been removed, and in others fire has done considerable damage. Many areas of the type are now becoming valuable for the forest growth they support, consisting principally of chestnut and oak. White pine has taken possession of some areas, and on others cedar is a conspicuous growth. Forestry is without doubt the best use to which land of this character can be put.

MERRIMAC GRAVELLY SANDY LOAM.

The soil of the Merrimac gravelly sandy loam, to a depth of 6 to 9 inches, is a brown sandy loam to fine sandy loam, containing varying quantities of gravel. In places the gravel content approaches 50 per cent of the soil mass. From the soil proper there is a quick change into a light or yellowish-brown or yellow gravelly sandy loam, which usually extends to a depth of 12 to 18 inches. Below this are beds of gravel and sands of the different grades interstratified, or in some places beds of almost pure gravel. In some of the rougher, ridgy, and hilly areas, where the material has not been completely assorted, some rather large, partially rounded boulders may occur on the surface and throughout the soil, but even here most of the gravel is less than 3 inches in diameter. Generally the gravelly character and agricultural value of the soil vary with the surface features, the areas most irregular in topography being usually the most gravelly and droughty and of little value for farming purposes, while as the surface becomes more level the gravel disappears from the surface and the agricultural value increases. In many areas, too small to be shown on the map the soil is the same as the Merrimac fine sandy loam.

The Merrimac gravelly sandy loam is found in all sections of the county, bordering all the streams of importance and lying in some old glacial valleys not now occupied by streams. For the most part it occurs as terraces intermediate in elevation between the present overflow lands and the highlands proper. In places the terrace feature is well developed, while in others, although considerable irregularities occur in the form of hillocks and ridges, the higher points rise to the level of the same plain.

The type is derived from material deposited by swiftly running water during glacial times. In most places the sands and gravel extend to great depths, but locally they give way to bedrock within a few feet of the surface.

The type has good natural drainage. The depth and open structural properties of the subsoil are such as to favor leaching and to make the soil droughty except over the more level areas. Careful management is necessary in growing crops on any of the rougher and more gravelly phases, and even then crops are likely to suffer during prolonged droughts.

The original forest growth consisted largely of white pine with occasional patches of chestnut, oak, hickory, and other hardwoods. White birch has taken possession of nearly all the areas where the original forest growth has been removed, and some of the very gravelly areas support a growth of cedar. Blueberries and huckleberries thrive as they do on all the other well-drained types.

Only a comparatively small part of the type is under cultivation, this being confined to the better areas. The general crops of the region are grown. Fair yields of corn, potatoes, and buckwheat are secured except in unusually dry seasons. Where the soil has been heavily manured and kept in a state of high cultivation it produces about as good crops as some of the heavier soils. It is best used, however, for potatoes and light truck crops, as it is easily cultivated and warms up early in the spring. The very irregular, gravelly areas could be reforested with white pine and other valuable trees.

MERRIMAC FINE SANDY LOAM.

The surface soil of the Merrimac fine sandy loam, to a depth of 6 to 10 inches, is a brown, mellow fine sandy loam. This changes rapidly into a yellowish-brown or brownish-yellow fine sandy loam to sandy loam which becomes more sandy with depth. At 15 to 24 inches interstratified beds of yellowish-gray coarse sand and fine gravel are encountered. Some areas of the type are almost free of gravel, while others have quite a sprinkling of small gravel on the surface and through the soil. The loaminess of the soil is due more to the high content of silt than to clay, which averages only 5 to 10 per cent. Small areas occur throughout the type, either as slight knolls or other

irregularities which are essentially the same as the Merrimac gravelly sandy loam.

While not an extensive type, the Merrimac fine sandy loam is widely distributed over the county. It occupies level to gently undulating topography like the Merrimac gravelly sandy loam, the two types being of the same origin and derived from stratified drift.

Occurring as it does at an intermediate elevation and occupying almost level topography, the type is retentive of moisture. The deep, porous subsoil, while affording the best of drainage, does not render the soil unduly droughty except in the very lightest phases.

It is the easiest soil in the county to cultivate, as it is practically free of stone and level enough to permit the use of all kinds of improved machinery. It is highly prized for farming, and is nearly all under cultivation.

The original forest growth consisted of white pine with a mixture of hardwoods. Chestnut thrives as on all of the highland types. Birch has sprung up on many of the areas which were once cleared but are no longer cultivated.

The type is especially adapted to truck farming and is used to a small extent for this purpose. Corn yields from 40 to 60 bushels, oats 20 to 50 bushels, and Irish potatoes from 125 to 250 bushels per acre. The soil also produces good crops of buckwheat, rye, and hay. Clover can be successfully grown, but not much of it is seen on the type.

PODUNK FINE SANDY LOAM.

The soil of the Podunk fine sandy loam is a dark brownish gray to black fine sandy loam, 8 to 12 inches deep, and high in organic matter. The subsoil is a brownish-gray sandy loam to coarse sandy loam to a depth of 2 or 3 feet, below which is a coarse, gritty sandy loam, or beds of fine gravel and coarse sand like the subsoil of the Merrimac types.

The Podunk fine sandy loam occupies narrow alluvial bottoms along the streams bordered by the gravelly terrace lands. In some areas the soil, although of similar occurrence, was too variable to be classed as a separate type. Such areas were mapped as Meadow.

The type has a very small extent. It lies so low that the soil is kept moist throughout the year, and some areas are badly waterlogged. The greater part of the type has been cleared and is used for pasture land. Most of it is subject to overflow, but a few fairly well-drained areas along the Yantic River, lying above overflow, are used for corn, potatoes, and a variety of vegetables, and give exceptionally large yields. With good drainage it would grow not only heavy crops of corn, hay, and potatoes, but would prove especially adapted to celery, onions, and fall cabbage.

MUCK.

Muck consists of accumulations of vegetation in an advanced stage of decomposition. The material is dark brown to black in color, usually finely divided, and mellow. Through it there may be numerous partially decayed grass roots and a small admixture of mineral matter, mainly fine sand and silt. The surface material extends to a depth of 1 foot or more, and is underlain by a gray sandy loam or in some places by gray coarse sand and gravel.

Areas of Muck are scattered throughout the county, and many spots occur, largely through the areas mapped as Meadow, which were too small to be shown separately on the map. The type is confined to areas along streams, around ponds, and in broad depressions where a condition of true Swamp has prevailed for long periods. This swampy condition has favored a rank growth of grasses, rushes, etc., the accumulation and decay of which have given rise to the soil. Generally the smaller areas, including those along the streams, are supporting a mixed growth of birch, swamp maple, alders, coarse grasses, and rushes, while in the larger swamps may be found white cedar and a variety of other trees. The majority of these largest swamps occur in the eastern part of the county.

Small areas of Muck have been cleared and the coarse grasses are mowed each year for hay. Excepting these and a few other areas cleared for pasture lands, no attempt has been made to use the type for farming. In many places it offers ideal conditions for growing cranberries, the areas lying in a peculiarly favorable position for both drainage and irrigation. If properly drained, this soil makes excellent land for growing a variety of special and general crops, among which may be mentioned onions, celery, cabbage, potatoes, corn, and hay.

MEADOW.

Meadow is a term used to designate low-lying, poorly drained areas in depressions and along streams, which can not be classed as Podunk fine sandy loam or Muck.

The areas as a rule are small, and the soil so mixed that no classification based upon texture is possible. In general, the soil may be described as a black fine sandy loam, 6 to 9 inches deep, underlain either by gray stony sandy loam or sand. Many small areas throughout the type approach the condition of a true Muck, the soil being mucky to a depth of 9 inches or more.

Areas of Meadow occur in all sections of the county, being found along some of the streams through the gravelly terrace lands, and along practically all of the streams and in the depressions throughout the highlands. They are prevailingly wet and some are in a semi-swampy condition.

The areas along the larger streams are subject to frequent overflow, and are forested principally with white birch, while in the smaller depressions the tree growth may be mostly birch or a mixture of aspen, birch, alder, willows, etc.

None of the Meadow lands are under cultivation, but small areas here and there have been cleared for pastures. Where partially drained the type affords good pasture during the summer months. On the other hand, if good drainage were established, and most areas can be drained at a reasonable cost, it would produce heavy yields of corn and forage, and of special crops, such as onions and cabbage.

TIDAL MARSH.

Tidal marsh includes the low, wet lands bordering the coast and tidewater streams and subject to tidal overflow. The soil varies considerably in different areas, and in single areas, but for the most part it is a gray, coarse, mucky material filled with partially decayed, fibrous roots, and containing varying quantities of mineral material, mainly silt and clay. The mucky material varies from 1 to 2 feet or more in depth and rests upon a gray sand or sandy loam.

The type is not extensive in New London County. Some of the largest areas are found along the Connecticut River, extending from the coast inland 6 miles. Smaller areas lie along the coast from the mouth of the Connecticut River to the Rhode Island line.

Tidal marsh is the result of a swampy condition due to tidal overflow and prevailing over a long period of time. Similar areas farther inland with only fresh-water overflow give rise to a true Muck as ordinarily classified. The areas of Tidal marsh are treeless on account of the salty nature of the water with which they are overflowed, but support a growth of coarse salt marsh grasses and rushes. The nature of this growth, however, varies with the salinity of the overflow waters and the frequency of inundation. On the areas immediately along the coast salt grass is about the only plant able to survive.

In a few places the coarse grasses on the type are mowed and cured for hay. While the hay is not very nourishing, cattle seem to relish it and it makes good bedding. The remainder of the type is not used for any agricultural purposes. Some areas, no doubt, can be drained at a reasonable cost by diking and pumping off the excess waters. These areas where drained so that the excess salt may be washed out would become valuable land, being essentially similar to well-drained Muck areas farther inland.

COASTAL BEACH.

Coastal beach includes the narrow, discontinuous, sandy and gravelly strips formed along the water front of Long Island Sound and some of the tidal estuaries. The texture of the material varies

from sands to gravel. It possesses no agricultural value. This material is of recent formation, and further additions are being received as the result of wave and wind action.

SUMMARY.

New London County is situated in the southeastern corner of Connecticut. It includes 21 towns and has a total area of 659 square miles, or 421,760 acres. The county has a population of 91,253. Norwich and New London are the county seats and largest cities, each having about 20,000 inhabitants. In addition there are a number of important manufacturing towns in the county. Most of the towns along the coast are summer resorts.

The topography is rolling to hilly and broken, except in some of the wide valleys occupied by comparatively level terrace lands and some depressed areas which are generally wet and mucky. The upland ridges range from 10 to 20 feet above sea level immediately along the coast to about 600 feet at the northwestern corner of the county, the local differences ranging up to 400 feet. The more level terraces, as found along a majority of the streams, are intermediate in elevation between the overflow bottoms and the highlands proper.

The county has good transportation facilities, including both steam and trolley lines, and also the advantage of cheap water transportation from Norwich, New London, and other points. It has an extensive system of roads, many of which are State roads, macadamized, and kept in the best condition. Good rural free-delivery service and ample church and school facilities are available.

Most of the drainage of the county is into the Thames River. This is a broad tidal stream extending from the coast almost due north to the north-central part of the county. Norwich is situated at its head and New London is near its mouth, 12 miles distant.

The climate is marked by long, cold winters with heavy snowfall and short, pleasant summers. The average growing season comprises about 5 months, the variation being from $4\frac{1}{2}$ to 6 months.

Until about 1870 agriculture was the chief occupation in the county. Since that time it has become a manufacturing center. With this industrial development and the opening up of cheap western lands which attracted many farmers from the section, the agriculture of the county received a serious setback, but greater attention is now being given to farming. Land values are increasing rapidly and nearly all of the old abandoned farms have recently been taken up. Dairying has made rapid strides in the last few years and is the chief source of revenue for a large number of farmers.

About half of the cleared lands are in pasture, while over 50,000 acres are in grass for hay. Among the cultivated crops, corn, potatoes, and oats are the most important. Buckwheat, rye, and several other crops are grown in a limited way.

Several peach orchards have been planted and have proved very profitable.

Possibly the best opportunities are presented in connection with dairying and the raising of sheep, cattle, and hogs, especially over those extensive stony areas which are unfit for cultivation, but which make excellent pasture lands.

Ten types of soil were mapped, being grouped in three series, with five miscellaneous types—Muck, Meadow, Tidal marsh, Coastal beach, and Rough stony land.

The Gloucester series includes the upland soils derived from glacial till, the Merrimac includes the terrace soils laid down by glacial flood waters, and the Podunk comprises the recent alluvial material where sufficiently uniform in texture to be classified as a distinct type

The Gloucester fine sandy loam is an important type, including practically all the uplands suitable for cultivated crops. It is naturally productive, is easily tilled, and will permit the use of improved machinery except in the stoniest phases on the steeper slopes. It is used principally for dairying and the production of hay, corn, and potatoes. It is a good apple and peach soil and no doubt will grow good alfalfa.

The Gloucester stony fine sandy loam is the most extensive type in the county. Very little of it is cultivated, but a large acreage is cleared and used for pasture. Its best use is for pasture and in places for the growing of apples and peaches.

The Rough stony land has scarcely any value except for the timber it supports. Small areas are devoted to pasturage.

The Merrimac gravelly sandy loam includes a large proportion of the terrace lands. Its topography varies from gently undulating to very irregular. The best areas give fair yields of buckwheat, corn, and other crops. Droughts are more disastrous on this type than on any other.

The Merrimac fine sandy loam, while not extensive, is an important type, and nearly all of it is under cultivation. It is used principally for corn and other general crops, which give good yields. The areas near the railroad can be used to best advantage for truck crops.

The Podunk fine sandy loam is very limited in extent. It is only fairly well drained, and is utilized mainly for pasture. Small areas near Norwich are used quite successfully in growing corn, cabbage, onions, etc. With good drainage this would be an excellent soil.

The Muck lands are in a swampy condition and, with the exception of small areas cleared for pasture, not generally used. Some areas are especially adapted to the growing of cranberries. With good drainage they would produce heavy crops of hay and forage and prove suitable for cabbage, potatoes, onions, celery, etc.

Meadow is wet and undesirable for farming in its present condition. If drained, it would grow heavy crops of hay and forage and some special crops.

Tidal marsh includes the low-lying, wet lands along the coast, subject to tidal overflow. It has scarcely any value. It can be drained by diking and pumping. Once thoroughly drained, it would become quite as productive as the reclaimed inland swampy areas.

Coastal beach has no agricultural value.



[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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